





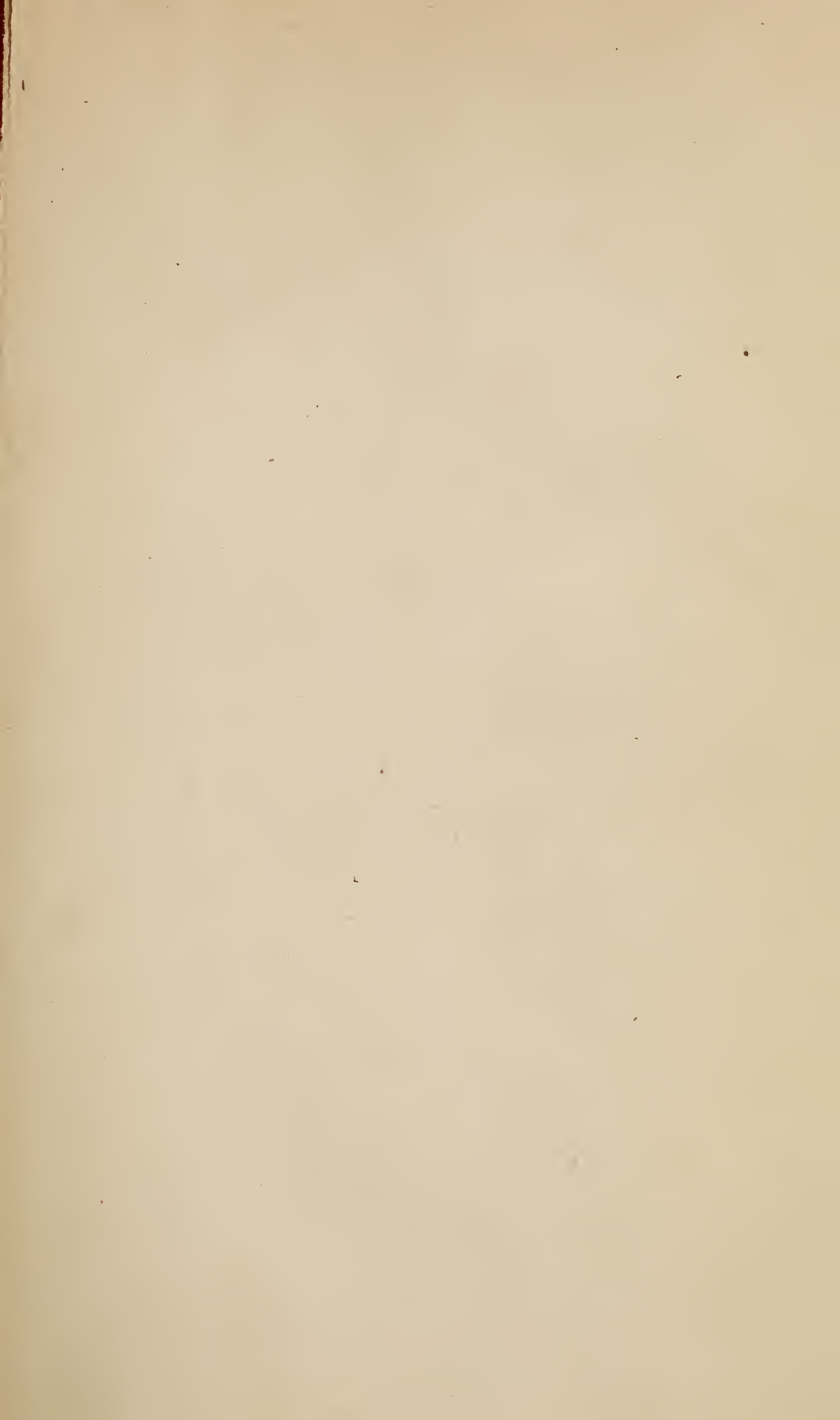
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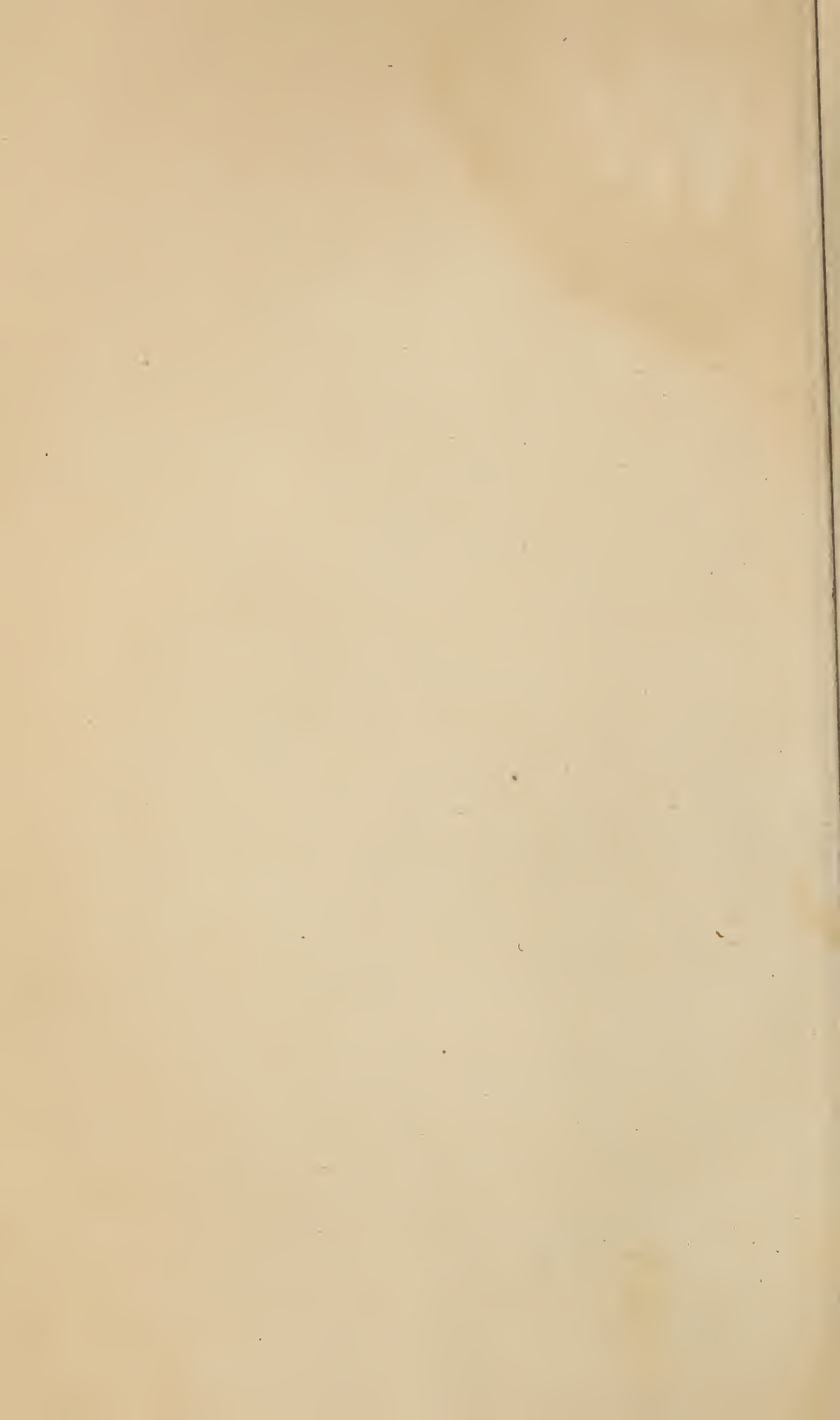
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CHINESE LOOMS.

Clinton G. Gilroy

THE
H I S T O R Y
OF
SILK, COTTON, LINEN, WOOL,
AND OTHER FIBROUS SUBSTANCES;

INCLUDING OBSERVATIONS ON
SPINNING, DYEING AND WEAVING.

ALSO AN ACCOUNT OF THE
PASTORAL LIFE OF THE ANCIENTS, THEIR SOCIAL STATE
AND ATTAINMENTS IN THE DOMESTIC ARTS.

WITH APPENDICES
ON PLINY'S NATURAL HISTORY; ON THE ORIGIN AND MANUFACTURE
OF LINEN AND COTTON PAPER; ON FELTING, NETTING, &c.

DEDUCED FROM
COPIOUS AND AUTHENTIC SOURCES.

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P R E F A C E .

HISTORY, until a recent period, was mainly a record of gigantic crimes and their consequent miseries. The dazzling glow of its narrations lighted never the path of the peaceful Husbandman, as his noiseless, incessant exertions transformed the howling wilderness into a blooming and fruitful garden, but gleamed and danced on the armor of the Warrior as he rode forth to devastate and destroy. One year of his labors sufficed to undo what the former had patiently achieved through centuries; and the campaign was duly chronicled while the labors it blighted were left to oblivion. The written annals of a nation trace vividly the course of its corruption and downfall, but are silent or meagre with regard to the ultimate causes of its growth and eminence. The long periods of peace and prosperity in which the Useful Arts were elaborated or perfected are passed over with the bare remark that they afford little of interest to the reader, when in fact their true history, could it now be written, would prove of the deepest and most substantial value. The world might well afford to lose all record of a hundred ancient battles or sieges if it could thereby regain the knowledge of one lost art, and even the Pyramids bequeathed to us by Egypt in her glory would be well exchanged for a few of her humble workshops and manufactories, as they stood in the days of the Pharaohs. Of the true history of mankind only a few chapters have yet been written, and now, when the deficiencies of that we have are beginning to be realized, we find that the materials for supplying them have in good part perished in the lapse of time, or been trampled recklessly beneath the hoof of the war-horse.

In the following pages, an effort has been made to restore a portion of this history, so far as the meagre and careless traces

scattered through the Literature of Antiquity will allow.—Of the many beneficent achievements of inventive genius, those which more immediately minister to the personal convenience and comfort of mankind seem to assert a natural pre-eminence. Among the first under this head may be classed the invention of Weaving, with its collateral branches of Spinning, Netting, Sewing, Felting, and Dyeing. An account of the origin and progress of this family of domestic arts can hardly fail to interest the intelligent reader, while it would seem to have a special claim on the attention of those engaged in the prosecution or improvement of these arts. This work is intended to subserve the ends here indicated. In the present age, when the resources of Science and of Intellect have so largely pressed into the service of Mechanical Invention, especially with reference to the production of fabrics from fibrous substances, it is somewhat remarkable that no methodical treatise on this topic has been offered to the public, and that the topic itself seems to have almost eluded the investigations of the learned. With the exception of Mr. Yates's erudite production, "*Textrinum Antiquorum*," we possess no competent work on the subject; and valuable as is this production for its authority and profound research, it is yet, for various reasons, of comparative inutility to the general reader.

That a topic of such interest deserved elucidation will not be denied when it is remembered that, apart from the question of the direct influence these important arts have ever exerted upon the civilization and social condition of communities, in various ages of the world, there are other and scarcely inferior considerations to the student, involved in their bearing upon the true understanding of history, sacred and profane. To supply, therefore, an important desideratum in classical archæology, by thus seeking the better to illustrate the true social state of the ancients, thereby affording a commentary on their commerce and progress in domestic arts, is one of the leading objects contemplated by the present work. In addition to this, our better acquaintance with the actual condition of these arts in early times will tend, in many instances, to confirm the historic accuracy and elucidate the idiom of many portions of Holy Writ..

How many of the grandest discoveries in the scientific world owe their existence to accident ! and how many more of the boasted creations of human skill have proved to be but restorations of lost or forgotten arts ! How much also is still being revealed to us by the monumental records of the old world, whose occult glyphs, till recently, defied the most persevering efforts of the learned for their solution !

To be told that the Egyptians, four thousand years ago, were cunning artificers in many of the pursuits which constitute lucrative branches of our modern industry, might surprise some readers : yet we learn from undoubted authorities that such they were. They also were acquainted with the fabrication of crapes, transparent tissues, cotton, silk, and paper, as well as the art of preparing colors which still continue to defy the corrosions of defacing time.

If the *spider* may be regarded as the earliest practical weaver upon record—the generic name *Textoriae*, supplying the root from which is clearly derived the English terms, *texture* and *textile*, as applied to woven fabrics, of whatever materials they may be composed—the *wasp* may claim the honor of having been the first paper-manufacturer, for he presents us with a most undoubted specimen of clear white pasteboard, of so smooth a surface as to admit of being written upon with ease and legibility. Would the superlative wisdom of man but deign, with microscopic gaze, to study the ingenious movements of the insect tribe more minutely, it would not be easy to estimate how much might thereby be achieved for human science, philosophy, and even morals !

For those who love to add to their fund of general knowledge, especially in the department of natural history, the author trusts that much valuable and interesting information will be found comprised in those pages of this work which delineate the habits of the Silk-Worm, the Sheep, the Goat, the Camel, the Beaver, &c. ; while another department, being devoted to the history of the Pastoral Life of the Ancients, will naturally enlist the sympathies of such as take a deeper interest in the records of ages and nations long since passed away. From a mass of heterogeneous, though highly valuable materials, it has

been the design of the author to select, arrange, and conserve all that was apposite to his subject and of intrinsic value. Thus has he endeavored to render the piles of antiquity, to adopt the words of a recent writer, well compacted—a process which has been begun in our times, and with such eminent success that even the men of the present age may live to see many of the thousand and one folios of the ancients handed over without a sigh to the trunk-maker.

The ample domains of Learning are fast being submitted to fresh irrigation and renewed culture,—the exclusiveness of the cloister has given place to an unrestricted distribution of the intellectual wealth of all times. What civilization has accomplished in the physical is also being achieved in the mental world. The sterile and inaccessible wilderness is transformed into the well-tilled garden, abounding in luxurious fruits and fragrant flowers. It is the golden age of knowledge—its Paradise Regained. The ponderous works of the olden time have been displaced by the condensing process of modern literature; yielding us their spirit and essence, without the heavy, obscuring folds of their former verbal drapery. We want real and substantial knowledge; but we are a labor-saving and a time-economizing people,—it must therefore be obtained by the most compendious processes. Except those with whom learning is the business of life, we are too generally ignorant of the mighty mysteries which Nature has heaped around our path; ignorant, too, of many of the discoveries of science and philosophy, in ancient as well as modern times. To meet the exigencies of our day, a judgment in the selection and condensation of works designed for popular use is demanded—a facility like that of the alchemist, extracting from the crude ores of antiquity the fine gold of true knowledge.

The plan of this work naturally divides itself into four departments. The first division is devoted to the consideration of *Silk*, its early history and cultivation in China and various other parts of the world; illustrated by copious citations from ancient writers: From among whom to instance Homer, we learn that embroidery and tapestry were prominent arts with the Thebans, that poet deriving many of his pictures of domestic

life from the paintings which have been found to ornament their palaces. Thus it is evident that some of the proudest attainments of art in our own day date their origin from a period coeval at least with the *Iliad*. Again we find that the use of the distaff and spindle, referred to in the Sacred Scriptures, was almost as well understood in Egypt as it now is in India; while the factory system, so far from being a modern invention, was in full operation, and conducted under patrician influence, some three thousand years ago. The Arabians also, even so far back as five centuries subsequent to the deluge, were, it is stated on credible authority, skilled in fabricating silken textures; while, at a period scarcely less remote, we possess irrefragable testimony in favor of their knowledge of paper made from cotton rags. The inhabitants of Phœnicia and Tyre were, it appears, the first acquainted with the process of dyeing: the Tyrian purple, so often noticed by writers, being of so gorgeous a hue as to baffle description. The Persians were also prodigal in their indulgence in vestments of gold, embroidery and silk: the memorable army of Darius affording an instance of sumptuous magnificence in this respect. An example might also be given of the extravagance of the Romans in the third century, in the fact of a pound of silk being estimated literally by its weight in gold. The nuptial robes of Maria, wife of Honorius, which were discovered in her coffin at Rome in 1544, on being burnt, yielded 36 pounds of pure gold! In the work here presented, much interesting as well as valuable information is given under this section, respecting the cultivation and manufacture of Silk in China, Greece and other countries.

The second division of the work, comprising the history of the *Sheep, Goat, Camel, and Beaver*, it is hoped will also be found curious and valuable. The ancient history of the *Cotton* manufacture follows—a topic that has enlisted the pens of many writers, though their essays, with two or three exceptions, merit little notice. The subsequent pages embody many new and important facts, connected with its early history and progress, derived from sources inaccessible to the general reader. The fourth and last division, embracing the history of the *Linen* manufacture, includes notices of *Hemp, Flax, Asbestos, &c.*

This department again affords a fruitful theme for the curious, and one that will be deemed, perhaps, not the least attractive of the volume. Completing the design of the work, will be found the Appendices, comprising rare and valuable extracts, derived from unquestionable authorities.

Of the *Ten Illustrations* herewith presented, five are entirely original. It is hoped that these, at least, will be deemed worthy the attention of the scholar as well as of the general reader, and that their value will not be limited by their utility as elucidations of the text. Among these, especial notice is requested to the engraving of the Chinese Loom, a reduced facsimile, copied by permission from a magnificent Chinese production, recently obtained from the Celestial Empire, and now in the possession of the Presbyterian Board of Foreign Missions in this city. Another, equally worthy of notice, represents an Egyptian weaving factory, with the processes of Spinning and Winding; also a reduced fac-simile, copied from *Champollion's* great work on Egypt. The Spider, magnified with his web, and the Indian Loom, it is presumed, will not fail to attract attention.

Throughout the entire work, the most diligent care has been used in the collation of the numerous authorities cited, as well as a rigid regard paid to their veracity. As a work so elaborate in its character would necessarily have to depend, to a considerable extent, for its facts and illustrations, upon the labors of previous writers, the author deems no apology necessary in thus publicly and gratefully avowing his indebtedness to the several authors cited in order at the foot of his pages; but he would especially mention the eminent name of Mr. Yates, to the fruits of whose labors the present production owes much of its novelty, attractiveness, and intrinsic value.

New York, Oct. 1st, 1845.

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PART FIRST.

ANCIENT HISTORY OF SILK.

CHAPTER I.

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To please the flesh a thousand arts contend:
The miser's heaps of gold, the figur'd vest,
The gem, the silk-worm, and the purple dye,
By toil acquir'd, promote no other end.—*Peristeph. Hymn. x.*

WHETHER silk is ever mentioned in the Old Testament cannot perhaps be determined.

In Ezek. xvi. 10 and 13, "silk" is used in the common English bible for *שי*, which occurs no where except here, but which, as appears from the context, certainly meant some

valuable article of female dress. Le Clerc and Rosenmüller translate it “serico;” Cocceius, Schindler, Buxtorf, in their Lexicons, and Dr. John Taylor in his Concordance, give the same interpretation. Augusti and De Wette in their German translation make it signify “*a silken veil.*” Others give different interpretations. The only ground, on which silk of any kind is supposed to be meant, is that in the Alexandrine or Septuagint version משי is translated τρίχαπτον, and τρίχαπτον is explained by Hesychius to mean “the *silken* web fitted to be placed over the hair of the head” (τὸ βομβύκινον ὕφασμα ὑπὲρ τῶν τριχῶν τῆς κεφαλῆς ἀπτόμενον), and that other ancient Greek lexicographers also suppose a silken garment to be meant.* But the meaning of τρίχαπτον is in reality as obscure as that of משי. Jerome could not discover it, and concluded that the word was invented by the Greek translator. It is now extant no where else except in a passage of the comic Pherecrates preserved in Athenæus. Schneider, followed by Passow, supposes it to mean some garment made of hair, and quotes to this effect the explanation of Pollux (2. 24.), πλέγμα ἐκ τριχῶν. Although, therefore, the term in question may possibly have denoted some elegant and costly ornament for the head, made at least partly of silk, yet this opinion appears to rest altogether upon the assumption, first, that the ancient lexicographers are accurate in their use of the epithet βομβύκινον, and secondly, that the Alexandrine version is accurate in adopting the word τρίχαπτον.

In Isaiah xix. 9, according to King James’s Translators and Bishop Lowth, mention is made of those “*that work in fine flax,*” in the original צברי פשתים שריקות. Rosenmüller adopts nearly the same interpretation, which is founded upon the use of the verb שרק or סרק in the Chaldee and Syriac dialects to denote the operation of *combing* flax, wool, hair, and other substances. In this sense the word has been taken by the author of the Alexandrine Version, τοὺς ἐργαζομένους τὸ λίνον τὸ σχιστόν; by Symmachus, who instead of σχιστόν uses κτενιστόν; and by Jerome, “*qui operabantur linum pectentes.*”

* See Schleusner, Lexicon in LXX., v. Τρίχαπτον.

In the Targum of Jonathan and in the Syriac Version the same root is taken to denote silk; רסריקין פלחי כתנא; Targ. חבב חבב חבב Syr. Both of these seem to admit of the following literal translation, “those who make silken tunics,” or in Latin, “*Factores tunicarum e sericis.*”

Kimchi supposes שריקות to mean silk webs, observing that silk is called אל שרק by the Arabs. The same opinion has been adopted by Nicholas Fuller*, Buxtorf, and other modern critics. Kennicott, however, arranges the words in two lines as follows,

ובשו עבדי פשתים
שריקות וארגים הורי

According to this arrangement, which seems most suitable to the rules of grammatical construction, we have three co-ordinate phrases in the plural number, denoting three different classes of artificers. The second, שריקות, would by its termination denote *female* artificers, viz. women employed in *combing* wool, flax, or other substances. On the whole we are inclined to adopt this explanation of the word, as it appears to be attended with the least difficulty, either grammatical or etymological.

Silk is mentioned Prov. xxxi. 22. in King James's Translation, i. e. the common English version, and in the margin of Gen. xli. 42. But the use of the word is quite unauthorized.

After a full examination of the whole question Brauniust decides that there is no mention of silk in the whole of the Old Testament, and that it was unknown to the Hebrews in ancient times.

“There can be no doubt,” says Professor Hurwitz, “that manufactures and the arts must have attained a high degree of perfection at the time when Moses wrote; and that many of them were known long before that period, we have the evidence of Scripture. It is true that inventions were at first

* Miscellanea Sacra, l. ii. c. 11.

† De vestitu Heb. Sacerdotum, l. 1. cap. viii. § 8.

few, and their progress very slow, but they were suited to the then condition and circumstances of man, as is evident even in the art of clothing. Placed in the salubrious and mild air of paradise, our first parents could hardly want any other covering than what decency required. Accordingly we find that the first and only article of dress was the **חגורה** *chagorà*, the belt, (not aprons, as in the established version). The materials of which it was made were fig leaves; (Gen. iii. 7.) the same tree that afforded them food and shelter, furnished them likewise with materials for covering their bodies. But when in consequence of their transgressions they were to be ejected from their blissful abode, and forced to dwell in less favourable regions, a more substantial covering became necessary, their merciful Creator made them (i. e. inspired them with the thoughts of making for themselves) **כתנות עור** coats of skins. (Gen. iii. 21.) The original word is **כתנת** *c'thoneth*, whence the Greek $\chi\iota\tau\omega\upsilon$ the tunic, a close garment that was usually worn next the skin, it reached to the knees, and had sleeves (in after times it was made either of wool or linen.) After man had subdued the sheep (Hebrew **כבש** *caves* from **כבש** to subdue*) and learned how to make use of its wool, we find a new article of dress, namely the **שמלה** *simla*, an upper garment: it consisted of a piece of cloth about six yards long and two or three wide, in shape not unlike our blankets. This will explain Gen. ix. 23, 'And Shem and Japheth took a garment, and laid it upon both their shoulders, and went backward and covered the nakedness of their father.' It served as a dress by day, as a bed by night, (Exod. xxii. 26.)

* There is not the least shadow of truth in support of such a deduction; and particularly so since the general tenor of the Scriptures leads to a very different conclusion. We are, therefore, not authorized to give our support to any such hypothesis. The history of the Sheep and Goat is so interwoven with the history of man, that those naturalists have not reasoned correctly, who have thought it necessary to refer the first origin of either of them to any wild stock at all. Such view is, we imagine, more in keeping with the inferences to be drawn from Scripture History with regard to the early domestication of the sheep. Abel, we are told, was a keeper of sheep, and it was one of the firstlings of his flock that he offered to the Lord, and which, proving a more acceptable sacrifice, excited the implacable and fatal jealousy of his brother Cain. (See Part ii. pp. 217 and 293.)

‘If thou at all take thy neighbour’s raiment to pledge, thou shalt deliver it unto him by that the sun goeth down ; for that is his covering only ; it is his raiment for his skin : wherein shall he sleep ?’ And sometimes burdens were carried in it, (Exod. xii. 34,) ‘And the people took their dough before it was leavened, their kneading-troughs being bound up in their clothes upon their shoulders.’

“In the course of time various other garments came into use, as mentioned in several other parts of Scripture. The materials of which these garments were usually made are specified in Leviticus xiii. 47—59, ‘The garment also that the plague of the leprosy is in, whether it be a woollen garment or a linen garment, whether it be in the *warp* or *woof*, of linen or of woollen ; whether in a skin, or in anything made of skin, &c.’ ”

In our search for the distant origin of any art or science, or in looking through the long vista of ages remote even to nations extinct before our own, we are favored with satisfactory evidence so long as we are accompanied with authentic records : beyond, all is dark, obscure, tradition, fable. On such ground it would be credulous or rash in the extreme to repeat as our own, an affirmation, when that rests on the single testimony of one party or interest, especially when that is of a very questionable character. It is even safer, when history or well authenticated records fail us, to appeal to philosophy, or to the well known laws of mind, from which all arts and science spring. The former favors us with the commanding evidence of certainty and decision ; and though the latter may only afford the testimony of analogy, yet, is its probability more safe, at least, than what rests on misguided calculations or on the legendary tales of artifice and fiction.

We have, however, authentic testimony that the *inventive* faculty existed at a very early period. The peculiar condition of man at that time must have afforded many imperative occasions for its exertion. Hence we read that “Jabal was the father of such as dwell in tents” (*i. e. inventor* of tent-making) ; that “Jubal, his brother, was the father” (inventor) of musical instruments : such as the *kinnor*, harp, or stringed in-

struments, and the *ugab*, organ, or wind instruments; that "Tubal-cain was the instructor of every artificer in brass and iron," the first smith on record, or one to teach how to make instruments and utensils out of brass and iron; and that the sister of Tubal-cain was Naamah, whom the Targum of Jonathan ben Uzziel affirms to have been the *inventrix* of plaintive or elegiac poetry*. Here is then an account of the *inventive* faculty being in exercise 3504 years before the Christian era; or 1156 years prior to the deluge; or 804 years before the earliest period assigned to the Chinese for the discovery of silk. And of whatever arts or sciences existing amongst men prior to the deluge, there is no difficulty in conceiving the possibility of the transmission of the leading and most essential parts, at least, to the post-diluvians, by the family of Noah.

But instead of giving our unqualified assent to what has been servilely copied from book to book from the most accessible account, we shall advert to the great discrepancy relative to Chinese chronology, amongst those who have had equal access to their records. Thus the time of Fohi, the first emperor, has been said to be 2951 B. C., by some 2198 B. C., and by others 2057, or about 300 years after the deluge: of Hoang-ti, 2700 B. C., by Mailla it is quoted at 2602 B. C., by Le Sage at 2597 B. C., and by Robinson and others at 1703 B. C. Similar disagreements might, would our limits allow, be observed concerning the rest, and particularly of the emperors, Hiao-wenti, Chim-ti, Ming-ti, Youen-ti, Wenti, Wou-ti, and Hiao-wou-ti. Even in more modern times, and relative to a character so notorious as Confucius, no less than three dates are

* As a proof that the inventive faculty, as to every thing truly useful to man, originally proceeded from *the only* "Giver of every good and perfect gift," consult Isa. xxviii. 24—29: and also a beautiful comment by Dr. A. Clarke on, "And thou shalt speak unto all that are wise hearted, *whom I have filled* with the spirit of wisdom." Exod. xxviii. 3: and also on, "I have filled him with the spirit of God in wisdom, and in understanding, and in knowledge, and in all manner of workmanship; to devise cunning works, to work in gold, and in silver, and in brass; and in cutting of stones, to set them, and in carving of timber, to work in all manner of curious workmanship." Exod. xxxi. 3, 4, and 5.

equally affirmed to be true. As to Hoang-ti, who is said to have begun *the culture of silk*, we are inclined to prefer the latter account, 1703 B. C., which makes him contemporary with Joseph, when prime minister over the land of Egypt.

As a confirmation of this, it may be stated, that by referring to the account given of nine* of the patriarchs at this period, we shall find that the average age of human life, *before much greater*, soon after rapidly declined. Now the average duration of the reigns of the first three† Chinese emperors, including Hoang-ti, was 118 years; of the five that immediately succeeded, only 68 years. After this, until the Christian era, the average duration of a single reign did not exceed 23 years, and thence until the present time not 13 years. Since, therefore, the average duration of the reign of the first three emperors bears an evident and fit proportion to that of the age of man at the period specified, though not at any other before or after, being in the former case as much too small as it would in the latter be too great, the opinion now offered is the only one that can be consistent with these striking facts; and, if duly considered, presents an argument strongly corroborating this view of the subject.

To attempt to establish any greater certainty, in a case of this nature, the Chinese during the dynasty of Tschin, having, to conceal the truth, destroyed everything authentic, would be in vain. It would be even more rational to have recourse to the Vedas, or sacred books of the Brahmins, or to records in the Sanscrit, were it not a well known fact, that nearly all ancient nations, *except the Jews*, actuated by the same ambition, have betrayed a wish to have their origin traced as far back as the creation. And in the gratification of this passion none are so notoriously pre-eminent as the Egyptians, Hindoos, and Chinese.‡ For them the limits of the creation itself have been too narrow, and days, weeks, and even months too short, unless multiplied into years.§

* Peleg, Reu, Serug, Nahor, Terah, Abraham, Isaac, Jacob and Joseph: Gen. xi. 16—26; xlvii. 28; and l. 26. † Fohi, Eohi Chinun, and Hoang-ti.

‡ See Dr. A. Clarke's remarks: end of Gen.

§ See pp. 68, 74, 119 and 294.

The chronology relative to the early culture of silk, as found in Chinese documents, for several irrefragable objections already assigned, is exceedingly questionable, and therefore we are by no means pledged to affirm that either in the authenticity of the books, or in the correctness of the dates have we any faith. M. Lavoisnè dates the commencement of the Chinese dynasties at A. M.* 1816, or 159 years after the deluge. The Rev. J. Robinson of Christ Col., Cam., at A. M. 1947. We have already given as strong reasons, as under the extreme incertitude of the case, can, perhaps, be offered, for preferring the latter; the important points may be briefly stated, thus:

End of the deluge	- - - - -	-	-	†1657 A. M.
Fohi, first emperor, began to reign	- - - - -	-	-	1947 A. M.
Noah died	- - - - -	-	-	2007 A. M.
Eohi Chinun, second emperor, began to reign	- - - - -	-	-	2061 A. M.
Hoang-ti, the third emperor, began to reign	- - - - -	-	-	2201 A. M.
Hoang-ti after establishing the silk culture, died	- - - - -	-	-	2301 A. M.

Hoang-ti was therefore contemporary with Joseph when administering the affairs of Egypt.‡ But would we know what account the Chinese themselves give relative to the earliest introduction of the silk culture, we shall find it in the French version of the Chinese Treatises, by M. Stanislas Julien, or in the following words of pages 77 and 78, as translated and published in 1838, at Washington, under the title of "Summary of the principal Chinese Treatises upon the Culture of the Mulberry, and the rearing of Silk-worms."

* A. M. signifies *Anno Mundi*, that is in the year of the World. The Year of Our Lord always commences on the first day of January, the day on which Christ was circumcised, being eight days old. From the Creation until the birth of Christ, was 4004 years.

Tirin places the birth of Christ in the 36th year of Herod, the 40th of Augustus, the 28th from the battle of Actium, the 749th of Rome, and the 4th of the 193d Olympiad.

† It will here not be improper to observe that the Samaritan text and Septuagint version of the Hebrew, carry the deluge as far back as to the year 3716 before Christ; or 1000 years before the Chinese account of Hoang-ti. On this subject see the *New Analysis of Chronology*, by the Rev. W. Hales, D.D. 4to., 3 vol.

‡ Joseph died in the 2369th year from the Creation.

In the book on silk-worms, we read: "The lawful wife of the emperor Hoang-ti, named *Si-ling-chi*, began the culture of silk. It was at that time that the emperor Hoang-ti invented the art of making garments (!)." The same fact is mentioned more in detail in the general history of China, by P. Maillâ, in the year 2602, before our era (4447 years ago).

"This great prince (Hoang-ti) was desirous that *Si-ling-chi*, his legitimate wife, should contribute to the happiness of his people. He charged her to examine the silk-worms, and to test the practicability of using the thread. *Si-ling-chi* had a large quantity of these insects collected, which she fed herself, in a place prepared for that purpose, and discovered not only the means of raising them, but also the manner of reeling the silk, and of employing it to make garments."

"It is through gratitude for so great a benefit," says the history, entitled *Wai-ki*, "that posterity has deified *Si-ling-chi*, and rendered her particular honors under the name of the goddess of silk-worms." (Memoirs on the Chinese, vol. 13, p. 240.)

We have seen that the most probable account relative to the time of Fohi, said to have been the first Chinese emperor, is that he reigned 2057 years before the Christian era, or in the year of the world 1947. "According to the most current opinion," says M. Lavoisnè, "China was founded by one of the colonies formed at the dispersion of Noah's posterity under the conduct of Yao, who took for his colleague Chun, afterwards his successor. But most writers consider Fohi to have been Noah himself(!)."

Now the deluge terminated A. M. 1657, and Noah lived after the deluge 350 years*, and therefore died A. M. 2007; and as Fohi is said to have reigned 114 years, before Eohi Chun or Chinun succeeded him, he was contemporary, at least, with Noah. The ark rested on Mount Ararat, which is generally allowed to be one of the mountains of Armenia, to the east of the head of the Tigris. And here the same author remarks, that "in rather less than a century and a half, after

* Gen. ix. 28.

the birth of Peleg, it is supposed that Noah, being then about his 840th year, *wearied with the growing depravity of his descendants, retired with a select company to a remote corner of Asia, and there began what in after ages has been termed the Chinese monarchy.*"* This view of the subject, we believe, coincides perfectly with the reputable testimonies presented by Mairan, Bailly, Guignes, and Sir William Jones, and demonstrates that the transit of more central aborigines, since the deluge, to the extremes of China, was perfectly feasible,† and a matter of even high probability.

The first ancient author, who affords any evidence respecting the use of silk, is Aristotle. He does not, however, appear to have been accurately acquainted with the changes of the silk-worm; nor does he say, that the animal was bred or the raw material produced in Cos. He only says, "Pamphile, daughter of Plates, is reported to have first woven it in Cos." (See Chapters ii. iii. and iv. of this Part.)

Long before the time of Aristotle a regular trade had been established in the interior of Asia, which brought its most valuable productions, and especially those which were most easily transported, to the shores opposite this flourishing island. Nothing therefore is more likely than that the raw silk from the interior of Asia was brought to Cos and there manufactured. We shall see hereafter from the testimony of Procopius, that it was in like manner brought some centuries later to be woven in the Phœnician cities, Tyre and Berytus.

The arts of spinning and weaving, which rank next in importance to agriculture, having been found among almost all the nations of the old and new continents, even among those little removed from barbarism, are reasonably supposed to have been invented at a very remote period of the world's history‡. They evidently existed in Egypt in the time of

* Clarke's "Treatise on the Mulberry-tree, and Silk-worm," pp. 14, 18, 20, 21, 27, and 34.

† See chap. iv. p. 67. Also Plate VII. (Map.)

‡ According to Pliny, Semiramis, the Assyrian queen, was believed to have been the inventress of the art of weaving. Minerva is in some of the ancient

Joseph (1700 years before the Christian era), as it is recorded that Pharaoh "arrayed him in vestures of fine linen." (Genesis xli. 42.) Two centuries later, the Hebrews carried with them on their departure from that ancient seat of civilization, the arts of *spinning, dyeing, weaving, and embroidery*; for when Moses constructed the tabernacle in the wilderness, "the women that were wise-hearted did spin with their hands, and brought that which they had spun, both of blue, and of purple, and of scarlet, and of fine linen." (Exod. xxxv. 25.) They also "spun goats' hair;" and Bezaleel and Aholiab "worked all manner of work, of the engraver, and of the cunning workman, and of *the embroiderer, in blue, and of purple, and in scarlet, and in fine linen, and of the weaver.*" These passages contain the earliest mention of woven clothing, which was linen, the national manufacture of Egypt. The prolific borders of the Nile furnished from the remotest periods; as at the present time, abundance of the finest flax*; and it appears, from the testimony both of sacred and profane history, that linen continued to be almost the only kind of clothing used in Egypt till after the Christian era†. The Egyptians exported their "linen yarn," and "fine linen," to the kingdom of Israel, in the days of Solomon, (2 Chron. i. 16; Prov. vii. 16;) their "fine linen with brodered work," to Tyre, (Ezek. xxvii. 7.)

The women of Sidon before the Trojan war, were especially celebrated for the skill in embroidery: and Homer, who lived 900 years B. C., mentions Helen *as being engaged in embroidering the combats of the Greeks and Trojans.*

statutes represented with a distaff, to intimate that she taught men the art of spinning; and this honor is given by the Egyptians to Isis, by the Mohammedans to a son of Japhet, by the Chinese to the consort of their emperor Yao, and by the Peruvians to Mamaoella, wife to Manco-Capac, their first sovereign. These traditions serve only to carry the invaluable arts of spinning and weaving up to an extremely remote period, long prior to that of authentic history.

* Paintings representing the gathering and preparation of flax have been found on the walls of the ancient sepulchres at Eleithias and Beni Hassan, in Upper Egypt, and are described and copied by Hamilton.—"Remarks on several parts of Turkey, and on ancient and modern Egypt," pp. 97 and 287, plate 23.

† Herodotus, book ii. c. 37, 81. (See Plate vi.)

The transition from vegetable fibre to the use of animal staples, such as wool and hair, could not have been very difficult; indeed, as already stated, it took place at a period of which we possess no very authentic written record.

The instrument used for spinning in all countries, from the earliest times, was the distaff and spindle. This simple apparatus was put by the Greek mythologists into the hands of Minerva and the Parcæ; Solomon employs upon it the industry of the virtuous woman; to the present day the distaff is used in India, Egypt, and other eastern countries.

The ancient spindle or distaff was a very simple instrument. The late Lady Calcott informs us, that it continued even to our own days to be used by the Hindoos in all its primitive simplicity. "I have seen," she says, "the rock or distaff formed simply of the leading shoot of some young tree, carefully peeled, it might be birch or elder, and, further north, of fir or pine; and the spindle formed of the beautiful shrub *Euonymus*, or spindle-tree."*

Spinning among the Egyptians, as among our ancestors of no very distant age, was a domestic occupation in which ladies of rank did not hesitate to engage. The term "spinner" is yet applied to unmarried ladies of every rank, and there are persons yet alive who remember to have seen the spinning wheel an ordinary piece of furniture in domestic economy.

We are told that "Solomon had horses brought out of Egypt

* The superior fineness of some Indian muslins, and their quality of retaining longer than European fabrics, an appearance of excellence, has occasioned a belief that the cotton wool of which they are woven is superior to any known elsewhere; this, however, is so far from being the fact, that no cotton is to be found in India which at all equals in quality the better kinds produced in the United States of America. The excellence of India muslins must be wholly ascribed to the skilfulness and patience of the workmen, as shown in the different processes of spinning and weaving. (See Plate v.) Their yarn is spun upon the distaff, and it is owing to the dexterous use of the finger and thumb in forming the thread, and to the moisture which it thus imbibes, that its fibres are more perfectly incorporated than they can be through the employment of any mechanical substitutes.

and linen yarn; the king's merchants received the linen yarn at a price." (1 Kings, x. 28.) And the linen of Egypt was highly valued in Palestine, for the seducer, in Proverbs, says, "I have decked my bed with coverings of tapestry, with carved works, with fine linen of Egypt." (Prov. vii. 16.) The prophet Ezekiel also declares that the export of the textile fabrics was an important branch of Phœnician commerce; for in his enumeration of the articles of traffic in Tyre, he says: "Fine linen with brodered work from Egypt was that which thou spreadest forth to be thy sail; blue and purple from the isles of Elisha was that which covered thee." (Ezek. xxvii. 7.)

It deserves to be remarked that the prophet here joins Egypt with the isles of Elisha or Elis, that is, the districts of western Greece, and thus confirms the ancient tradition recorded by Herodotus of some Egyptian colonists having settled in that country, which the sceptics of the German school of history have thought proper to deny.* Spinning was wholly a female employment; it is rather singular that we find this work frequently performed by a large number collected together, as if the factory system had been established 3000 years ago.

We have, however, many specimens of spinning as a domestic employment. Indeed, attention to the spindle and distaff forms a leading feature in king Lemuel's description of a virtuous woman. "Who can find a virtuous woman? for her price is far above rubies. The heart of her husband doth safely trust in her, so that he shall have no need of spoil. She will do him good and not evil all the days of her life.

* The sceptical school of history, founded by Niebuhr, in Germany, and extended by his disciples to a sweeping incredulity, far beyond what was contemplated by the founder, has labored hard to prove, that the Greek system of civilization was indigenous, and that the candid confession of Herodotus, attributing to Egyptian colonies the first introduction of the arts of life into Hellas, was an idle tale, or a groundless tradition. But the examination of the monuments has proved that Greek art originated in Egypt; and that the elements of the architectural, sculptural, and pictorial wonders which have rendered Greece and Italy illustrious, were derived from the valley of the Nile.

She seeketh wool and flax, and worketh willingly with her hands. She is like the merchant's ships; she bringeth her food from afar. She riseth also while it is yet night, and giveth meat to her household, and a portion to her maidens. She considereth a field, and buyeth it; with the fruit of her hands she planteth a vineyard. She girdeth her loins with strength, and strengtheneth her arms. She perceiveth that her merchandise is good: her candle goeth not out by night. She layeth her hands to the spindle, and her hands hold the distaff. She stretcheth out her hand to the *poor*; yea, she reacheth forth her hands to the *needy*. She is not afraid of the snow for her household: for all her household are clothed with scarlet. She maketh herself coverings of tapestry; her clothing is silk and purple. Her husband is known in the gates, when he sitteth among the elders of the land. She maketh fine linen, and selleth it; and delivereth girdles unto the merchant." (Prov. xxxi. 10-24.)

Hamilton and Wilkinson have already shown that many of the descriptions of combats we meet in the Iliad appear to have been derived from the battle pieces on the walls of the Theban palaces, which the poet himself pretty plainly intimates that he had visited. The same observation may be applied to most of Homer's pictures of domestic life. We find the lady of the mansion superintending the labors of her servants, and using the distaff herself. Her spindle made of some precious material, richly ornamented, her beautiful work-basket, or rather vase, and the wool dyed of some bright hue to render it worthy of being touched by aristocratic fingers, remind us of the appropriate present which the Egyptian queen, Alcandra, made to the Spartan Helen; for the beauty of that frail fair one scarcely is less celebrated than her skill in embroidery and every species of ornamental work. After Polybus had given his presents to Menelaus, who stopped at Egypt on his return from Troy,

Alcandra, consort of his high command,
A golden distaff gave to Helen's hand;
And that rich vase, with living sculpture wrought,
Which, heap'd with wool, the beauteous Phylo brought;

The silken fleece empurpled for the loom,
Rivall'd the hyacinth in vernal bloom.

Odyssey, iv.

In the hieroglyphics over persons employed with the spindle on the Egyptian monuments, it is remarkable that the word *saht*, which in Coptic signifies to twist, constantly occurs. The spindles were generally of wood, and in order to increase their impetus in turning, the circular head was occasionally of gypsum, or composition: some, however, were of a light plaited work, made of rushes, or palm leaves, stained of various colors, and furnished with a loop of the same materials, for securing the twine after it was wound*. Sir Gardner Wilkinson found one of these spindles at Thebes, with some of the linen thread upon it, and is now in the Berlin Museum.

Theocritus has given us a very striking proof of the pleasure which the women of Miletus took in these employments; for, when he went to visit his friend Nicias, the Milesian physician, to whom he had previously addressed his eleventh and thirteenth Idylls, he carried with him an ivory distaff as a present for Theugenis, his friend's wife. He accompanied his gift with the following verses, which modestly commend the matron's industry and virtue, and, at the same time, throw an interesting light on the domestic economy of the ladies of Miletus:

O Distaff, friend to warp and woof,
Minerva's gift in man's behoof,
Whom careful housewives still retain,
And gather to their households' gain;
With me repair, no vulgar prize,
Where the famed towers of Nileus rise †,
Where Cytherea's swayful power
Is worship'd in the reedy bower.

* The ordinary distaff does not occur in these subjects, but we may conclude they had it. Homer mentions one of gold, given to Helen by "Alcandra the wife of Polybus," who lived in Egyptian Thebes.—*Od. iv. 131.*

† Miletus was called "the towers of Nileus," from its having been founded by Nileus, the son of the celebrated king Codrus, who devoted himself for the safety of Athens. Nileus was so indignant at the abolition of royalty on his father's death, that he migrated to Ionia.

Thither, would Jove kind breezes send,
 I steer my course to meet my friend,
 Nicias, the Graces' honor'd child,
 Adorn'd with sweet persuasion mild,
 That I his kindness may requite—
 May be delighted, and delight.
 Thee, ivory distaff, I provide,
 A present for his blooming bride ;
 With her thou wilt sweet toil partake
 And aid her *various vests* to make.
 For Theugenis the shepherds shear
 The sheep's soft fleeces twice a year,
 So dearly industry she loves
 And all that wisdom points, approves,
 I ne'er design'd to bear thee hence
 To the dull house of Indolence ;
 For, in that city thou wert framed
 Which Archias built, Corinthian named,—
 Fair Syracuse, Sicilia's pride,
 Where troops of famous men abide.
 Dwell thou with him whose art can cure
 Each dire disease that men endure ;
 'Thee to Miletus now I give,
 Where pleasure-crown'd Ionians live ;
 That Theugenis by thee may gain
 Fair honor with the female train ;
 And thou renew within her breast
 Remembrance of her muse-charm'd guest.
 Admiring thee, each maid will call
 The favor great, the present small ;
 For love the smallest gift commends,
 All things are valued by our friends.

Idyll, xxviii.

The Roman and Grecian ladies displayed not less taste in the decoration of their various spinning implements, than those of modern times in the ornaments of their work-table. The *calathus* or *qualus* was the basket in which the wool was kept for the fair spinsters. It was usually made of wicker-work. Thus Catullus in his description of the nuptials of Peleus and Thetis, says :

The softest fleeces, white as driven snow,
 Beside their feet in osier baskets glow.

Poema, lxiv.

Homer asserts that the Egyptian queen Alcandra presented Helen with a silver work-basket as well as a golden distaff (Odys. iv.); and from the paintings on ancient vases, we see that the *calathi* of ladies of rank were tastefully wrought and richly ornamented. From the term *qualus* or *quasillus*, equivalent to *calathus*, the Romans called the female slaves employed in spinning *quasillariæ*.

The material prepared for spinning was wrapped loosely round the distaff, the wool being previously combed, or the flax hackled by processes not very dissimilar to those used at the present day amongst the peasantry in the west of Ireland. The ball thus formed on the distaff required to be arranged with some neatness and skill, in order that the fibres should be sufficiently loose to be drawn out by the hand of the spinner. Ovid declares, that Arachne's skill in this simple process excited the wonder of the nymphs who came to see her triumphs in the textile art, not less than the finished labors of the loom.

Oft, to admire the niceness of her skill,
 The nymphs would quit their fountain, shade, or hill:
 Thither from green Tymolus they repair,
 And leave the vineyards, their peculiar care;
 Thither from fair Pactolus' golden stream,
 Drawn by her art, the curious Naiads came.
 Nor would the work, when finish'd, please so much
 As while she wrought to view each graceful touch;
 Whether the shapeless wool in balls she wound,
 Or with quick motion turn'd the spindle round.

Met., vi.

The distaff was generally about three feet in length, commonly a stick or reed, with an expansion near the top for holding the ball. It was sometimes, as we have shown, composed of richer materials. The distaff was usually held under the left arm, and the fibres were drawn out from the projecting ball, being, at the same time, spirally twisted by the forefinger and thumb of the right hand. The thread so produced was wound upon the spindle until the quantity was as great as it would carry.

The spindle was made of some light wood, or reed, and was

generally from eight to twelve inches in length. At the top of it was a slit, or catch, to which the thread was fixed, so that the weight of the spindle might carry the thread down to the ground as fast as it was finished. Its lower extremity was inserted into a whorl, or wheel, made of stone, metal, or some heavy material which both served to keep it steady and to promote its rotation. The spinner, who, as we have said before, was usually a female, every now and then gave the spindle a fresh gyration by a gentle touch so as to increase the twist of the thread. Whenever the spindle reached the ground a length was spun; the thread was then taken out of the slit, or clasp, and wound upon the spindle; the clasp was then closed again, and the spinning of a new thread commenced. All these circumstances are briefly mentioned by Catullus, in a poem from which we have already quoted:—

The loaded distaff, in the left hand placed,
 With spongy coils of snow-white wool was graced;
 From these the right hand lengthening fibres drew
 Which into thread 'neath nimble fingers grew.
 At intervals a gentle touch was given
 By which the twirling whorl was onward driven.
 Then, when the sinking spindle reach'd the ground,
 The recent thread around its spire was wound,
 Until the clasp within its nipping cleft
 Held fast the newly-finish'd length of weft.

In order to understand this description of Catullus, it is necessary to bear in mind, that as the bobbin of each spindle was loaded with thread, it was taken off from the whorl and placed in a basket until there was a sufficient quantity for the weavers to commence their operations.

Homer incidentally mentions the spool or spindle on which the weft-yarn was wound, in his description of the race at the funeral-games in honor of Patroclus:

Oileus led the race;
 The next Ulysses, measuring pace with pace
 Behind him, diligently close he sped,
 As closely following as the running thread
 The spindle follows, and displays the charms
 Of the fair spinner's breast, and moving arms.

Iliad, xxiii.

In India women of all castes prepare the cotton thread for the weaver, spinning it on a piece of wire, or a very thin rod of polished iron with a ball of clay at one end; this they turn round with the left hand, and supply the cotton with the right; the thread is then wound upon a stick or pole, and sold to the merchants or weavers; for the coarser thread the women make use of a wheel very similar to that of the Irish spinster, though upon a smaller construction. (For further information on the manufactures of India, their present state, &c., see Part III.)

The Reverend Mr. C. Forster of Great Britain, has lately published a very curious work on Arabia, being the result of many years' untiring research in that part of the world; from which we learn the very interesting fact, that the ancient Arabians were skilled in the manufacture of *silken textures*, at as remote a period as within 500 years of the flood!

Mr. Forster has, it appears, succeeded in deciphering many very remarkable inscriptions found on some ancient monuments near Adon on the coast of Hadramant. These records, it is said, restore to the world its earliest written language, and carry us back to the time of Jacob, and within 500 years of the flood.

The inscriptions are in three parts. The longest is of ten lines, engraved on a smooth piece of rock forming one side of the terrace at Hisn Ghorab. Then there are three short lines, found on a small detached rock on the summit of the little hill. There are also two lines found near the inscriptions, lower down the terrace. They all relate to one transaction, an incident in Adite history. The tribe of Ad, according to Mr. Sale, were descended from Ad the son of Aws or Uz, the son of Aram, the son of Shem, the son of Noah. The event recorded is the rout and entire destruction of the sons of Ac, an Arab tribe, by the Aws or tribe of Ad, whom they invaded. In Mr. Forster's book fac similes are given of the inscription; the Aditie and the Hamyaritie alphabet; and a glossary containing every word in them, its derivation, and its explanation; with notes of copious illustration upon every point which they involve. The first inscription of ten lines is thus translated:

We dwelt, living long luxuriously in the zananas of this spacious mansion ; our condition exempt from misfortune and adversity. Rolled in through our channel.

The sea, swelling against our castle with angry surge ; our fountains flowed with murmuring fall, above

The lofty palms ; whose keepers planted dry dates in our valley date-grounds ; they sowed the arid rice.

We hunted the young mountain-goats and the young hares, with gins and snares ; beguiling we drew forth the fishes.

We walked with slow, proud gait, IN NEEDLE-WORKED, MANY-COLORED SILK VESTMENTS, IN WHOLE SILKS, IN GRASS-GREEN CHEQUERED ROBES* !

Over us presided kings, far removed from baseness, and stern chastisers of reprobate and wicked men. They noted down for us according to the doctrine of Heber,

Good judgments, written in books to be kept ; and we proclaimed our belief in miracles, in the *resurrection*, in the *return into the nostrils of the breath of life*.

Made an inroad robbers, and would do us violence ; we rode forth, we and our generous youth, with stiff and sharp-pointed spears ; rushing onward.

Proud champions of our families and wives ; fighting valiantly upon coursers with long necks, dun-colored, iron-gray, and bright bay.

With our swords still wounding and piercing our adversaries, until charging home, we conquered and crushed this refuse of mankind.

On the subject of these inscriptions, Mr. Forster, in the dedication of his book to the Archbishop of Canterbury, thus remarks : “ What Job (who, living in the opposite quarter of Arabia, amid the sands of the great Northern desert, had no lasting material within reach on which to perpetuate his thoughts,) so earnestly desired, stands here realized.” “ Oh that my words were now written ! Oh that they were printed in a Book ! That (like the kindred creed of the lost tribe of Ad) they were *graven with an iron pen, and lead, in the rock forever*. (For mine is a better and brighter revelation than theirs.) For I know that my Redeemer liveth, and that he shall stand at the latter day upon the earth ; and though, after my skin, worms destroy this body, yet in the flesh shall I see God : whom I shall see for myself, and mine eyes shall behold, and not another.”

* Silk is the only material used for human clothing which Mohammed, the impostor, introduces among the luxuries of Paradise. (See the Koran, chap. 35.)

That the Arabians should have understood the manufacture of silken textures at as remote a period as that supposed by Mr. Forster, viz., 500 years after the flood, is, to say the least of it, exceedingly questionable, yet it cannot be denied that we are indebted to them for many useful inventions, and among which may be mentioned the art of making *cotton paper**. It is no less true that we first received our cotton-wool from countries where the Arabic language was spoken.

To the Arabs also we are indebted for that almost indispensable article of apparel, the *shirt*, the Arabic name for which is *camees*, whence the Italian *camiscia*, and the French *chemise*†.

In the attempt here made to trace from the dark ages of antiquity the progress of trades and manufactures so widely diffused over the civilised world as those of cotton, linen, silk, wool, &c., *chronological order* is followed as closely as the nature of the inquiry will permit.

* See Appendix B.

† For further information on Arabia, see Parts II. and III.

CHAPTER II.

HISTORY OF THE SILK MANUFACTURE CONTINUED TO THE FOURTH CENTURY.

SPINNING, DYEING, AND WEAVING.—HIGH DEGREE OF EXCELLENCE
ATTAINED IN THESE ARTS.

Testimony of the Latin Poets of the Augustan age—Tibullus—Propertius—Virgil—Horace—Ovid—Dyonisius Perigetes—Strabo. Mention of silk by authors in the first century—Seneca the Philosopher—Seneca the Tragedian—Lucan—Pliny—Josephus—Saint John—Silius Italicus—Stattius—Plutarch—Juvenal—Martial—Pausanias—Galen—Clemens Alexandrinus—Caution to Christian converts against the use of silk in dress. Mention of silk by authors in the second century—Tertullian—Apuleius—Ulpian—Julius Pollux—Justin. Mention of silk by authors in the third century—Ælius Lampidius—Vopiscus—Trebellius Pollio—Cyprian—Solinus—Ammianus Marcellinus—Use of silk by the Roman emperors—Extraordinary beauty of the textures—Use of water to detach silk from the trees—Invectives of these authors against extravagance in dress—The Seres described as a happy people—Their mode of traffic, etc.—(Macpherson's opinion of the Chinese.)—City of Dioscurias, its vast commerce in former times.—(Colonel Syke's account of the Kolissura silk-worm—Dr. Roxburgh's description of the Tusseh silk-worm.)

THE next Authors, who make mention of silk, are the Latin poets of the Augustan age, Tibullus and Propertius, Virgil, Horace, and Ovid. The Parthian war, and the increased intercourse between the Roman empire and the kingdoms of the East, had been the means of recently introducing every kind of silken goods into more general use, although these manufactures were still so rare as to be the objects of curiosity and admiration, and were therefore well adapted to be brought in among the embellishments of poetical imagery.

The appearance of the silken flags attached to the gilt standards of the Parthians (Florus iii. 11.) must have been a very striking sight for the army of Crassus, contributing both to inflame their cupidity and to alarm them with a sense of the

power of their opponents. The conflict here referred to took place in the year 54 B. C. In about 30 years after this date the Roman empire obtained its greatest extension. In the language of Petronius Arbiter (c. 119.),

Th' insatiate Roman spread his conquering arms
O'er land and sea, where'er heaven's light extends.

After these words he says, that among the richest productions of distant climates the Seres sent their "new fleeces." The remotest countries thus contributed to increase the luxury of Rome, and we shall now see how silk, one of the most costly and the most admired of its recent acquisitions, was used by its poets to represent the polish of elevated life and to adorn their language with rich and beautiful allusions. The webs, which they mention, are either those still obtained from Cos, or those imported from the country of the Seres.

TIBULLUS.

A Coan vest for girls.
L. ii. 4.

She may thin garments wear, which female Coan hands
Have woven, and in stripes dispos'd the golden bands.
L. ii. 6.

The latter of these two passages is remarkable as showing that the Coan women practised the elegant art of interweaving gold thread in their silken webs. The gold was no doubt displayed in transverse stripes.

PROPERTIUS.

Why thus, my life, display thy braided hair,
And heave beneath thin Coan webs thy bosom fair?
L. i. 2.

In the next passage Propertius is speaking of his own Poetry, and alludes to his frequent mention of Coan garments.

If bright she walk in Coan vest array'd,
Through all this book will Coan be display'd.
L. ii. 1.

ON A STATUE OF VERTUMNUS.

My nature suits each changing form :
 Turn'd into what you please, I'm fair.
 Clothe me in Coan, I'm a decent lass,
 Put on a toga, for a man I pass.

L. iv. 2.

The texture of the Coan Minerva.

L. iv. 5.

Who gives no Coan robe, but verse instead,
 Artless shall be his lyre, his verses dead.

Ibid.

The same poet (L. iv. 8. 23.) mentions "Serica carpenta," chariots with silk curtains; and the following line (L. i. 14. 22.) shows, that couches with ornamented silk covers were then in use:

Quid revelant variis Serica textilibus?

Propertius also mentions silk under the name of the animal, which produced it:

Shines with the produce of th' Arabian worm.

L. ii. 3. 15.

In this line, as well as in some of those before quoted, he alludes to the use of silk by females of indifferent character. He probably uses the epithet *Arabian*, because the Roman merchants obtained silk from the Arabs, who received it from Persia.

VIRGIL.

Soft wool from downy groves the Æthiop weaves,
 And Seres comb their fleece from silken leaves.

Georg. ii. 120, 121.—Sotheby's Translation.

The poet is here enumerating the chief productions of different countries, and therefore mentions cotton and silk. The idea, that silk webs were manufactured from thin fleeces obtained from trees, will be found recurring in many of the subsequent citations. It may have been founded on reports brought

by the soldiers of Crassus, or by others who visited the interior of Asia about the same period.

HORACE.

Nor Coan purples, nor the blaze
Of jewels can bring back the days,
Which, fix'd by time, recorded stand,
By all, who read the Fasti, scann'd.

Od. l. iv. 13. (ad Lycen.) 13-16.

As if uncloth'd, she stands confess'd
In a translucent Coan vest.

Sat. i. 2. 101.

These passages allude to the fineness and transparency of silken webs, which in the time of Horace were worn at Rome only by prostitutes, or by those women who aimed at being as attractive and luxurious as possible in their attire.

The former passage shows, that the silks manufactured in Cos were dyed with the murex, "Coæ purpuræ."

The expression "Sericos pulvillos" (*Epod. 8. 15.*) has been supposed to denote small cushions covered with silk. But the epithet "Sericos" implies nothing more than that they were obtained from the Seres, who supplied the Romans with skins as well as silk*; and leather seems to have been a more proper substance than silk for making cushions.

OVID.

Sive erit in Tyriis, Tyrios laudabis amictus,
Sive erit in Cois, Coa decere puta.
Aurata est : ipso tibi sit pretiosior auro ;
Gausapa si sumsit, gausapa sumta proba.

Ars Amat. ii. 297-300.

Whatever clothing she displays,
From Tyre or Cos, that clothing praise :
If gold shows forth the artist's skill,
Call her than gold more precious still :
Or if she choose a coasre attire,
E'en coarseness, worn by her, admire.

* Plin. xxxiv. cap. 24.

In another passage (*Amores* i. 14. 5.) Ovid compares the thin hairs of a lady to the silken veils of the Seres,

Veils such as color'd Seres wear.

We now proceed to the testimonies of authors who wrote either in Greek or Latin at the latter part of the Augustan age, or immediately after it.

DYONISIUS PERIEGETES.

Καὶ ἔθνεα βάρβαρα Σηρῶν,
 Ὅτε βοας μὲν ἀναίνονται καὶ ἴφια μῆλα,
 Αἰόλα δὲ ξαίνοντες ἐρήμης ἄνθεα γαίης,
 Ἐἴματα τεύχουσιν πολυδαίδαλα, τιμήντα,
 Εἰδόμενα χροίῃ λειμωνίδος ἄνθεσι ποίης·
 Κείνοις οὔτι κεν ἔργον ἀραχνάων ἐρίσειεν. (l. 755.)

And the barbarous nations of the Seres, who renounce the care of sheep and oxen, but comb the variously colored flowers of the desert land to make precious figured garments, resembling in color the flowers of the meadow, and rivalling (in fineness) the work of spiders.—Yates's Translation.

It is worthy of observation that Dyonisius speaks expressly not only of the fineness of the thread, but of the *flowered texture* of the silk.

STRABO.

Τοιαῦτα δὲ καὶ τὰ Σηρικὰ, ἕκ τι νων φλοιῶν ξαινομένης βύσσου.
 L. xv. 695. (v. vi. p. 40. *Tzschucke.*)

This is repeated by Eustathius on Dyonisius Periegetes*. The account seems to have been taken by Strabo, perhaps inaccurately, from Nearchus. It is doubtful, whether Σηρικὰ denoted silken webs in this passage. But whatever Strabo meant, he supposed the raw material to be scraped from the bark of trees†.

As contemporary with the authors last quoted, Dyonisius and Strabo, we may here mention the law passed by the Roman Senate early in the reign of Tiberius, "Ne vestis Serica viros fœdaret." *Taciti Annales*, ii. 33. *Dion. Cass. l. 57. p. 860.*

* L. 1107. p. 308, Bernhardy.

† Book ii. ch. 3. p. 307.

*Reim. Suidas in v. Τιβήριος**. Silk was to be worn by women only.

The next emperor Caligula had silk curtains to his throne (*Dion. Cass. l. 59. p. 915. Reim.*), and he wore silk as part of his dress, when he appeared in public. Dio Cassius particularly mentions, that, when he was celebrating a kind of triumph at Puteoli, he put on what he alleged to be the *thorax* of Alexander, and over that a silken chlamys, dyed with the murex, and adorned with gold and precious stones. On the following day he wore a tunic interwoven with gold†. The use of shawls and tunics of silk was, however, except in the case of the extravagances of a Caligula, still confined to the female sex. Under the earlier emperors it is probable, that silk was obtained in considerable quantities for the wardrobe of the empress, where it was preserved from one reign to another, until in the year 176 Marcus Aurelius Antoninus, the philosopher, in consequence of the exhausted state of his treasury, sold by public auction in the Forum of Trajan the imperial ornaments and jewels together with the golden and silken robes of the Empress‡.

FIRST CENTURY.

SENECA, THE PHILOSOPHER.

Posse nos vestitos esse sine commercio Serum.—*Epist. 91.*

We may clothe ourselves without any commerce with the Seres.

Video Sericas vestes, si vestes vocandæ sunt, in quibus nihil est, quo defendi aut corpus aut denique pudor possit: quibus sumtis mulier parum liquidò nudam se non esse jurabit. Hæc ingenti summâ ab ignotis etiam ad commercium gentibus accersunter, ut matronæ nostræ ne adulteris quidem plus sui in cubiculo quam in publico ostendant.—*De Beneficiis, L. vii. c. 9.*

I see silken (Seric) garments, if they can be called garments, which cannot afford any protection either for the body or for shame: on taking which a woman will scarce with a clear conscience deny, that she is naked. These are sent for

* Dio Cassius (l. 43. p. 358. Rheim.) mentions as a report, that Julius Cæsar employed silk curtains (παραπετάσματα Σηρικὰ) to add to the splendor of his triumph.

† In describing the effeminate dress of the emperor Caligula, Suetonius tells us (*cap. 52*), that he often went into public, wearing bracelets and long sleeves, and sometimes in a garment of silk and a cyclas.

‡ Jul. Capitol. c. xvii. p. 65. Bip.

at an enormous price from nations, to which our commerce has not yet extended, in order that our matrons may display their persons to the public no less than to adulterers in their chamber!—Yates's Translation.

The Seres must be supposed to have dwelt somewhere in the centre of Asia. Perhaps those geographers who represent Little Bucharìa as their country*, are nearest the truth, and thus far neither Greeks nor Romans had penetrated. Silk was brought to them "from nations, to which even their commerce had not yet extended." Hence their inaccurate ideas respecting its origin†.

SENECA, THE TRAGEDIAN.

Nec Mæoniâ distinguit acu,
Quæ Phœbeis subditus Euris
Legit Eois Ser arboribus.

Herc. Œtæus, 664.

Nor with Mæonian needle marks the web,
Gather'd by Eastern Seres from the trees.

Seres, illustrious for their fleece.

Thyestes, 378.

Remove, ye maids, the vests, whose tissue glares
With purple and with gold; far be the red
Of Tyrian murex, and the shining thread,
Which furthest Seres gather from the boughs.

Hyppolitus, 386. (*Phædra loquitur*.)

At a very early period the art of dyeing had been carried to a very great degree of perfection in Phœnicia. The method of dyeing woollen cloths purple was, it is said, first discovered at Tyre. This color, the most celebrated among the ancients, appears to have been brought to a degree of excellence, of which we can form but a very faint idea :

* The position of Serica is discussed by Latreille in his paper hereafter cited. See also Mannert. iv. 6. 6, 7. Brotier, Mem. de l'Acad. des Inscip. tom. 46. John Reinhold Forster (*De Byssu*, p. 20, 21.) thinks that Little Bucharìa was certainly the ancient Serica. Sir John Barrow (*Travels in China*, p. 435–438.) thinks the Seres were not the Chinese.

† The first author who speaks of the Seres as a distinct nation, is Mela, iii. 7. He describes them as a very honest people, who brought what they had to sell, laid it down and went away, and then returned for the price of it. The same account is given by Eustathius, on Dionysius, l. 752. p. 242, Bernhardy.

“ In oldest times, when kings and hardy chiefs
 In bleating sheep-folds met, for purest wool
 Phœnicia’s hilly tracts were most renown’d,
 And fertile Syria’s and Judæa’s land,
 Hermon, and Seir, and Hebron’s brooky sides,
 Twice with the murex, crimson hue, they ting’d
 The shining fleeces—hence their gorgeous wealth ;
 And hence arose the walls of ancient Tyre*.”

LUCAN.

Candida Sidonio perlucent pectora filo,
 Quod Nilotis acus percussum pectine Serum
 Solvit, et extenso laxavit stamina velo.

L. x. 141.

Her snowy breast shines through Sidonian threads,
 First by the comb of distant Seres struck,
 Divided then by Egypt’s skilful toil,
 And with embroidery transparent made.

The poet is describing the dress of Cleopatra. He supposes her to have worn over her breast a piece of silk, woven by the Seres, imported through Sidon into Egypt, and then embroidered. By the last process, in which the Egyptians greatly excelled, the threads were in part separated, so as to exhibit the appearance of lace, and to allow the white breast of the queen to be visible through the texture.

Amidst the braidings of her flowing hair,
 The spoils of orient rocks and shells appear :
 Like midnight stars, ten thousand diamonds deck
 The comely rising of her graceful neck ;
 Of wondrous work, a thin transparent lawn
 O’er each soft breast in decency was drawn,
 Where still by turns the parting threads withdrew,
 And all the panting bosom rose to view.
 Her robe, her every part, her air confess
 The power of female skill exhausted in her dress.

Pharsalia, x.

In glowing purple rich the coverings lie,
 Twice had they drunk the noblest Tyrian dye
 Others, as Pharian artists have the skill
 To mix the party-color’d web at will,

* Old Tyre was besieged by Nebuchadnezzar in the second year after the destruction of Jerusalem, or 584 B. C.

With winding trails of various silks were made,
Whose branching gold set off the rich brocade.

Ibid.

With this description we compare that of Seneca, which represents silk as embroidered in Asia Minor, with the "Mæonian needle."

PLINY

speaks copiously and repeatedly of the manufacture of silk. Nevertheless we learn from him scarce anything, which we did not know from the earlier authorities. His accounts are taken from Aristotle, from Varro, and probably also from persons who accompanied the Parthian expeditions, or who engaged in the trade with inner Asia. But according to his usual manner, when he speaks of what he has not himself seen, he confounds accounts from different witnesses, which are inconsistent with one another. He asserts that the bombyx was a native of Cos; but it is not probable that the women of that island would, in such case, have recourse to the laborious operation of converting foreign finished goods into threads for their own weaving. It is, therefore, only reasonable to suppose, that whatever manufacture was carried on from the raw material, was, like that of Tyre or Berytus, composed of unwrought silk imported from the East. It is mentioned both by Theophanes and Zonares, the Byzantine historians, that before silk-worms were brought to Constantinople in the middle of the sixth century, no person in that capital knew that silk was produced by a worm; a tolerably strong evidence that none were reared so near to Constantinople as Cos.

Pliny's account of the Coan bombyx is evidently a cloud of fable and absurdity, in which, however, we may discern a few lines of truth, probably derived from the accounts of the silk-worm of the Seres.

JOSEPHUS

says, that the emperors Titus and Vespasian wore silk dresses*, when they celebrated at Rome their triumph over the Jews.

* De Bello Jud. vii. 5. 4.

SAINT JOHN.

Silk (Σηρικιδόν) occurs but once in the New Testament, Rev. xviii. 12. It is here mentioned in a curious enumeration of all the most valuable articles of foreign traffic.

SILIUS ITALICUS.

Seres lanigeris repetebant vellera lucis. *Punica*. vi. 4.

Seres took fleeces from the woolly groves.

Munera rubri

Præterea Ponti, depexaque vellera ramis,

Femineus labor. *Ib.* xiv. 664.

The produce of the Erythræan seas,

And fleeces comb'd by women from the trees*.

Videre Eoi (monstrum admirabile!) Seres

Lanigeros cinere Ausonio canescere lucos.

Ib. xvii. 595, 596.

The Seres' woolly groves, O wondrous sight!

In the far East, were with Italian ashes white.

In the last passage Silius is describing the effects of the recent eruption of Mount Vesuvius, A. D. 79. That its ashes should reach the country of the Seres, whether it was in Persia or China, would indeed have been "Monstrum admirabile!"

STATIUS.

Seric (i. e. *silken*) palls.

Sylvæ, iii. 4. 89.

PLUTARCH

dissuades the virtuous and prudent wife from wearing silk†. He mentions, that webs of silk and fine linen were at the same time thin and compact or close‡.

* See latter part of Chapter viii. Part First.

† *Conjugalia Præcepta*, tom. vi. p. 550. ed. Reiske.

‡ *De Pythiæ Orac.* c. iv. p. 557. Reiske.

JUVENAL

speaks of women,

Quarum

Delicias et panniculus bombycinus urit. *Sat.* vi. 259.

Whose beauty e'en a silken veil o'erheats.

MARTIAL.

Nec vaga tam tenui discursat aranea tela,

Tam leve nec bombyx pendulus urget opus. *L.* viii. 33

The spider traces not so thin a line,

Nor does the pendent silk-worm spin so fine.

Fœmineum lucet sic per bombycina corpus,

Calculus in nitida sic numeratur aqua. *L.* viii. 68.

Thus through her silk a lady's body looks,

Thus count we pebbles in the sparkling brooks.

De Pallatinis dominæ quod Serica prelis.

L. xi. 9.

Here Martial alludes to the employment of presses (*prela*) for preserving the garments of silk and other precious materials, belonging to the Empress, in the same way, in which we now use presses to keep table-linen. He says to a lady (*L.* ix. 38.),

Nec dentes aliter, quam Serica, nocte reponas.

Your teeth at night, like silks, you lay aside.

In another passage (*L.* xi. 27.) he speaks of silken goods (*Serica*) as procurable in the Vicus Tuscus at Rome: and lastly in *L.* xiv. *Ep.* 24, he mentions ribbons or fillets of silk as used for adorning the hair.

Tenuia ne madidi violent bombycina crines,

Figat acus tortas, sustineatque comas.

Lest your moist hair defile the ribbons thin,

Twist it in knots, and fix it with a pin.

PAUSANIAS,

a native of Asia Minor, and an inquisitive traveller in the second century, gives the following distinct account of Sericum according to the ideas received among the Greeks in his time.

The threads from which the Seres make webs, are not the produce of bark, but are obtained in the following manner. There is an animal in that country, which

the Greeks call *Ser*, but which *they* call by some other name. Its size is twice that of the largest beetle. In other respects it resembles the spiders, *which weave under the trees*. It has also the same number of feet as the spider, namely, eight*. In order to breed these creatures, the Seres have houses adapted both for summer and winter. The produce of the animal is a fine thread twisted about its legs. The Seres feed it four years on "panicum." In the fifth year they give it green reed, of which it is so fond as to eat of it until it bursts, and after this the greatest part of the thread is found within its body†.

The most interesting circumstance, mentioned by Pausanias, is the breeding of the silk-worms within doors in houses adapted both for summer and winter. There seems no reason to doubt the truth of this fact; and, if admitted, it proves, that their country, the *Serica* of the ancients, lay so far North, or was so elevated, as to have a great difference of temperature in summer and in winter. It is remarkable, that in China the worms are now reared in small houses, and this practice has long prevailed in that country‡.

GALEN

recommends silk thread for tying blood-vessels in surgical operations, observing that the opulent women in many parts of the Roman empire possessed such thread, especially in the great cities§. He also mentions cloths of silk and gold in his treatise, c. 9. (*Hippocratis et Galeni Opp. ed. Chartier*, tom. vi. p. 533.):

"Of this kind are the shawls *interwoven with gold*, the materials of which are brought from afar, and which are called *Seric* or silk."

CLEMENS ALEXANDRINUS,

dissuading the Christian convert from luxury in dress, thus speaks:

Εἰ δὲ συμπεριφέρεσθαι χρὴ, ὀλίγον ἐνδοτέον αὐταῖς μαλακωτέροις χρῆσθαι τοῖς ὑφάσμασιν·

* This does not apply to the silk-worm, which has sixteen legs, in pairs: six proper legs before, and ten holders behind. (See Figure 1, Plate iii.)

† *L.* vi. 26. p. 125. ed. Siebel.

‡ Barrow's *Travels in China*, p. 437, &c. *Résumé des Traités Chinois*, &c. traduit par Julien, p. 70-72. 77-80. The practice is here shown to have prevailed as early as the fifth century B. C.

§ *Methodus Medendi*, l. xiii. c. 22.

μόνον τας μεμωρημένας λεπτοουργίας, καὶ τὰς ἐν ταῖς ὄφαϊς περιέργους πλοκάς ἐκποδῶν μεθιστάνας· νῆμα χρυσοῦ, καὶ οἷρας Ἰνδικοῦς, καὶ τοὺς περιέργους βόμβυκας χαίρειν ἑῶντας, ὅς σκώληξ φύεται τὸ πρῶτον· εἶτα ἐξ αὐτοῦ δασεῖα ἀναφαίνεται κάμπη. μεθ' ἣν εἰς τρίτην μεταμόρφωσιν νεοχμοῦται βομβύλιον· οἱ δὲ νεκύδαλον αὐτὸ καλοῦσιν· ἐξ οὗ μακρὸς τίκτεται στήμων, καθάπερ ἐκ τῆς ἀράχνης ὁ τῆς ἀράχνης μίτος.—*Pædag.* ii. 10.

But, if it is necessary to accommodate ourselves to the women, let us concede to them the use of cloths, which are a little softer, only refusing that degree of fineness, which would imply folly, and such webs as are *excessively labored* and *intricate*; bidding farewell to gold thread, and to the Indian Seres, and that industrious bombyx, which is first a worm, then puts on the appearance of a hairy caterpillar, and hence passes, in the third place, into a Bombylius, or, as some call it, a Necdalus; and out of which is produced a long thread, in the same manner as the thread of the spider.—*Yates's Translation.*

The use of the epithet "Indian" in this passage may be accounted for from the circumstance, that in the time of the writer silken goods were brought to Alexandria and other cities of Egypt from India. Clemens has evidently borrowed this description from Aristotle.

SECOND CENTURY.

TERTULLIAN.

thus describes the Bombyx :

Vermiculi genus est, qui per aërem liquando aranearum horoscopis idoneas sedes tendit, dehinc devorat, mox alvo reddere; proinde si necaveris, animata jam stamina volves.

It is a kind of worm, which extends abodes like the *dials of spiders* by floating them through the air. It then devours them so as to restore them to its stomach. Therefore, if you kill it, you will roll living threads. (See chap. ix.)

In the same treatise (*De Pallio*, c. 4.) we find the following notice :

Such as Hercules was in the silk of Omphale.

Soon after, the same author, speaking of Alexander the Great, says,

Vicerat Medicam gentem, et victus est Medicâ veste:—pectus squamarum signaculis disculptum, textu pellucido tegendo, nudavit: et anhelum adhuc ab opere belli, ut mollius, ventilante serico extinxit. Non erat satis animi tumens Macedo, ni illum etiam vestis inflatior delectâset.

He had conquered the Medes, and was conquered by a Median garment. When his breast exhibited the sculptured resemblances of scales, he covered it

with a pellucid texture, which rather laid it bare ; panting from the work of war, he cooled and mollified it by the use of silk, exposing it to the wind. It was not sufficient for the Macedonian to have a tumid mind ; he required to be delighted also with an inflated garment.

He afterwards says of a philosopher,

He went wearing a garment of silk, and sandals of brass.

Again he says of a low character, "*She exposes her silk to the wind.*"

In his treatise on Female Attire he mentions silk in relation to Milesian wool, and he concludes that treatise in the following terms :

Manus lanis occupate, pedes domi figite, et plus quam in auro placebitis. Vestite vos serico probitatis, byssino sanctitatis, purpurâ pudicitiaë.

Employ your hands with wool ; keep your feet at home. Thus will you please more than if you were in gold. Clothe yourselves with the silk of probity, with the fine linen of sanctity, and with the purple of modesty.

Lastly, this author says (*Adv. Marcionem*, l. i. p. 372.),

Imitare, si potes, apis ædificia, formicæ stabula, aranei retia, bombycis stamina.

Imitate, if thou canst, the constructions of the bee, the retreats of the ant, the nets of the spider, the threads of the silk-worm.

APULEIUS.

Prodeunt, mitellis, et crocotis, et carbasinis, et bombycinis injecti. * * * Deamque, serico contactam amiculo, mihi gerendam imponunt. *Metamorphoseon*, l. viii. p. 579, 580. *ed. Oudendorpii.*

They came forward, wearing ribbons, and cloths of a saffron color, of cotton, and of silk, loosely thrown over them. * * * And they place on me the Goddess covered with a small silken scarf, to be carried by me.

Hic incinctus baltheo militem gerebat ; illum succinctum chlamyde, copides et venabula venatorem fecerant ; alius soccis obauratis, indutus serica veste, mundoque pretioso, et adtextis capite crinibus, inæssu perfluo feminam mentiebatur. *Ibid.* l. xi. p. 769.

One performed the part of a soldier, girt with a sword ; another had his chlamys tucked up by a belt, and carried scimitars and hunting-poles, as if engaged in the chace ; another, wearing gilt slippers, a silken tunic, precious ornaments, and artificial hair, by his flowing attire represented a woman.

ULPIAN.

Vossius, in his *Etymologicum Linguaë Latinæ*, in the learned and copious article SERICUM, says, "*Inter sericum et*

bombycinum discrimen ponit Ulpianus, l. xxiii. de aur. arg. leg. 'Vestimentorum sunt omnia lanæa, lineaque, vel serica, vel bombycina.' "

JULIUS POLLUX.

The Bombyces are worms, which emit from themselves threads, like the spider. Some say, that the Seres collect their webs from animals of this kind. L. vii. 76. p. 741.—*Kühn*

JUSTIN

evidently refers to the use of silken garments in his account of the customs of the Parthians, where he says,

They formerly dressed after their own fashion. After they became rich, they adopted the pellucid and flowing garments of the Medes. L. xli. c. 2.

All doubt, whether the transparent garments, mentioned by Justin, were of silk, must be removed by the authority of Procopius, from whom we shall hereafter cite ample and important testimony in reference to the time when he lived, and who in the two following passages expressly states, that the webs, called by the Greeks in his time *Seric*, were more anciently denominated *Median*.

Among the valuable and curious effects of the emperor Commodus, which after his death (A. D. 192.) were sold by his successor Pertinax, was a garment with a woof of silk, of a bright yellow color, the appearance of which was more beautiful than if the material had been interwoven with threads of gold*.

THIRD CENTURY.

The authorities now quoted supply evidence respecting the use of silk among the Greeks and Romans down to the end of the second century. It is rarely mentioned by any writer belonging to the following century†; so far as we have discovered,

* Vestis subtegmine serico, aureis filis insignior.—Jul. Capitolini Pertinax, c. 8. in Scrip. Hist. Augustæ.

† Mannert (Geogr. iv. 6. 7. p. 517.) attributes the excessive dearth of silk in the third century to the victories of the Persians, which at that time cut off all direct communication between Serica and the western world.

only by the three historians now to be quoted, by Cyprian, and by Solinus. But we have from these historians some remarkable accounts of the regard paid to it by the emperors Heliogabalus, Alexander Severus, Aurelian, Claudius II., Tacitus, and Carinus, all of whom reigned in the third century.

ÆLIUS LAMPRIIDIUS says (c. 26.), that the profligate and effeminate emperor Heliogabalus was the first Roman, who wore cloth made wholly of silk, the silk having been formerly combined with other less valuable materials, and, in consequence of his example, the custom of wearing silk soon became general among the wealthy citizens of Rome. He mentions (c. 33) among the innumerable extravagances of this emperor, that he had prepared a silken rope of purple and scarlet colors to hang himself with.

Of the emperor Alexander Severus he says (c. 40), that he himself had few garments of silk, that he never wore a tunic made wholly of silk, and that he never gave away cloth made of silk mixed with less valuable materials.

The following is the testimony of Flavius Vopiscus in his life of the emperor Aurelian.

Aurelian neither had himself in his wardrobe a garment wholly of silk, nor gave one to be worn by another. When his own wife begged him to allow her to have a single shawl of purple silk, he replied, Far be it from us to permit thread to be reckoned worth its weight in gold. For a pound of gold was then the price of a pound of silk. c. 45.

Although the above mentioned restrictions in the use of silk may be partly accounted for from the usual severity of Aurelian's character, yet the facts here stated abundantly show the rarity and high value of this material in that age.

Flavius Vopiscus further states, that the emperor Tacitus made it unlawful for men to wear silk unmixed with cheaper materials. Carinus, on the other hand, made presents of silken garments, as well as of gold and silver, to Greek artificers, and to wrestlers, players, and musicians.

TREBELLIVS POLLIO, in his life of Claudius II. (c. 14 and 17.), twice mentions white garments of silk mixed with cheaper materials, which were destined for that emperor.

CYPRIAN,

Bishop of Carthage in the third century, inveighs in the following terms against the use of silk :

Tu licet indumenta peregrina et vestes sericas induas, nuda es. Auro te licet et margaritis gemmisque condecoris, sine Christi decore deformis es. *De Lapsis, p. 135. ed. Fell.*

Although thou shouldst put on a tunic of foreign silk, thou art naked ; although thou shouldst beautify thyself with gold, and pearls, and gems, without the beauty of Christ thou art unadorned.

Also in his treatise on the dress of Virgins he says,

Sericum et purpuram indutæ, Christum induere non possunt : auro et margaritis et monilibus adornatæ, ornamenta cordis et pectoris perdidērunt.

Those who put on silk and purple, cannot put on Christ : women, adorned with gold and pearls and necklaces, have lost the ornaments of the heart and of the breast.

In the same place he gives us a translation of the well-known passage of Isaiah enumerating the luxuries of female attire among the Jews : “ In that day the Lord will take away the bravery of their tinkling ornaments about their feet, and their cauls, and their round tires like the moon, the chains, and the bracelets, and the mufflers, the bonnets, and the ornaments of the legs, and the head-bands, and the tablets, and the ear-rings, the rings, and nose-jewels, the changeable suits of apparel, and the mantles, and the wimples, and the crisping pins, the glasses, and the fine linen, and the hoods, and the veils.” Isaiah iii. 18–23.

SOLINUS,

Primos hominum Seres cognoscimus, qui, aquarum aspergine inundatis frondibus, vellera arborum adminiculo depectunt liquoris, et lanuginis teneram subtilitatem humore domant ad obsequium. Hoc illud est sericum, in quo ostentare potius corpora quàm vestire, primò feminis, nunc etiam viris persuasit luxuriæ libido. *Cap. 1.*

The Seres first, having inundated the foliage with aspersions of water, combed down fleeces from trees by the aid of a fluid, and subdued to their purposes the tender and subtile down by the use of moisture. The substance so prepared is silk ; that material in which at first women, but now even men, have been persuaded by the eagerness of luxury rather to display their bodies, than to clothe them.

AMMIANUS MARCELLINUS.

This historian describes the Seres as “a quiet and inoffensive people who, avoiding all quarrels with their neighbors, are exempt from the distresses and alarms of war, and not being under the necessity of using offensive arms, do not even know their use, and occupy a fertile country under a delicious and healthy climate. He represents them as passing their happy life in the most perfect tranquillity and the most delicious repose amidst shady thickets refreshed by pleasant zephyrs, and where the soil furnishes so soft a wool, that after having been sprinkled with water and combed, it forms cloths resembling silk.”

Marcellinus proceeds to describe the Seres as being content with their own felicitous condition, and so reserved in their intercourse with the rest of mankind, that when foreigners venture within their boundaries for wrought and unwrought silk, and other valuable articles, they consider the price offered in silence, and transact their business without exchanging a word; a mode of traffic which is still practised in some eastern countries.

Macpherson, in the *Annals of Commerce*, a very valuable work, thinks that according to all appearances, the Seres were themselves the authors of this story, in order to make strangers believe that their country enjoyed all these benefits by the peculiar blessing of heaven, and that no other nation could participate in them.

The remarks of Solinus and Ammianus conspire to show, how much more common silk had become about the end of the third century, being then worn, at least with a warp of cheaper materials, by men as well as by women, and not being confined to the noble and the wealthy. These authors likewise dilate upon the use of showers of water to detach silk from the trees on which it was found. According to Pliny and Solinus, water was also employed after the silk was gathered from the trees*: and probably the fact was so. Silk, as it

* “The remaining shores are occupied by savage nations, as the Melanchlæni

comes from the worm, contains a strong gum, which would be dissolved by the showers of water dashed against the trees, and thus the cocoons, being loosened from the leaves and twigs, would be easily collected. In the subsequent processes, water would be further useful in enabling the women to spin the silk or to wind it upon bobbins.

It may be observed that in this use of water art only follows nature. When the moth is ready to leave its cell, it always softens the extremity of it by emitting a drop of fluid, and thus easily obtains for itself a passage. In the third volume of the Transactions of the Royal Asiatic Society (p. 543.), Colonel Sykes gives the following account of the process by which the moth of the Kolisurra silk-worm liberates itself from confinement. "It discharges from its mouth a liquor, which dissolves or loosens that part of the cocoon adjoining to the cord which attaches it to the branch, causing a hole, and admitting of the passage of the moth. The solvent property of this liquid is very remarkable; for that part of the cocoon, against which it is directed, although previously as hard as a piece of wood, becomes soft and pervious as wetted brown paper."

In the seventh volume of the Linnæan Transactions, is an account by Dr. Roxburgh of the Tusseh silk-worm. Both species are natives of Bengal. The cocoons require to be immersed in cold water before the silk can be obtained from them. In the latter species it is too delicate to be wound from the cocoons, and is therefore spun like cotton. Thus manufactured it is so durable, that the life of one person is seldom sufficient to wear out a garment made of it, and the same piece descends from mother to daughter. (See Chap. VIII. of this Part.)

and Coraxi, Dioscurias, a City of the Colehians, near the river Anthemus, being now deserted, although formerly so illustrious, that Timosthenes has recorded that *three hundred nations* used to resort to it *speaking different languages*; and that business was afterwards transacted on our part through the medium of *one hundred and thirty* interpreters."

CHAPTER III.

HISTORY OF THE SILK MANUFACTURE FROM THE THIRD TO THE SIXTH CENTURY.

SPINNING, DYEING, AND WEAVING.—HIGH DEGREE OF EXCELLENCE
ATTAINED IN THESE ARTS.

Fourth century—Curious account of silk found in the Edict of Diocletian—Extravagance of the Consul *Furius Placidus*—Transparent silk shifts—*Ausonius* describes silk as the produce of trees—*Quintus Aur Symmachus*, and *Claudian's* testimony of silk and golden textures—Their extraordinary beauty—*Pisander's* description—*Periplus Maris Erythræi*—*Dido of Sidon*. Mention of silk in the laws of *Manu*—*Rufus Festus Avinus*—Silk shawls—*Marciannus Capella*—Inscription by *M. N. Proculus*, silk manufacturer—Extraordinary spiders' webs—*Bombyces* compared to spiders—Wild silk-worms of *Tsouen*—*Kien and Tiao-Kien*—*M. Bertin's* account—Further remarks on wild silk-worms. Christian authors of the fourth century—*Arnobius*—*Gregorius Nazienzenus*—*Basil*—Illustration of the doctrine of the resurrection—*Ambrose*—*Georgius Pisida*—*Macarius*—*Jerome*—*Chrysostom*—*Heliodorus*—*Salmasius*—Extraordinary beauty of the silk and golden textures described by these authors—Their invectives against Christians wearing silk. Mention of silk by Christian authors in the fifth century—*Prudentius*—*Palladius*—*Theodosian Code*—*Appolinaris Sidonius*—*Alcimius Avitus*. Sixth century—*Boethius*. (Manufactures of Tyre and Sidon—Purple—Its great durability—Incredible value of purple stuffs found in the treasury of the King of Persia.)

FOURTH CENTURY.

SOME curious evidence respecting the use of silk, both un-mixed with linen and with the warp of linen, or some inferior material, is found in the *EDICT OF DIOCLETIAN*, which was published A. D. 303 for the purpose of fixing a maximum of prices for all articles in common use throughout the Roman Empire*. The passage pertaining to our present subject, is as follows:

* It was edited A. D. 1826, by Colonel Leake, as a sequel to his *Journal of a Tour in Asia Minor*, and is also published in *Tr. of the Royal Society of Literature*, vol. i. p. 181.

Sarcinatori in veste soubtili replicat(u)ræ . . .	* sex
Eidem aperturæ cum subsutura olosericæ . . .	* quinquaginta
Eidem aperturæ cum subsutura su(b)sericæ . . .	* triginta
(Sub)suturæ in veste grossiori	* quattuor.

Denarii*.

To the Tailor for lining a fine vest	6
To the same for an opening and an edging with silk	50
To the same for an opening and an edging with stuff made of a mixed tis- sue of silk and flax	30
For an edging on a coarser vest	4

Colonel Leake's translation.

This document proves, in exact conformity with the passages quoted from Solinus and Ammianus, that silk had come into general use at the commencement of the fourth century. It is also manifest from this extract, that silk was employed in giving to garments a greater proportion of intricacy and ornament than had been in use before.

The authors who make mention of silk in the fourth and following centuries are very numerous. We shall first take the heathen authors, and then the Christian writers, whose observations often have some moral application, which gives them an additional interest.

The unknown author of the Panegyric on the emperor Constantine, pronounced A. D. 317, thus mentions silk as characterizing oriental refinement.

Facile est vincere timidos et imbelles, quales amœna Græcia et deliciæ Orientis educunt, vix leve pallium et sericos sinus vitando sole tolerantes.

It is easy to vanquish the timid and those unused to war, the offspring of pleasant Greece and the delightful East, who, whilst they avoid the heat of the sun, can scarcely bear even a light shawl and folds of silk.

The testimony of the Roman historian FLAVIUS VOPISCUS, in reference to the practice of the emperor Aurelian and the dearness of silk during his reign, has already been produced. This author, in his life of the same emperor, makes the following remarks on a display of silk which he had himself recently witnessed.

* A Roman coin of the value of about sixteen or seventeen cents, called Denarii from the letter X upon it; which denoted *ten*.

We have lately seen the Consulate of Furius Placidus celebrated in the Circus with so great eagerness for popularity, that he seemed to give not prizes, but patrimonies, presenting tunics of linen and silk, borders of linen, and even horses, to the great scandal of all good men.

The exact period here referred to is no doubt the Consulship of Placidus and Romulus, A. D. 343.

In the Epistles of ALCIPHON (i. 39.) Myrrhine, a courtesan, loosens her girdle, which probably fastened her upper garment or shawl. Her *shift* was silk, and so transparent as to show the *color* of her skin.

AUSONIUS

satirizes a rich man of mean extraction, who nevertheless made lofty pretensions to nobility of birth, pretending to be descended from Mars, Romulus, and Remus, and who therefore caused their images to be embossed upon his plate and *woven* in a silken shawl.—Epig. 26.

In the following line, he alludes to the production of silk in the usual terms :

Vellera depectit nemoralia vestifluus Ser.

Idyll. 12.

The Ser remote, in flowing garments drest,
Combs down the fleeces, which the trees invest.

QUINTUS AUR SYMMACHUS.

This distinguished officer, in a letter to the Consul Stilicho, apologizes in the following terms for his delay in sending a contribution of Holoseric pieces, that is, webs wholly made of silk, to the public exhibitions.

Others have deferred supplying the water for the theatre and the Holoseric pieces, so that I have examples in my favor.—*Epist. l. iv. 8.*

In a letter to Magnillus (*l. v. 20.*) he speaks of Subseric pieces, webs made only in part of silk, as presents ;

At your instigation the Subseric pieces have been supplied, which my men kept back after the price had been settled ; and likewise everything else pertaining to the prizes which were to be given.

CLAUDIAN

mentions silk in numerous passages. This poet, in describing

the consular robes of the two brothers Probinus and Olybrius (A. D. 395.), represents the Sabine Cincture, by which the toga was girt over the breast, as made of silk.

In the following passage he represents the two brothers, Honorius and Arcadius, as dividing the empire of the world between them and receiving tributes of its productions from the most distant regions :

Vestri juris erit, quicquid complectitur axis.
Vobis rubra dabunt pretiosas æquora conchas,
Indus ebur, ramos Panchaia, vellera Seres.

De III. Cons. Honorii, l. 209-211.

To you the world its various wealth shall send :
Their precious shells the Erythrean seas ;
India its iv'ry, Araby its boughs,
The distant Seres fleeces from the trees.

In a poem, which immediately succeeds this in the order of time, Claudian describes a magnificent toga, worn by Honorius on being appointed a fourth time consul, by saying, that it received its color (*the Tyrian purple*) from the Phœnicians ; its wool (*of silk forming stripes or figures*) from the Seres ; and its weight (*produced by Indian gems*) from the river Hydaspes*. Again, in his poem on the approaching marriage of Honorius and Maria, he mentions yellow silk curtains (*l. 211.*) as a decoration of the nuptial chamber.

Again he says (*in Eutrop. l. i. v. 225, 226. 304. l. ii. v. 337.*):

Te grandibus India gemmis,
Te foliis Arabes ditent, te vellere Seres.
Let India with her gems thy wealth increase,
The Arabs with their leaves, the Seres with their fleece.

He also mentions with delight the use of gold in dress, as well as of silk. The following passage represents the manner in which Proba, a Roman matron, near the end of the fourth century, expressed her affectionate congratulations on the elevation of her two sons to the Consulship, by preparing robes *interwoven with gold* for the ceremony of their installation.

* De IV. Cons. Honorii, i. 600, 601.

With joy elated at this proud success,
 Their venerable mother now prepares
 The golden trabeas, and the cinctures bright
 With Seric fibres shorn from woolly trees:
 Her well-train'd thumb protracts the length'ning gold,
 And makes the metal to the threads adhere.

In Probini et Olybrii Consulatum, l. 177-182.

From these verses we learn that Proba had herself acquired the art of *covering the thread with gold*, and that she then used her gold thread in the *woof* to form the stripes or other ornaments of the consular trabeæ. These are afterwards called "stiff togas" (*togæ rigentes, l. 205.*), on account of the rigidity imparted to them by the gold thread.

The same poet gives an elaborate description of a Trabea which he supposes to have been woven by the Goddess Rome with the aid of Minerva for the use of the Consul Stilicho. Five different scenes are said to have been *woven* in this admirable robe (*regentia dona, graves auro trabeas*), and certain parts of them were wrought in gold*.

Again, Claudian supposes Thetis to have woven scarfs of gold and purple for her son Achilles :

Ipsa manu chlamydes ostro texebat et auro. (Ep. 35.)

The epigram in which this line occurs, seems to imply that Serena, mother-in-law of the Emperor Honorius, wove garments of the same kind for him.

Maria, the daughter of the above-mentioned Stilicho, was bestowed by him upon Honorius, but died shortly after, about A. D. 400. In February, 1544, the marble coffin, containing her remains, was discovered at Rome. In it were preserved a garment and a pall, which, on being burnt, yielded 36 *pounds of gold*. There were also found a great number of glass vessels, jewels, and ornaments of all kinds, which Stilicho had given as a dowry to his daughter†. We may conclude, that the garments discovered in the tomb of Maria were *woven* by the hands of her mother Serena, since the epigram of Claudian

* In I. Cons. Stilichonis, L. ii. 330-359.

† Surtii Comment. Rerum Gest. ab anno 1500, &c.

proves that she wove robes of a similar description for Honorius, and probably on the same occasion. Anastasius Bibliothecarius says, that when Pope Paschal was intent on finding the body of St. Cæcilia, having performed mass with a view to obtain the favor of a revelation on the subject, he was directed A. D. 821 to a cemetery on the Appian Way near Rome, and there found the body enveloped in cloth of gold*. Although there is *no* reason to believe, that the body found by Paschal was the body of the saint pretended, yet it may have been the body of a Roman lady who had lived some centuries before, and probably about the time of Honorius and Maria.

Pisander, who belonged to the same period (900 B. C.) with Homer, speaks of the *Lydians* as *wearing tunics adorned with gold*. Lydus observes, that the Lydians were supplied with gold from the sands of the Pactolus and the Hermus†.

Virgil also represents the use of gold in weaving, as if it had existed in Trojan times. One of the garments so adorned was manufactured by *Dido*, the *Sidonian*, one by Andromache, and another was in the possession of Anchises‡. In all these instances the reference is to the habits of Phœnice, Lycia, or other parts of Asia.

He describes an ape ludicrously attired in a silk jacket; and, inveighing against the progress of luxury, he speaks of some to whom even silk garments were a burthen. In elaborate descriptions of the figured consular robes (the *Trabeæ*) of Honorius and Stilicho, he mentions the *reins and other trappings of horses*, as being wrought in silk§.

The frequent allusions to silk in the complimentary poems of Claudian, receive illustration from various imperial laws, which were promulgated in the same century, and in part by the very emperors to whom his flattery is addressed, and which

* "Aureis vestitum indumentis." DE VITIS ROM. Pontificum Mogunt. 1602, p. 222.

† De Magistratibus Rom. L. iii. § 64.

‡ Æn, iii. 483.; iv. 264.; viii. 167.; xi. 75.

§ Rubra Serica, De VI. Cons. Honor. I. 577. Serica Fræna. In I. Cons. Stilichonis I. ii. V. 350.

are preserved in the CODE OF JUSTINIAN. Their object was not to encourage the silk manufacture, but, on a principle very opposite to that of modern times, to make it an imperial monopoly. The admiration excited by the splendor and elegance of silk attire was the ground, on which it was forbidden that any individual of the *male sex* should wear even a silken border upon his tunic or pallium, with the exception of the emperor, his officers and servants. To confine the enjoyment of these luxuries more entirely to the imperial family and court, all private persons were strictly forbidden engaging in the manufacture, gold and silken borders were to be made only in the imperial Gynæcea*.

THE PERIPLUS MARIS ERYTHRÆI.

In this important document on ancient geography and commerce, we find repeated mention of silk in its raw state, in that of thread, and woven†. These articles were conveyed down the Indus to the coast of the Erythrean Sea. They were also brought to the great mart of Barygaza, which was on the Gulf of Cambay near the modern Surat, and to the coast of Lymirica, which was still more remote. The author of the Periplus states, that they were carried by land through Bactria to Barygaza from a great city called *Thina*, lying far towards the North in the interior of Asia. He of course refers to some part of Serica. It is remarkable, that he makes no mention of silk as the native production of India.

Silk is mentioned in two passages of the laws of Manu, viz. XI. v. 168, and XII. v. 64. It is, however, observed by Heeren, who quotes passages of the Ramayana that make mention of silk, that garments of this material are there represented as worn only on festive occasions, and that they were undoubtedly Seric or Chinese productions‡. Indeed it appears that

* See the Corpus Juris Civilis, Lugduni 1627, folio, tom. v. Codex Justiniani, l. x. tit. vii. p. 131. 134.

† Arriani Opp., vol. ii. Blancardi, pp. 164, 170. 173. 177.

‡ Ideen über die Politik, &c. der alten Welt, i. 2. pp. 647. 648. 665-668. 677. 3rd edition. Gottingen, 1815.

the cloth made from the thread of the native worms of Hindostan, although highly valued for strength and durability, is not remarkable for fineness, beauty, or splendor.

RUFUS FESTUS AVIENUS.

This author, adopting the common notion of his time, supposes the Seres to spin thread from fleeces which were produced upon the trees. He also mentions silk shawls (*Serica pallia*, l. 1008.) as worn by the female Bacchantes of Ionia in their processions in honor of Bacchus; and it is worthy of remark, that they are not mentioned in the original passage of Dionysius, the author whom Avienus translates, so that we may reasonably infer, that the use of them on these occasions was introduced between the time of Dionysius (about 30 B. C.) and that of Avienus (A. D. 400).

MARTIANUS CAPELLA.

Beyond these (*the Anthropophagi*) are the Seres, who asperse their trees with water to obtain the down, which produces silk. L. vi. p. 223. *ed. Grotii*, 1599.

The following Inscription is given in Gruter, Tom. iii. p. DCXLV. It was found at Tivoli, and expresses that M. N. Proculus, *silk-manufacturer*, erected a monument to Valeria Chrysis, his excellent and deserving wife.

D. M.
 VALERIAE. CHRYSIDI.
 M. NVMIVS. PROCVLVS.
 SERICARIVS.
 CONJVGI. SVAE.
 OPTIMÆ. BENEM.
 FECIT.

Before proceeding to the Christian writers of the 4th and following centuries we may now introduce the remarks of Servius on the passage formerly quoted from Virgil. He is supposed to have written about A. D. 400.

Among the Indians and Seres there are on the trees certain worms, called Bombyces, which draw out very fine threads after the manner of spiders; and these threads constitute silk.

It will be seen hereafter, that these "Indian Seres" were the inhabitants of Khotan in Little Bucharía.

The frequent comparison of Bombyces to spiders by the ancients suggests the inquiry whether they employed the thread of any kind of spider to make cloth, as was attempted in France by M. Bon. The failure of his attempt is sufficient, as it appears, to show, that the extensive manufacture of garments from this material must have been scarcely possible in ancient times. It is also to be observed, that the ancients, when they compare the silk-worm to the spider, refer to the spider's *web*, whereas M. Bon, not finding the web strong enough, made his cloth from the thread with which the spider envelopes its eggs*.

But, although we have no reason to believe, that the web of any spider was anciently employed to make cloth, yet these accounts may have referred to worms, possibly varieties of the silk-worm, which spun long threads floating in the air. The

* The most extraordinary account of a spider's web, which we have ever seen, is that given by Lieutenant W. Smyth. He says, "We saw here (*viz.* at Pachiza, on the river Huayabamba in Peru) a gigantic spider's web suspended to the trees: it was about 25 feet in height, and near 50 in length; the threads were very strong, and it had the empty sloughs of thousands of insects hanging on it. It appeared to be the habitation of a great number of spiders of a larger size than we ever saw in England." Narrative of a Journey from Lima to Para, London, 1836, p. 141.

For some interesting notices of the great spider of Brazil the reader is referred to Caldeleugh's Travels in South America, London 1825, vol. i. ch. 2. p. 41; and to the Rev. R. Walsh's Notices of Brazil, London 1830, vol. ii. p. 300, 301. Mr. Caldeleugh "*assisted in liberating from a spider's net a bird of the size of a swallow, quite exhausted with struggling, and ready to fall a prey to its indefatigable enemies.*" Mr. Walsh had his light straw hat removed from his head by a similar web extending from tree to tree in an opening through which he had occasion to pass. He wound upon a card several of the threads composing the web; and he observes, that, as these spiders are gregarious, the difficulties experienced by M. Bon from the ferocity of the solitary European spiders in killing and devouring one another, would not exist if the attempt were made to obtain clothing from the former.

† In the forests of Java Sir George Staunton "found webs of spiders, woven with threads of so strong a texture as not easily to be divided without a cutting instrument."—Account of Lord Macartney's Embassy to China, London 1797, vol. i. ch. 7. p. 302. (See Chap. IX.)

common silk-worm spins and suspends itself by its thread, long before it begins its cocoon. It appears probable, therefore, that there may have been wild varieties of this creature, or perhaps other species of the same genus, which in the earlier stages of their existence spun threads long enough for use. We ground this conjecture partly on the following passage from Du Halde's *History of China**.

“The province of Chan-tong produces a particular sort of silk, which is found in great quantities on the trees and in the fields. It is spun and made into a stuff called *Kien-tcheou*. This silk is made by little insects that are much like caterpillars. They do not spin an oval or round cocoon, like the silk-worms, but very long threads. These threads, as they are driven about by the winds, hang upon the trees and bushes, and are gathered to make a sort of silk, which is coarser than that made of the silk spun in houses. But these worms are wild, and eat indifferently the leaves of mulberry and other trees. Those who do not understand this silk would take it for unbleached cloth, or a coarse sort of drugget.

“The worms, which spin this silk, are of two kinds: the first, much larger and blacker than the common silk-worms, are called *Tsouen-kien*; the second, being smaller, are named *Tiao-kien*. The silk of the former is of a reddish gray, that of the latter darker. The stuff made of these materials is between both colors, it is very close, does not *fret*, is very lasting, washes like linen, and, when it is good, receives no damage by spots, even though oil were to be shed on it.

‡ “This stuff is much valued by the Chinese, and it is sometimes as dear as satin or the finest silks. As the Chinese are very skilful at counterfeiting, they make a false sort of *Kien-tcheou* with the waste of the *Teche-kiang* silk, which without due inspection might easily be taken for the genuine article.”

This account affords a remarkable illustration of many of the expressions of the ancient writers, such as “*Bombyx pendulus urget opus*,” *Martial*; “*Per aerem liquando aranearum horoscopis idoneas sedes tendit*,” *Tertullian*; “*In aranearum morem tenuissima fila deducunt*,” *Servius*.

In further illustration of the subject, and as tending to show that the *Kien-tcheou* is manufactured from the thread of a silk-worm, modified in its habits and perhaps in its organization by circumstances, we shall now quote a few passages from a work having the following title: “*China; its costume, arts, manufactures, &c., edited from the originals in the cabinet of M. Bertin, with observations by M. Breton. Translated from the French. London, 1812.*” Vol. iv. p. 55, &c.

* Vol. ii. p. 359, 360, 8vo. edition, London, 1736.

“The wild silk-worms are found in the hottest provinces of China, especially near Canton. They live indifferently on all sorts of leaves, particularly on those of the ash, the oak, and the fagara, and spin a greyish and rarely white silk. The coarse cloth manufactured from it is called *Kien-tcheou*, will bear washing, and on that account persons of quality do not disdain to wear clothes of it. With this silk also the strings of musical instruments are made, because it is stronger and more sonorous.

“Entomologists treat but very superficially of the habits of the wild silk-worms, while they dwell in minute detail on the method of rearing them in Provence.

“It is between the nineteenth and twenty-second day of their existence, that they undertake the great work of spinning their cocoon. They curve a leaf into a kind of cup, and then form a cocoon as large and nearly as hard as a hen’s egg! This cocoon has one end open like a reversed funnel; it is a passage for the butterfly, which is to come out.

“The oak-worms are slower in making their cocoon than those of the fagara and ash, and they set about it differently. Instead of bending a single leaf, they roll themselves in two or three and spin their cocoon. It is larger, but the silk is inferior in quality, and of course not so valuable.

“The cocoons of wild silk-worms are so strong and compact, that the insects encounter great difficulty in extricating themselves, and therefore remain inclosed from the end of the summer, to the spring of the following year. These butterflies, unlike the domestic insect, fly very well.—The domestic silk-worm is but a variety of the wild species. It is fed on the leaves of the mulberry tree.” (See chap. VIII.)

The circumstance that the worms were sometimes fed with oak-leaves is mentioned in Du Halde’s *History of China*, vol. ii. p. 363.

Here then we have a justification of the ancients in asserting, both that the silk-worms produced *long threads and webs floating in the air like those of spiders*, and that they fed upon the leaves of the oak, the ash, and many other trees. It may be recollected, that Pliny expressly mentions both the oak (*quercus*) and the ash (*fraxinus*).

Until very lately the use of silk among the ancients was investigated only by philologists. Within a few years M. Latreille, an entomologist of the highest distinction, has directed his attention to the subject and has examined particularly the above-cited passages of Aristotle, Pliny, and Pausanias*. He never

* M. Latreille’s paper is published in the *Annales des Sciences Naturelles*, tome xxiii. pp. 58–84.

supposes the ancient *Sericum* to have been the produce of anything except the silk-worm. But of this there are several varieties, partly perhaps natural, and partly the result of domestication. He endeavors to explain some parts of Pliny's description by showing their seeming correspondence with some of the practices actually observed by the Orientals in the management of silk-worms.

An account of the wild silk-worms of China is to be found in the "*Mémoires concernant l'Histoire, les Sciences, les Arts, &c., des Chinois*," compiled by the missionaries of Peking*. This account is principally derived from the information of Father D'Incarville, one of the missionaries. It coincides generally with the accounts already quoted from Du Halde and Breton. We extract the following particulars as conveying some further information :

"The Chinese annals from the year 150 B. C. to A. D. 638 make frequent mention of the great quantity of silk produced by the wild worms, and observe that their cocoons were as large as eggs or apricots."

The following passage is also deserving of attention : "*Le papillon de ces vers sauvages, dit le Père d'Incarville, est à ailes vitrées.*" This information, if correct, would prove that there was at least one kind of wild silk-worms in China, which was a different species from the *Phalæna Mori* ; for that has no transparent membranes in its wings, and would not be likely to receive them in consequence of any change in its mode of life.

We now proceed to take the Christian authors of the fourth and following centuries in the order of time.

ARNOBIUS (A. D. 306.)

thus speaks of the heathen gods :

They want the covering of a garment : the Tritonian virgin must spin a thread of extraordinary fineness, and according to circumstances put on a tunic either of mail, or silk†.

* Tome ii. pp. 579-601. Paris, 1777, 4to. This Memoir is reprinted with abridgments as an Appendix to Stanislaus Julien's Translation of the Chinese Treatise on the Breeding of Silk-worms, Paris, 1837, 8vo.

† Adv. Gentes, l. iii. p. 580, ed. Erasmi.

GREGORIUS NAZIENZENUS, CL., A. D. 370.

The following passage contains, we believe, the earliest allusion to the use of silk in the services of the Christian Church.

Ἄλλοι μὲν χρυσόν τε καὶ ἄργυρον, οἱ δὲ τὰ Σηρῶν
 Δῶρα φέρουσι θεῷ νήματα λεπταλέα.
 Καὶ Χριστῷ θυσίην τὶς ἀγνὴν ἀνέθηκεν ἑαυτὸν·
 Καὶ σπένδει δαρκῶν ἄλλος ἀγνὰς λιβάδας.

Ad Hellenium pro Monachis Carmen. tom. ii. p. 106. ed. Par. 1630.

Silver and gold some bring to God
 Or the fine threads by Seres spun:
 Others to Christ themselves devote,
 A chaste and holy sacrifice,
 And make libations of their tears.

Yates's Translation.

BASIL, CL., A. D. 370.

Although this celebrated author was a native of Asia Minor, and had studied in Syria and Palestine, he appears to have known the silk-worm only from books and by report. His description of it in the following passage, in which we first find the beautiful illustration of the doctrine of a *resurrection* from the change of the chrysalis, is chiefly copied from Aristotle's account as formerly quoted.

Τί φάτε οἱ ἀπιστοῦντες τῷ Παύλῳ περὶ τῆς κατὰ τὴν ἀνάστασιν ἀλλοιώσεως, ὁρῶντες πολλὰ τῶν ἀερίων τὰς μορφὰς μεταβάλλοντα; ὅποια καὶ περὶ τοῦ Ἰνδικοῦ σκώληκος ἱστορεῖται τοῦ κερασφόρου· ὃς εἰς κάμπην τὰ πρῶτα μεταβαλὼν, εἶτα προῖον βομβυλιῶς γίνεται, καὶ οὐδὲ ἐπὶ ταύτης ἴσταιται τῆς μορφῆς, ἀλλὰ χαῦνοις καὶ πλατέσι πετάλοις ὑποπεροῦται. Ὅταν οὖν καθέζησθε τὴν τούτων ἐργασίαν ἀναπηνιζόμεναι αἱ γυναῖκες, τὰ νήματα λέγω, ἃ πέμπουσιν ὑμῖν οἱ Σῆρες πρὸς τὴν τῶν μαλακῶν ἐνδομάτων κατασκευὴν, μεμνημένοι τῆς κατὰ τὸ ζῶον τοῦτο μεταβολῆς, ἐναργῆ λαμβάνετε τῆς ἀναστάσεως ἔννοιαν, καὶ μὴ ἀπιστεῖτε τῇ ἀλλαγῇ, ἣν Παῦλος ἅπασι κατεπαγγέλλεται.—*Hexaheameron, p. 79. A. Ed. Benedict.*

What have you to say, who disbelieve the assertion of the Apostle Paul concerning the change at the resurrection, when you see many of the inhabitants of the air changing their forms? Consider, for example, the account of the horned worm of India, which (i. e. the silk-worm) having first changed into a caterpillar (*eruca*, or *veruca*), then in process of time becomes a cocoon (*bombylius*, or *bombulio*), and does not continue even in this form, but assumes light and expanded wings. Ye women, who sit winding upon bobbins the produce of these animals, namely the threads, which the Seres send to you for the manufacture of fine garments, bear in mind the change of form in this creature; derive from it a clear conception of the resurrection; and discredit not that transformation which Paul announces to us all.—Yates's Translation.

When St. Basil says of the new-born moth, that "it assumes light and expanded wings," the beauty of the comparison in illustrating the Christian doctrine of the resurrection is enhanced, when we consider that in its *wild* state the moth flies very well, although, when domesticated, its flight is weak and its wings small and shrivelled*: but still more beautiful does the figure become, if we suppose a reference to those larger and more splendid *Phalænæ* which produce the coarser kinds of silk in India, and probably in China also.

Basil is the *first* writer, who distinctly mentions the change of the silk-worm from a *Chrysalis* to a moth. In his application of that fact he addresses himself to his countrywomen in Asia Minor, and his language represents them sitting and winding on bobbins the raw silk obtained from the Seres and designed to be afterwards woven into cloth.

Between these two authors, Aristotle and Basil, we observe a difference of phraseology which appears deserving of notice. While they both describe the women, not as spinning the silk, but as *winding it on bobbins*, they designate the material so wound by two different names. Basil uses the term *νήματα*, which might be meant to imply that the silk came from the Seres in skeins as it comes to us from China: Aristotle, on the contrary, uses the term *βομβόκια*, which can only refer to the state of silk before it is wound into skeins. As it might appear impossible to convey it in this state to Cos, we shall here insert from the authorities already quoted, the Chinese Missionaries, an account of the process by which the cocoons are prepared for winding, and it will then be seen, that the cocoons might have been transported to any part of the world.

"To prepare the cocoons of the wild silk-worms, the Chinese cut the extremities of them with a pair of scissors. They are then put into a canvass bag, and immersed for an hour or more in a kettle of boiling lye, which dissolves the gum. When this is effected, they are taken from the kettle ;

* The *Phalæna Atlas*, apparently a native of China, measures eight inches across the wings from tip to tip.

pressed to expel the lye, and then laid out to dry. Whilst they are still moist, the chrysalises are extracted; each cocoon is then turned inside out, so as to make a sort of cowl. It is necessary only, to put them again into lukewarm water, after which ten or twelve of them are capped one upon another like so many thimbles, to insert a small distaff through them, when the silk may be reeled off.

Basil, in one of his Homilies, (*Opp. tom. ii. p. 53. 55. ed. Benedict.*) inveighs against the ladies of Cæsarea, who employed themselves in weaving gold; and he is no less indignant at their husbands who adorned even their horses with cloths of gold and scarlet as if they were bridegrooms.

The author of a Treatise “*De disciplinâ et bono pudicitiaë,*” which is usually published with Cyprian, and which may be referred to the fourth or fifth century, thus speaks (*Cypriani Opera, ed. Erasmi, p. 499.*):

To weave gold in cloth is, as it were, to adopt an expensive method of spoiling it. Why do they interpose stiff metals between the delicate threads of the warp?

The same censure is implied in the following address of Al-cimus Avitus to his sister.

Non tibi gemmato posuere nonilia collo,
 Nec te contextit, neto quæ fulguratauro
 Vestis, ductilibus concludens fila talentis:
 Nec te Sidonium bis coeti muricis ostrum
 Induit, aut rutilo perlucens purpura succo,
 Mollia vel tactu quæ mittunt vellera Seres:
 Nec tibi transfossis fixerunt auribus aurum.

No threaded gems have pressed thy sparkling neck:
 No cloth, with lines incased in ductile gold,
 Or twice with the Sidonian murex dyed,
 Has glittered on thee: thou hast never worn
 The fleeces soft which distant Seres send:
 Nor are thy ears transfixed for pendent gold.

The effect of such exhortations as the preceding, was to induce piously disposed persons to apply pieces of gold cloth to *public* and *sacred*, instead of private purposes. After this period we find continual instances of their use in the decoration of churches and in the robes of the priesthood.

AMBROSE, CL. A. D. 374.

Sericæ vestes, et auro intexta velamina, quibus divitis corpus ambitur, damna viventium, non subsidia defunctorum sunt.—*De Nabutho Jezraelitâ, cap. i. tom. i. p. 566. Ed. Bened.*

Silken garments, and veils interwoven with gold, with which the body of the rich man is encompassed, are a loss to the living, and no gain to the dead.

Here we think it not out of place to introduce the account of the silk-worm by Georgius Pisida, who flourished about A. D. 640, although he lived at Constantinople after the breeding of silk-worms had been introduced there. According to him the silk-worm pines or moulders almost to nothing in its tomb, and then returns to its former shape. The verses are however deserving of attention for their elegance, and for the repetition of Basil's idea, which Ambrose has left out, of the analogy between the restoration of the silk-worm and the resurrection of man.

Ποῖος δὲ καὶ σκολήκα Σηρικὸν νόμος
 Πείθει τὰ λαμπρόκλωστα νήματα πλέκειν,
 Ἄ, τῇ βαφῇ χρωσθέτα τῆς ἀλουργίδος,
 Χαννοὶ τὸν ὄγκον τῶν κρατούντων ἐμφρόνως;
 Μνήμη γὰρ αὐτοῦς εὐλαβῶς ὑποτρέχει,
 Ὅτι πρὸ αὐτῶν τῆς στολῆς ἡ λαμπρότης
 Σκώληκος ἦν ἔνδυμα καὶ φθαρτὴ σκέπη,
 Ὅς, τῇ καθ' ἡμᾶς μαρτυρῶν ἀναστάσει,
 Θνήσκει μὲν ἔνδον τῶν ἑαυτοῦ νημάτων,
 Τὸν αὐτὸν οἶκον καὶ ταφὴν δεδεγμένος,
 Σχεδὸν δὲ παντὸς τοῦ κατ' αὐτὸν σαρκίου
 Σαπέντος ἢ ῥυέντος ἢ τετηγμένου,
 Χρονόνυ καλοῦντος ἐκ φθορᾶς ὑποστρέφει,
 Καὶ τὴν πάλαι μόρφωσιν ἀρβήτως φύει
 Ἐν τῷ περιτεύσαντι μικρῷ λειψάνῳ,
 Πρὸς τὴν ἀπ' ἀρχῆς σωματούμενος πλάσιν.

l. 1265–1282.

What law persuades the Seric worm to spin
 Those shining threads, which, dyed with purple hue,
 Inflate, yet check the pride of mighty men?
 For, whilst they blaze in grand attire, the thought
 Steals on,—This splendid robe once cloth'd a worm:
 Type of our resurrection from the grave,
 It dies within the tomb itself has spun,
 That perishing abode, which is at once
 Its house and tomb; in which it rots away,

Till at the call of time it gladly leaves
 Corruption, and its ancient shape resumes.
 A little remnant of its mould'ring flesh,
 By processes unspeakable and dark,
 Restores the wonders of its earliest form.

Yates's Translation

MACARIUS, CL., A. D. 373.

This author gives us an additional proof (*Homil.* 17, § 9,) that the use of silken clothing was characteristic of dissolute women.

JEROME, CL., A. D. 378.

This great author mentions silk in numerous passages.

In his translation of Ezekiel xxvii. he has supposed silk (*sericum*) to be an article of Syrian and Phœnician traffic as early as the time of that prophet.

In his beautiful and interesting Epistle to Læta on the Education of her Daughter (*Opp. Paris*, 1546, *tom.* i. *p.* 20. C.), he says :

Let her learn also to spin wool, to hold the distaff, to place the basket in her bosom, to twirl the spindle, to draw the threads with her thumb. Let her despise the webs of silk-worms, the fleeces of the Seres, and gold beaten into threads. Let her prepare such garments as may dispel cold, not expose the body naked, even when it is clothed. Instead of gems and silk, let her love the sacred books, &c.

Because we do not use garments of silk, we are reckoned monks ; because we are not drunken, and do not convulse ourselves with laughter, we are called restrained and sad : if our tunic is not white, we immediately hear the proverb, He is an impostor and a Greek.—*Epist. ad Marcellum, De Ægrotatione Blesillæ*, *tom.* i. *p.* 156, *ed. Erasmi*, 1526.

You formerly went with naked feet ; now you not only use shoes, but even ornamented ones. You then wore a poor tunic and a *black* shirt under it, dirty and pale, and having your hand callous with labor ; now you go adorned with linen and silk, and with vestments obtained from the Atrebates and from Laodicea.—*Adv. Jovinianum*, l. ii *Opp. ed. Paris*, 1546, *tom.* ii. *p.* 29.

In the following he further condemns the practice of wrapping the bodies of the dead in cloth of gold :

Why do you wrap your dead in garments of gold ? Why does not ambition cease amidst wailings and tears ? Cannot the bodies of the rich go to corruption except in silk ? *Epist.* L. ii.

You cannot but be offended yourself, when you admire garments of silk and gold in others.—*Epist.* L. ii. No. 9, *p.* 138, *ed. Par.* 1613, 12^{ma}.

CHRYSOSTOM, CL., A. D. 398.

Ἄλλὰ σηρικὰ τὰ ἱμάτια; ἀλλὰ βράκιων γέμουσα ἡ ψυχὴ.

Comment. in Psalm 48. tom. v. p. 517. ed. Ben.

Does the rich man wear silken shawls? His soul however is full of tatters.

Καλὰ τὰ σηρικὰ ἱμάτια, ἀλλὰ σκωλήκων ἐστὶν ὕφασμα.

(*Quoted by Vossius, Etym. Lat. p. 466.*)

Silken shawls are beautiful, but the production of worms.

Chrysostom also inveighs against the practice of embroidering shoes with silk thread, observing that it was a shame even to wear it woven in shawls. Such is the change of circumstances, that now even the poorest persons of both sexes, if decently attired, have silk in their shoes.

HELIODORUS, CL., A. D. 390.

This author, describing the ceremonies at the nuptials of Theagenes and Chariclea, says, "The ambassadors of the Seres came, bringing the thread and webs of their spiders, one of the webs dyed purple (!), the other white." *Æthiopica, lib. x. p. 494. Commelini.*

Salmasius (*in Tertullianum de Pallio, p. 242.*) quotes the following passage from *an uncertain author.*

Ὅμοία ἐστὶν ἡ τοῦ παρόντος βίου τερπνότης Ἰνδικῶ σκωληκιῶ, ὅπερ τῶ φυλλῶ τοῦ δένδρου συντυλιχθὲν, καὶ τῇ τροφῇ ἀσχοληθὲν, συνεπνίγη ἐν αὐτῶ τοῦ μεταξίου κοκκοῦ λίφ.

The pleasure of the present life is like the Indian worm, which, having involved itself in the leaf of the tree and having been satisfied with food, chokes itself in the cocoon of its own thread.—Yates's Translation.

This writer, whoever he was, appears to have had a correct idea of the manner in which the silk-worm wraps itself in a leaf of the tree, on which it feeds, and spins its tomb within*.

* In the Royal Museum of Natural History at Leyden are eight or ten cocoons of the Phalæna Atlas from Java. They consist of a strong silk, and are formed upon the leaves of a kind of Ficus. The first layer of the cocoon covers the whole of a leaf, and receives the exact impress of its form. Then two or three other layers are distinctly perceptible. Two or three leaves are joined together to form the cocoon. In regard to the looseness of the layers these cocoons do not correspond to M. Breton's description of the cocoons of the wild silk-worms of

FIFTH CENTURY.

PRUDENTIUS, CL., A. D. 405.

The following sentence occurs in a speech of St. Lawrence at his martyrdom :

Hunc, qui superbit serico,
 Quem currus inflatum vehit ;
 Hydrops aquosus lucido
 Tendit veneno intrinsecus.

Peristeph. Hymn. ii. l. 237-240.

See him, attir'd in silken pride,
 Inflated in his chariot ride ;
 The lucid poison works within,
 Dropsy distends his swollen skin.

In another Hymn to the honor of St. Romanus we find the following lines :

Aurum regestum nonne carni adquiretur ?
 Inlusa vestis, gemma, bombyx, purpura,
 In carnis usum mille quæruntur dolis.

Peristeph. Hymn. x.

To please the flesh a thousand arts contend :
 The miser's heaps of gold, the figur'd vest,
 The gem, the silk-worm, and the purple dye,
 By toil acquir'd, promote no other end.

In the same Hymn (*l. 1015.*) Prudentius describes a heathen priest sacrificing a bull, and dressed *in a silken toga* which is held up by the Gabine cincture (*Cinctu Gabino Sericam fultus togam*). Perhaps, however, we ought here to understand that the cincture only, not the whole toga, was of silk. It was used to fasten and support the toga by being drawn over the breast.

In two other passages this poet censures the progress of luxury in dress, and especially when adopted by men.

Sericaque in fractis fluitent ut pallia membris

Psychomachia, l. 365.

The silken scarfs float o'er their weaken'd limbs.

Sed pudet esse viros : quærunt vanissima quæque.
 Quis niteant : genuina leves ut robora solvant,

China, which are very strong and compact, and therefore more resemble those of the Phalæna Paphia.

Vellere non ovium, sed Eoo ex orbe petitis
 Ramorum spoliis fluitantes sumere amictus,
 Gaudent, et durum scutulis perfundere corpus.
 Additur ars, ut fila herbis saturata recoctis
 Inludant varias distincto stamine formas.
 Ut quæque est lanugo feræ mollissima tactu,
 Pectitur. Hunc videas lascivas præpete cursu
 Venantem tunicas, avium quoque versicolorum
 Indumenta novis textentem plumea telis:
 Illum pigmentis redolentibus, et peregrino
 Pulvere femineas spargentem turpitur auras.

Hamartigenia, l. 286–298.

They blush to be call'd men : they seek to shine
 In ev'ry vainest garb. Their native strength
 To soften and impair, they gaily choose
 A flowing scarf, not made of wool from sheep,
 But of those fleeces from the Eastern world,
 The spoil of trees. Their hardy frame they deck
 All o'er with tessellated spots: and art
 Is added, that the threads, twice dyed with herbs,
 May sportively intwine their various hues
 And mimic forms, within the yielding warp.
 Whatever creature wears the softest down,
 They comb its fleece. This man with headlong course
 Hunts motley tunics which inflame desire,
Invents new looms, and weaves a feather'd vest,
 Which with the plumage of the birds compares :
 That, scented with cosmetics, basely sheds
 Effeminate foreign powder all around.

PALLADIUS.

A work remains under the name of Palladius on “The Nations of India and the Brachmans.” Whether it is by the same Palladius, who wrote the *Historia Lausiaca*, is disputed. But, as we see no reason to doubt, that it may have been written as early as his time, we introduce here the passages, which have been found in it, relating to the present subject. The author represents the Bramins as saying to Alexander the Great, “You envelope yourselves in soft clothing, like the silk-worms.” (*p. 17. ed. Bissæi.*) It is also asserted, that Alexander did not pass the Ganges, but went “as far as Serica, where the silk-worms produce raw-silk” (*p. 2.*).

In the London edition this tract is followed by one in Latin,

bearing the name of St. Ambrose and entitled *DE MORIBUS BRACHMANORUM*. It contains nearly the same matter with the preceding. The writer professes to have obtained his information from "Musæus Dolenorum Episcopus," meaning, as it appears from the Greek tract, Moses, Bishop of Adule, of whom he says,

Sericam ferè universam regionem peragravit: in quâ refert arbores esse, quæ non solum folia, sed lanam quoque proferunt tenuissimam, ex quâ vestimenta conficiuntur, quæ Serica nuncupantur. p. 58.

He travelled through nearly all the country of the Seres, in which, he says, that there are trees producing not only leaves, but the finest wool, from which are made the garments called Serica.

These notices are not devoid of value as indicating what were the first steps to intercourse with the original silk country. It may however be doubted, whether the last account here quoted is a modification of the ideas previously current among the Greeks and Romans, or whether it arose from the mistakes of Moses himself, or of other Christian travellers into the interior of Asia, *who confounded the production of silk with that of cotton.*

THE THEODOSIAN CODE,

published A. D. 438, mentions silk (*sericam et metaxam*) in various passages.

APOLLINARIS SIDONIUS, CL., A. D. 472.

Describing the products of different countries, this learned author says (*Carmen. v. l. 42-50*),

Fert

Assyrius gemmas, Ser vellera, thura Sabæus.

Th' Assyrian brings his gems, the Ser

His fleeces, the Sabean frankincense.

In a passage (*Carmen. xv.*), he mentions a pall,

Cujus bis coctus aheno

Serica Sidonius fucabat stamina murex.

The Tyrian murex, twice i' th' cauldron boil'd,

Had dyed its silken threads.

The expression here used, indicates that the silk thread was

brought from the country of the Seres to be dyed in Phœnice. In Horace we have already noticed the "Coæ purpuræ."

A passage from the Burgus Pontii Leontii (*Carmen. xxii.*), shows that the same article (*Serica fila*) was imported into Gaul.

In the same author (*l. ii. Epist. ad Serranum*) we meet with "Sericatum toreuma." The latter word probably denoted a carved sofa or couch. The epithet "sericatum" may have referred to its silken cover.

The same author describes Prince Sigismer, who was about to be married, going in a splendid procession and thus clothed :

Ipsè medius incessit, flammeus cocco, rutilus auro, lacteus serico. L. iv. Epist. p 107. ed. Elmenhorstii.

He himself marched in the midst, his attire flaming with coccus, glittering with gold, and of milky whiteness with silk.

Describing the heat of the weather, he says :

One man perspires in cotton, another in silk.

L. ii. Epist. 2.

Lastly, in the following lines he alludes to the practice of giving silk to the successful charioteers at the Circensian games :

The Emp'ror, just as powerful, ordains
That silks with palms be given, crowns with chains :
Thus marks high merit, and inferior praise
In brilliant *carpets* to the rest conveys.

Carmen. xxiii. l. 423-427

ALCIMUS AVITUS, CL., A. D. 490.

Describing the rich man in the parable of Lazarus, this author says :

*Ipsè cothurnatus gemmis et fulgidus auro
Serica bis coctis mutabat tegmina blattis.*

L. iii. 222.

In jewell'd buskins and a blaze of gold,
Silk shawls, or twice in scarlet dipt, he wore.

Avitus also mentions "the soft fleeces sent by the Seres."

SIXTH CENTURY.

BOETHIUS, CL., A. D. 510

Nor honey into wine they pour'd, nor mix'd
Bright Seric fleeces with the Tyrian dye.

De Consol. Philos. ii.

The Tyrians are chiefly known to us in commercial history for their skill in dyeing; the Tyrian purple formed one of the most general and principal articles of luxury in antiquity: but dyeing could scarcely have existed without weaving, and though we have no direct information respecting the Tyrian and Sidonian looms, we possess several ancient references to their excellence, the less suspicious because they are incidental. Homer, for instance, when Hecuba, on the recommendation of the heroic Hector, resolves to make a rich offering to Minerva, describes her as selecting one of Sidonian manufacture as the finest which could be obtained.

The Phrygian queen to her rich wardrobe went
Where treasured odors breathed a costly scent;
There lay the vestures of no vulgar art—
Sidonian maids embroider'd every part,
Whom from soft Sidon youthful Paris bore
With Helen, touching on the Tyrian shore.
Here, as the queen revolved with careful eyes
The various textures and the various dyes,
She chose a veil that shone superior far,
And glow'd refulgent as the morning star.

Iliad, vi.

Tyre appears to have been the only city of antiquity which made dyeing its chief occupation, and the staple of its commerce. There is little doubt that purple, the sacred symbol of royal and sacerdotal dignity, was a color discovered in that city; and, that it contributed to its opulence and grandeur. It is related that a shepherd's dog, instigated by hunger, having broken a shell on the sea shore, his mouth became stained with a color, which excited the admiration of all who saw it, and that the same color was afterwards applied with great success to the dyeing of wool. According to some of the ancient writers, this discovery is placed in the reign of Phœnix, second

King of Tyre (five hundred years before the Christian era); others fix it in that of Minos, who reigned 939 years earlier or, 1439 B. C. The honor of the invention of dyeing purple, is however, generally awarded to the Tyrian Hercules, who presented his discovery to the king of Phœnicia; and the latter was so jealous of the beauties of this new color, that he forbade the use of it to all his subjects, reserving it for the garments of royalty alone. Some authors relate the story differently: Hercules' dog having stained his mouth with a shell, which he had broken on the seashore, Tysus, a nymph of whom Hercules was enamored, was so charmed with the beauty of the color, that she declared she would see her lover no more until he had brought garments dyed of the same. Hercules, in order to gratify his mistress, collected a great number of the shells, and succeeded in staining a robe of the color she had demanded. "Colored dresses," says Pliny*, "were known in the time of Homer (900 B. C.), from which the robes of triumph were borrowed." Purple habits are mentioned among the presents made to Gideon, by the Israelites, from the spoils of the kings of Midan. Ovid, in his description of the contest in weaving between Minerva and Arachne, dwells not only on the beauty of the figures which the rivals wove, but also mentions the delicacy of shading by which the various colors were made to harmonize together :

Then both their mantles button'd to their breast,
 Their skilful fingers ply with willing haste,
 And work with pleasure, while they cheer the eye
 With glowing purple of the Tyrian dye:
 Or justly intermixing shades with light,
 Their colorings insensibly unite
 As when a shower, transpierced with sunny rays,
 Its mighty arch along the heaven displays;
 From whence a thousand different colors rise
 Whose fine transition cheats the clearest eyes;
 So like the intermingled shading seems
 And only differs in the last extremes.
 Their threads of gold both artfully dispose,
 And, as each part in just proportion rose,
 Some antic fable in their work disclose.—*Metam.* vi.

* Plin. viii. 48.

The Tyrian purple was communicated by means of several species of univalve shell-fish. Pliny gives us an account of two kinds of shell-fish from which the purple was obtained. The first of these was called *buccinum*, the other *purpura**. A single drop of the liquid dye was obtained from a small vessel or sac, in their throats, to the amount of only *one drop* from *each* animal! A certain quantity of the juice thus collected being heated with sea salt, was allowed to ripen for three days, after which it was diluted with five times its bulk of water, kept at a moderate heat for six days more, occasionally skimmed, to separate the animal membranes, and when thus clarified, was applied directly as a dye to white wool, previously prepared for this purpose, by the action of lime-water, or of a species of lichen called fucus. Two operations were requisite to communicate the finest Tyrian purple; the first consisted in plunging the wool into the juice of the *purpura*, the second into that of the *buccinum*. Fifty drachms of wool required one hundred of the former liquor, and two hundred of the latter. Sometimes a preliminary tint was given with cocus, the kermes of the present day, and the cloth received merely a finish from the precious animal juice. The color appears to have been very durable; for Plutarch observes in his life of Alexander†, that, at the taking of Susa, the Greeks found in the royal treasury of Darius a quantity of purple stuffs of the value of five thousand talents, which still retained its beauty, though it had lain there for one hundred and ninety years‡.

* Plin. Lib. vi. c. 36.

† Plutarch, chap. 36.

‡ The true value of the talent cannot well be ascertained, but it is known that it was different among different nations. The Attic talent, the weight, contained 60 Attic minæ, or 6000 Attic drachmæ, equal to 56 pounds, 11 ounces, English troy weight. The mina being reckoned equal to £3 4s. 7d. sterling, or \$14 33 cents; the talent was of the value of £193 15s. sterling, about \$861. Other computations make it £225 sterling.

The Romans had the great talent and the little talent; the great talent is computed to be equal to £99 6s. 8d. sterling, and the little talent to £75 sterling.

2. *Talent*, among the Hebrews, was also a gold coin, the same with a shekel of gold; called also stater, and weighing only four drachmas. But the Hebrew talent of silver, called *cicar*, was equivalent to three thousand shekels, or one hundred and thirteen pounds, ten ounces, and a fraction, troy weight.—*Arbuthnot*.

CHAPTER IV.

HISTORY OF THE SILK MANUFACTURE CONTINUED FROM THE INTRODUCTION OF SILK-WORMS INTO EUROPE, A.D. 530, TO THE FOURTEENTH CENTURY.

A. D. 530.—Introduction of silk-worms into Europe—Mode by which it was effected—The Serinda of Procopius the same with the modern Khotan—The silk-worm never bred in Sir-hind—Silk shawls of Tyre and Berytus—Tyrannical conduct of Justinian—Ruin of the silk manufactures—Oppressive conduct of Peter Barsames—Menander Protector—Surprise of Maniak the Sogdian ambassador—Conduct of Chosroes, king of Persia—Union of the Chinese and Persians against the Turks—The Turks in self-defence seek an alliance with the Romans—Mortification of the Turkish ambassador—Reception of the Byzantine ambassador by Disabul, king of the Sogdiani—Display of silk textures—Paul the Silentiary's account of silk—Isidorus Hispalensis. Mention of silk by authors in the seventh century—Dorotheus, Archimandrite of Palestine—Introduction of silk-worms into Chubdan, or Khotan—Theophylactus Simocatta—Silk manufactures of Turfan—Silk known in England in this century—First worn by Ethelbert, king of Kent—Use of by the French kings—Aldhelmus's beautiful description of the silk-worm—Simile between weaving and virtue. Silk in the eighth century—Bede. In the tenth century—Use of silk by the English, Welsh, and Scotch kings. Twelfth century—Theodorus Prodromus—Figured shawls of the Seres—Ingulphus describes vestments of silk interwoven with eagles and flowers of gold—Great value of silk about this time—Silk manufactures of Sicily—Its introduction into Spain. Fourteenth century—Nicholas Tegrini—Extension of the Silk manufacture through Europe, illustrated by etymology—Extraordinary beauty of silk and golden textures used in the decoration of churches in the middle ages—Silk rarely mentioned in the ninth, eleventh, or thirteenth centuries.

WE now come to the very interesting account of the first introduction of silk-worms into Europe, which is given by Procopius in the following terms. (*De Bello Gothico*, iv. 17.)

“About this time (A. D. 530.) two monks, having arrived from India, and learnt that Justinian was desirous that his subjects should no longer purchase raw silk from the Persians, went to him and offered to contrive means, by which the Romans would no longer be under the necessity of importing this article from their enemies the Persians or any other nation.

They said, that they had long resided in the country called Serinda, one of those inhabited by the various Indian nations, and had accurately informed themselves how raw silk might be produced in the country of the Romans. In reply to the repeated and minute inquiries of this Emperor, they stated, that the raw silk is made by worms, which nature instructs and continually prompts to this labor; but that to bring the worms alive to Byzantium would be impossible; that the breeding of them is quite easy; that each parent animal produces numberless eggs, which long after their birth are covered with manure by persons who have the care of them, and being thus warmed a sufficient time, are hatched. The Emperor having promised the monks a handsome reward, if they would put in execution what they had proposed, they returned to India and brought the eggs to Byzantium, where, having hatched them in the manner described, they fed them with the leaves of the *Black Mulberry*, and thus enabled the Romans thenceforth to obtain raw silk in their own country."

The same narrative, abridged from Procopius, is found in Manuel Glycas (*Annal. l. iv. p. 209.*), and Zonares (*Annal. l. xiv. p. 69. ed. Du Cange.*). In the abstract given by Photius (*Biblioth. p. 80. ed. Rotham*) of the history of Theophanes Byzantinus, who was a writer of nearly the same age with Procopius, we find a narrative, in which the only variation is, that a Persian brought the eggs to Byzantium in the hollow stem of a plant. The method now practised in transporting the eggs from country to country is to place them in a bottle not more than half full, so that by being tossed about, they may be kept cool and fresh. If too close, they would probably be heated and hatch on the journey*.

The authors who have hitherto treated of the history of the silk-worm, have supposed the Serinda of Procopius to be the modern Sir-hind, a city of Circar in the North of Hindostan†.

* Transactions of the Society for encouraging Arts, Manufactures, &c., vol. xliii. p. 236.

† In this they have followed D'Anville, *Antiquité Géographique de l'Inde*, Paris, 1775, p. 63.

Notwithstanding the striking similarity of names, we think it more likely that Serinda was adopted by Procopius as another name for Khotan in Little Bucharía. The ancients included Khotan among the Indian nations* : and that they were right in so doing is established from the facts, that Sanscrit was the ancient language of the inhabitants of Khotan ; that their alphabetical characters, their laws, and their literature resembled those of the Hindoos ; and that they had a tradition of being Indian in their origin†. Since, therefore, Khotan was also included in the ancient Serica, a term probably of wide and rather indefinite extent‡ ; the name *Serinda* would exactly denote the origin and connexions of the race which occupied Khotan.

On the other hand, although Sir-hind is termed “an ancient city” by Major Rennell§, we cannot find any evidence that the

* In proof of this we refer to Heeren, *Ideen*, i. l. p. 358–387, on the Indian tribes which constituted one of the Persian Satrapies, and in which the inhabitants of Khotan appear to have been included ; and also to Cellarii *Antiqui Orbis Notitia*, l. iii. c. 23. § 2.

† Remusat, *Hist. de la Ville de Khotan*, p. 32. Note 1. and p. 37.

‡ De Guignes (*Hist. Gen. des Huns*, tome i. p. v.) expresses his opinion, that Serica, besides the North of China, included the countries towards the West, which were conquered by the Chinese, viz. Hami, Turfan, and other neighboring territories. Rennell (*Mem. of a map of Hindostan*) agrees with D’Anville, *that Serica was at the Northwest angle of the present empire of China*. Heeren decides in favor of the same opinion, supposing Serica to be identical with the modern Tongut. *Comment. Soc. Reg. Scient. Gottingensis*, vol. xi. p. 106. 111. Gottingæ, 1793.

Pausanias observes that the Seres, in order to breed the insects which produced silk, had houses adapted both for summer and winter, which implies that there was a vast difference between the summer and winter temperature of their country. A late oriental traveller says of the climate of Khotan, “ In the summer, when melons ripen, it is very hot in these countries ; but, during winter, extremely cold.”—Wathen’s *Memoir on Chinese Tartary and Khotan*, in *Journal of the Asiatic Society of Bengal*, December 1835, p. 659.

On referring to the map, Plate VII., the reader will see the position of Serica indicated at its Eastern extremity. As that map is limited to the *Orbis Veteribus Cognitus*, only a small space on its border is marked as the country of silk indicated by the yellow color. It is, nevertheless, pretty certain that silk may be justly placed next in order to wool.

§ *Memoir of a Map of Hindostan*.

silk-worm was ever bred there. So far is this from being the case, that it appears to be a country very ill adapted for the production of silk*. It may indeed be true, as stated by Latreille, that Sir-hind was colonized from Khotan, and it may be mentioned as a remarkable circumstance in confirmation of this supposition, that there is a town called Kotana a little way to the North East of the City of Sir-hind. But, supposing this account to be correct, it is highly probable that the settlement of Sir-hind as a colony of Khotan did not take place till after the year 530, when the breeding of silk-worms was according to Procopius introduced into Europe from "Serinda." Rather more than 120 years before this time India was visited by the Chinese traveller, Fa Hian, who on his way passed some months with great delight and admiration in Khotan; and the special object of whose journey was to see and describe all the cities of India where Buddhism was professed. The inhabitants of Khotan being wholly devoted to that delusion, the same system must have been established in its colony; and, since this zealous pilgrim crossed India at no great distance from the spot where Sir-hind afterwards stood, we cannot doubt that he would have mentioned it, if it had existed in his age. He says not a word about it; and the time is comparatively so short between his visit to India and the date of the introduction of silk-worms into Europe, that we can scarcely suppose Sir-hind, the colony of Khotan and consequently the seat of Buddhism, to have been in existence either at the former or latter period†.

In another passage of his history (*Bell. Pers.* 1. 20.) Procopius throws some light upon our subject by stating that in consequence of the monopoly of the trade in raw silk by the Persians, Justinian attempted to obtain it through the Æthi-

* "The S. W. portion of the Circar Sir-hind is extremely barren, being covered with low scrubby wood, and in many places destitute of water. About A. D. 1357 Feroze the Third cut several canals from the Jumna and the Sutulege in order to fertilize this naturally arid country."—Walter Hamilton's *Description of Hindostan*, vol. i. p. 465.

† Foe Koue Ki, ou *Rélation des Royaumes Bouddiques: Voyage dans la Tartarie, dans l'Afghanistan, et dans l'Inde*; traduit du Chinois et commenté par Remusat, Klapproth, et Landresse. Paris, 1836, 4to.

opians of Arabia, but found this to be impracticable, as the Persian merchants frequented the ports to which the Indians resorted, and from them purchased all their cargoes.

Procopius further states (*Hist. Arcana*, c. 25.), that *silk shawls* had long been manufactured in the Phœnician cities Tyre and Berytus (to which all who were concerned in the silk trade, either as merchants or manufacturers, consequently resorted, and from whence goods were carried to every part of the earth); but that in the reign of Justinian the manufacturers in Byzantium and other Greek cities raised the prices of their goods, alleging that the Persians had also advanced theirs, while the imposts were increased among the Romans. Justinian, pretending to be much concerned at the high prices, forbade any one in his dominions to sell silk for more than eight *aurei* per pound, threatening confiscation of goods against any one who transgressed the law. To comply was impossible, since they were required to sell their goods at a price lower than that for which they bought them. They therefore abandoned the trade, and secretly sold the remnant of their goods for what they could get. The Empress Theodora, on being apprised of this, immediately seized the goods and fined the proprietors a hundred *aurei* besides. It was then determined, that the silk manufacture should be carried on solely by the Imperial Treasurer. PETER BARSAMES held the office, and conducted himself in relation to this business in the most unjust and oppressive manner, so that the silk-trade was ruined not only in Byzantium but also at Tyre and Berytus, while the Emperor, Empress and their Treasurer amassed great wealth by the monopoly.

MENANDER PROTECTOR, A. D. 560-570.

In an account of an embassy sent to Constantinople by the Avars of Sarmatia, this author states, that the Emperor Justinian endeavored to excite their admiration by a display of splendid couches, gold chains, and garments of silk*.

The establishment of the Turkish power in Asia, about the

* Corp. Hist. Byzant. ed. 1729. tom. i. p. 67.

middle of the sixth century, together with subsequent wars, had greatly interrupted the caravan trade between China and Persia. On the return of peace, the Sogdians, an Asiatic people, who had the greatest interest in the revival of the trade, persuaded the Turkish sovereign, whose subjects they were become, to send an embassy to Chosroes, king of Persia, to open a negotiation for this purpose. Maniak, a Sogdian prince, who was ambassador, being instructed to request that the Sogdians might be allowed to supply the Persians with silk; presented himself before the Persian monarch in the double character of merchant and envoy, carrying with him many bales of silken merchandise, for which he hoped to find purchasers among the Persians. But Chosroes, who thought the conveyance by sea to the Persian Gulf more advantageous to his subjects than this proposed traffic, was not disposed to lend a favorable ear to the legation, and rather uncourteously showed his contempt for the Sogdian traders. He bought up all the silk which the ambassador had carried with him, and immediately burned it before them; thus giving the most convincing proof of the little value which it had in his estimation.

After this the Persians and Chinese united against the Turks, who, to strengthen themselves, sought an alliance with the Emperor Justin. Maniak was again appointed ambassador, and sent to negotiate the terms of the alliance; but disappointment, though from a dissimilar cause, attended this his second embassy. The sight of silk-worms, and the establishment for manufacturing their produce, in Constantinople, were to him as unwelcome as unexpected; he however concealed his mortification, and, with perhaps an overstrained civility, acknowledged, that the Romans were already become as expert as the Chinese in both the management of silk-worms and manufacture of their silk*; and when in the fourth year of Justin II. (*i. e.* A. D. 569.) they went on the same mission to Byzantium, they found that here also there was no demand, since silk-worms were bred there already. Soon after this we learn that the Byzantines sent an embassy to Disabul, King of the Sogdiani, who

* Gibbon's Decline and Fall of the Roman Empire, chap. xlii.

received the ambassadors in tents covered with variously-colored silks.

PAUL, THE SILENTIARY, A. D. 562,

mentions silk thread, used in adorning the vestments in the church of St. Sophia at Constantinople. (P. ii. l. 368.) The note of the Editor, Du Cange, on the description of the pall, (577.), contains various quotations from ecclesiastical writers, which mention "vela rubea Serica;" "vela alba holoserica rasata;" "vela serica de blattin." These quotations show, that silk had been introduced into general use for the churches.

ISIDORUS HISPALENSIS, CL., A. D. 575.

The etymological work of Isidore of Seville may be regarded as a kind of encyclopedia, exhibiting the general state of knowledge and art at the time when he wrote. Hence the following descriptive extracts are well deserving of attention.

Bombyx frondium vermis, ex cujus texturâ Bombycinum conficitur. Appellatur autem hoc nomine ab eo quod evacuetur dum fila generat, et aer solus in eo remanet. Origin. l. xii. c. 5.

Bombyx, a worm which lives upon the leaves of trees, and from whose web silk is made. It is called *Bombyx*, because it empties itself in producing threads, and nothing but air remains within it.

The cloth called *Bombycina*, derives its name from the silk-worm (*Bombyx*), which emits very long threads; the web woven from them is called *Bombycinum*, and is made in the island of *Cos*.

That called *Serica* derives its name from silk (*sericum*), or from the circumstance, that it was first obtained from the *Seres*.

Holoserica is all of silk: for *Holon* means *all*.

Tramoserica has a warp of linen; and a woof (*trama*) of silk.—L. xix. c. 22

Touching these extracts we would remark, that the testimony of Isidore must not be considered as proving, that the silk manufacture still existed in *Cos*. His statement was no doubt merely copied from Varro or Pliny, or founded upon the authority of other writers long anterior to his own age. It is indeed probable that silk-worms had by this time been brought into Greece, but that he was ignorant of the fact.

SEVENTH CENTURY.

DOROTHEUS, ARCHIMANDRITE OF PALESTINE, A. D. 601.

“Ὡσπερ γὰρ ἐνδεδυμένος ὀλοσήρικον.—*Doctr.* 2, as quoted in *Cod. Theodos. Gothofredi. L. Bat.* 1665.

For as a man wearing a tunic entirely of silk.

THEOPHYLACTUS SIMOCATTA, A. D. 629.

This author, in his *Universal History* (*l.* vii. c. 9.), informs us that the silk manufacture was carried on at Chubdan, with the greatest skill and activity, which was probably the same as Khotan, or, as it was called in his time, Ku-tan*.

We have, moreover, the following account of the origin of the growth and manufacture of silk in that country (*p.* 55, 56.).

“The monastery of Lou-che (*occupied by Buddhists*) is to the south-west of the royal city. Formerly the inhabitants of this kingdom had neither mulberries nor silk-worms. They heard of them in the East country, and sent an embassy to ask for them. The King of the East refused the request, and issued the strictest injunctions to prevent either mulberries or silk-worms’ eggs from being conveyed across the border. Then the King of Kiu-sa-tan-na (*i. e.* *Koustana*, or *Khotan*) asked of him a princess in marriage. This having been granted, the king charged the officer of his court who went to escort her, to say, that in his country there were neither mulberry-trees nor cocoons, and that she must introduce them, *or be without silk dresses*. The princess, having received this information, obtained the seed both of mulberries, and silk-worms, which she concealed in her head-dress. On arriving at the frontier, the officers searched every where, but dare not touch the turban of the princess. Having arrived at the spot, where the monastery of Lou-che was afterwards erected, she deposited the seed both of the mulberries and worms. The trees were planted in the spring, and she afterwards went herself to assist in gathering the leaves. At first the worms were fed upon the

* *Intineraire de Hiuan Tshang*, Appendice ii. à Foe Koue Ki, p. 399.

leaves of other plants, and a law was enacted, that no worms were to be destroyed or sacrificed until their quantity was sufficiently great. The monastery was founded to commemorate so great a benefit, and some trunks of the original mulberry-trees can yet be seen there*.”

In the following passage (*Règne Animal, par Cuvier, tom. v. p. 402.*) Latreille mentions Turfan as an important city as far as it affected the early silk-trade. In other respects his account coincides with that already given.

“La ville de Turfan, dans la petite Bucharie, fut long-temps le rendez-vous des caravanes venant de l’Ouest, et l’entrepôt principal des soieries de la Chine. Elle était la métropole des Sères de l’Asie supérieure, ou de la Séricie de Ptolémée. Expulsés de leurs pays par les Huns, les Sères s’établirent dans le grande Bucharie et dans l’Inde. C’est d’une de leurs colonies, du Ser-hend (*Ser-indi*), que des missionaires Grècs transportèrent, du temps de Justinien, les œufs du ver à soie à Constantinople.”

The City of Turfan in Little Bucharie was for a long time the rendezvous of the caravans coming from the West, and the principal market for Chinese silks. It was the metropolis of the Seres of Upper Asia, or the Serica of Ptolemy. The Seres having been expelled their country by the Huns, established themselves in Great Bucharie and in India. It is from one of their colonies (of Ser-indi), that the Grecian Missionaries, in the time of Justinian, brought the eggs of the silk-worm to Constantinople.

A diploma of **ETHELBERT**, King of Kent, mentions “*Ar-milausia holoserica*,” proving that silk was known in England at the end of the sixth century†. The usual dress of the earliest French kings seems to have been a linen shirt and drawers of the same material next to the skin; over these a tunic, probably of fine wool, which had a border of silk, ornamented sometimes with gold or precious stones; and upon this a sagum, which was fastened with a fibula on the right shoulder. Eginhart informs us, that Charlemagne wore a tunic, or vest, with a silken border (*limbo serico*)‡.

* It may be observed, that the folds of the turban are not unfrequently used in the East to convey articles of value. See *Journal of a Tour in Asia Minor*, by Charles Fellows, London, 1839, p. 216.

† Dugdale’s *Monasticon*, vol. i. p. 24. Adelung’s *Glossarium Manuale*, v. *Ar-milausia*.

‡ Examples of it may be seen, I. in the two figures of Charlemagne, executed in mosaic during his life-time, one of which is preserved in the Penitentiary of St.

ALDHELMUS, CL., A. D. 680.

This author, who died Abbot of Sherburn, was among the most learned men of his age. In his *Ænigmas*, which are written in tetrastics, we find the following description of the silk-worm. As it is scarcely possible that he could have seen this creature, we have cause to admire both the ingenuity and general accuracy of his lines. The ascending to the tops of thorns or shrubs, such as “genistæ,” to which the animal may attach its cocoon (*globulum*), has not been noticed by any earlier author.

De Bombycibus.

Annua dum redeunt texendi tempora telas,
Lurida setigeris replentur viscera filis;
Moxque genistarum frondosa cacumina scando,
Ut globulus fabricans cum fati sorte quiescam.

Maxima Bibl. Vet. Patrum, tom. xiii. p. 25.

Soon as the year brings round the time to spin,
My entrails dark with hairy threads are fill'd:
Then to the leafy tops of shrubs I climb,
Make my cocoon, and rest by fate's decree.

In a book written by this author, in praise of virginity, he observes, That chastity alone did not form an amiable and perfect character, but required to be accompanied and adorned by many other virtues; and this observation he further illustrates by the following simile taken from the art of weaving: “As it is not a web of one uniform color and texture, without any variety of figures, that pleaseth the eye and appears beautiful, *but one that is woven by shuttles, filled with threads of purple, and many other colors, flying from side to side, and forming a variety of figures and images, in different compartments, with admirable art.*”—*Bibliotheca Patrum, tom. xiii.*

John Lateran at Rome, and both of these are described by Spon in his *Miscellanea Eruditæ Antiquitatus* (p. 284.); II. in the figure of Charles the Bald, the grandson of Charlemagne, which is in the splendid copy of the Latin Gospels made for his use, now preserved in the library at Munich, and which may be seen engraved in Sanft's Dissertation on that MS. (p. 42.); III. in the figure of an early French king engraved from a MS. by Baluzius in his *Capitularia Regum Francorum* (tom. ii. p. 1308.); and IV. in the first volume of Montfaucon's *Monumens de la Monarchie Française*.

EIGHTH CENTURY.

BEDE, CL., A. D. 701.

Joseph autem mercatus est sindonem, et deponens eum involvit sindone. (*Marc.* xv. 46.)—Et ex simplici sepultura domini ambitio divitum cōdemnatur, qui ne in tumultis quidem possunt carere divitiis. Possumus autem juxta intelligentiam spiritalem hoc sentire, quod corpus domini non auro, non gemmis et serico, sed lintamine puro obvolvendum sit, quanquam et hoc significet, quod ille in sindone munda involvat Jesum, qui pura eum mente suscepit. Hinc ecclesiæ mos obtinuit, ut sacrificium altaris non in serico, neque in panno tincto, sed in lino terreno celebretur, sicut corpus est domini in sindone munda sepultum, juxta quod in gestis pontificalibus a beato Papâ Silvestro legimus esse statutum.—*Expos. in Marcum, tom. v. p. 207. Col. Agrip. 1688.*

But Joseph bought a linen cloth, and, taking him down, wrapped him in the linen cloth. (*Mark xv. 46.*)—The simple burial of our Lord condemns the ambition of rich men, who cannot be without wealth even in their tombs. That his body is to be wrapped not in gold, not in silk and precious stones, but in pure linen, may be understood by us spiritually. It also intimates, that he incloses Jesus in a clean linen cloth, who receives him with a pure mind. Hence the custom of the church has obtained, to celebrate the sacrifice of the altar, not in silk, nor in dyed cloth, but in earthy flax, as the body of our Lord was buried in a clean linen cloth; for so we read in the pontifical acts, that it was decreed by the blessed Pope Silvester.

The latter portion of this extract, wherein we are informed of the origin of the practice, universally adopted, of covering the Eucharist with a white linen cloth, must be a *later* addition. Pope Silvester lived, as the reader will perceive, long *after* the time of Bede.

Bede, in his *History of the Abbots of Wearmouth*, states that the first abbot and founder of the monastery, Biscop, surnamed Benedict, went a fifth time to Rome for ornaments and books to enrich it, and on this occasion (A. D. 685.) brought two *scarfs*, or palls, of incomparable workmanship, composed entirely of silk, with which he afterwards purchased the land of three families situated at the mouth of the Wear*. This shows the high value of silken articles at that period.

* Bedæ Hist. Eccles. &c. cura Jo. Smith. Cantab. 1722. p. 297. Mr. Sharon Turner, speaking of Bede, says, "His own remains were inclosed in silk. Mag. Bib. xvi. p. 88. It often adorned the altars of the church; and we read of a present to a West-Saxon bishop of a casula, not entirely of silk, but mixed with goat's

TENTH CENTURY.

About the year 970 Kenneth, king of Scotland, paid a visit in London to Edgar, king of England. The latter sovereign, to evince at once his friendship and munificence, bestowed upon his illustrious guest silks, rings, and gems, together with one hundred ounces of pure gold*.

Perhaps we may refer to the same date the composition of the "Lady of the Fountain," a Welsh tale, recently translated by Lady Charlotte Guest†. At the opening of this poem King Arthur is represented sitting in his chamber at Caer-leon upon Usk. It is said,

In the centre of the chamber, King Arthur sat upon a seat of green rushes, over which was spread a covering of flame-colored satin, and a cushion covered with the same material was under his elbow.

The mention of silk and satin is frequent in this tale.

GERBERT, CL., A. D. 970.

This author, who became Pope Silvester, mentions garments of silk (*sericas vestes*) in a passage which has been already quoted (see Part II. chap. V.).

TWELFTH CENTURY.

THEODORUS PRODROMUS,

a romance writer in the twelfth century, mentions the *figured shawls* (*πέπλα*) manufactured by the Seres.

The breeding of silk-worms in Europe appears to have been confined to Greece from the time of the Emperor Justinian until the middle of the twelfth century. The manufacture

wool." Ibid. p. 50. He refers to p. 97. of the same volume, as mentioning "*pallia holoserica*."—History of the Anglo-Saxons, vol. iii. book vii. chap. 4. p. 48, 49

* Lingard's Hist. of England, vol. i. 241. London, 1819, 4to.

† The Mabinogion, from the Llyfr Coch o Hergest and other ancient Welsh manuscripts; with an English translation and notes. By Lady Charlotte Guest. Part I. The Lady of the Fountain. Llandovery, 1838.

of silk was also very rare in other parts of Europe, being probably practised only as a recreation and accomplishment for ladies. But in the year 1148 Roger I., King of Sicily, having taken the cities of Corinth, Thebes, and Athens, thus got into his power a great number of silk-weavers, took them away with the implements and materials necessary for the exercise of their art, and forced them to reside at Palermo*. Nicetas Choniates†, referring to the same event, speaks of these artisans as of both sexes, and remarks that in his time those who went to Sicily might see the sons of Thebans and Corinthians employed in weaving velvet stoles *interwoven with gold*, and serving like the Eretrians of old among the Persians‡.

We find in the writings of Ingulphus several curious accounts of vestments of silk, interwoven with eagles and flowers of gold. This author, in his history, mentions that among other gifts made by Witlaf, king of Mercia, to the abbey of Croyland, he presented *a golden curtain, embroidered with the siege of Troy*, to be hung up in the church on his birthday§. At a later period, 1155, a pair of richly worked sandals, and three mitres, the work of Christina, abbess of Markgate, were among the valuable souvenirs presented by Robert, abbot of St. Albans, to Pope Adrian IV.||.

* Otto Frisingen, Hist. Imp. Freder. l. i. c. 33. in Muratori, Rerum Italicarum Scriptores, tom. vi. p. 668.

† In Manuel Comnenus, l. ii. c. 8., tom. xii. of the Scriptores Hist. Byzantinæ, p. 51. ed. Ven.

‡ Hugo Falcandus, who visited this manufactory A. D. 1169, represents it as being then in the most flourishing condition, producing great quantities of silks, both plain and figured, of many different colors, and enriched with gold

§ Ingulphus, p. 487, edit. 1596.

|| Adrian IV., was the only Englishman that ever sat in St. Peter's chair. His name was Nicolas Breakspear: he was born of poor parents at Langley, near St. Albans. Henry II., on his promotion to the papal chair, sent a deputation of an abbot and three bishops to congratulate him on his election; upon which occasion he granted considerable privileges to the abbey of St. Albans. With the exception of the presents named above, he refused all the other valuable ones which were offered him, saying jocosely,—“I will not accept your gifts, because when I wished to take the habit of your monastery you refused me.” To which the abbot pertinently and smartly replied,—“It was not for us to oppose the will of Providence, which had destined you for greater things.”

Without digressing from our subject to question the right of the royal marauder thus tyrannously to sever these unoffending artisans from the ties of country and of kindred, we may yet be allowed to express some satisfaction at the consequences of his cruelty. It is well for the interests of humanity that blessings, although unsought and remote, do sometimes follow in the train of conquest; that wars are not always limited in their results to the exaltation of one individual, the downfall of another, the slaughter of thousands, and misery of millions, but occasionally prove the harbingers of peaceful arts, heralds of science, and in short deliverers from the yoke of slavery or superstition.

In twenty years from this forcible establishment of the manufacture, the silks of Sicily are described as having attained a decided excellence; as being of diversified patterns and colors; some fancifully interwoven with gold—tastefully embellished with figures; and others richly adorned with pearls. The industry and ingenuity thus called forth, could not fail to exercise a beneficial influence over the character and condition of the Sicilians.

From Palermo the manufacture of silk extended itself through all parts of Italy and into Spain. We learn from Roger de Hoveden, that the manufacture flourished at Almeria in Grenada about A. D. 1190*.

FOURTEENTH CENTURY.

According to Nicholas Tegrini†, the silk manufacture afterwards flourished in Lucca; and the weavers, having been ejected from that city in the earlier part of the fourteenth century, carried their art to Venice, Florence, Milan, Bologna, and even to Germany, France, and Britain.

We have seen from different historical testimonies, that silk was known to the inhabitants of France and England as early as the sixth century. The fact of its introduction into all parts

* “Deinde per nobilem civitatem, quæ dicitur Almaria, ubi fit nobile sericum et delicatum, quod dicitur sericum de Almaria.” *Scriptores post Bedam*, p. 671.

† *Vita Castrucci*, in *Muratorii, Rer. Ital. Scriptores*, t. xi. p. 1320.

of the North of Europe is manifest from the use of words for silk in several northern languages. These words appear, according to the inquiries of the learned orientalists, Klaproth and Abel Remusat*, to have been derived from those Asiatic countries, in which silk was originally produced. In the language of Corea silk is called *Sir*; in Chinese *Se*, which may have been produced by the usual omission of the final *r*. In the Mongol language silk is called *Sirkek*, in the Mandchou *Sirghè*. In the Armenian the silk-worm is called *Chèram*. In Arabic, Chaldee, and Syriac, silk was called Seric†. From the same source we have in Greek and Latin Σηρικόν, Sericum.

In the more modern European languages we find two sets of terms for silk, the first evidently derived from the oriental Seric, but with the common substitution of *l* for *r*, the second of an uncertain origin. To the first set belong,

<i>Chelk</i> ,	silk, in Slavonian.
<i>Silke</i> ,	— in Suio-Gothic and Icelandic‡.
<i>Silcke</i> ,	— in Danish.
Siolc or Seolc,	silk, in Anglo-Saxon. Also Siolcen or Seolcen, silken; Æal reolcen, <i>Holosericus</i> ; Seolc-pynm, silk-worm§.

* Journal Asiatique, 1823, tom. ii. p. 246. Julius Klaproth (Tableau Historique de l'Asie, Paris, 1826, p. 57, 58.) says, that in the year 165 B. C. the inhabitants of the country called by us Tangut, who constituted a powerful kingdom, were attacked by the Hioung Nou, and driven to the West, where they fixed themselves in Transoxiana, and that these events led to an uninterrupted communication with Persia and India, especially in regard to the silk trade. Klaproth considers that the Seres of the ancients were the Chinese; but he appears to include under that term all the nations which were brought into subjection to the Chinese.

Professor Karl Ritter (Erdkunde, Asien, Band iv. 2te Auflage, Berlin, 1835, p. 437.) observes, in allusion to the authority just quoted, that all the names of the silk-worm and its products are to be accounted for on the supposition (which he considers the true one) that they were first known and cultivated in China, and from thence extended through central Asia into Europe.

† See Schindler's Pentaglott, p. 1951, D.

‡ *Silki trojo ermalausa*, a silk tunic without sleeves. Knitlynga Saga, p. 114, as quoted by Ihre, Glossar. Suio-Goth. v. Armalausa.

§ Ælfric's Glossary (made in the tenth century), p. 68. Appendix to Sumner's Dictionary.

<i>Silk,</i>	silk, in English*.
<i>Sirig,</i>	—— in Welsh†.
To the second set belong,	
<i>Seda,</i>	silk, in the Latin of the middle ages.
<i>Seta,</i>	—— in Italian.
<i>Seide,</i>	—— in German.
<i>Side,</i>	—— in Anglo-Saxon. Also Sidene, silken, Ælfric as quoted by Lye; Sidpypm, silk-worm, Junius, l. c.
<i>Sidan,</i>	—— in Welsh.
<i>Satin,</i>	—— in French and English‡.

According to Abel Remusat (*Journal Asiat. l. c.*) the merchandise of Eastern Asia passed through Slavonia to the North of Europe in the middle ages, even without the mediation of Greece or Italy. This may account for the use of the terms of the first class, while it is possible that those of the second have been derived from the South of Europe, from whence we have seen that silken commodities were also occasionally transported to the North.

To the evidence now produced from *authors* and *printed documents* respecting the history of silk from the earliest times to the period of its universal extension throughout Europe, another species of proof may be added, viz. that afforded by Relics preserved in churches, and by other remains of the antiquities of the middle ages. As examples of this method for illustrating the subject, the following articles may be enumerated.

I. The relics of St. Regnobert, Bishop of Bayeux in the seventh century. These consist of a *Casula*, or *Chasuble*, a *Stole*, and a *Maniple*. They are yet preserved in the cathedral of Bayeux, and worn by the Bishop on certain annual fes-

* Nicholas Fuller (Miscellanea, p. 248.) justly observes, Vocabulum Anglicanum Selk non nisi Sericum authorem generis sui agnoscit. Selk enim nuncupatum est quasi Selik pro Serik, literæ r in l facili commutatione factâ.

Minshew and Skinner give the same etymology.

† Junius, Etymologicum, v. *Silk*. It appears doubtful, however, whether Junius is here to be depended on:

‡ Menage, Diction. Etym. de la Langue Française, tom. ii. p. 457, ed. Joulst.

tivals. They are of silk *interwoven with gold*, and *adorned with pearls**.

II. Portions of garments of the same description with those of St. Regnobert were discovered A. D. 1827 on opening the tomb of St. Cuthbert in the Cathedral of Durham. They are preserved in the library of that church, and accurately described by the Rev. James Raine, the librarian, in a quarto volume.

III. The scull-cap of St. Simon, said to have been made in the tenth century, and now preserved in the Cathedral of Treves. Its border is *interwoven with gold*.

In regard to these interesting relics, they may with confidence be looked upon as specimens of the manufacture of silk from the *seventh* to the *twelfth* century.

IV. In the Cathedral at Hereford is a charter of one of the Popes with the bull (the leaden seal), attached to it by silken threads. Silk was early used for this purpose in the South of Europe†. The Danish kings began to use silk to append the waxen seals to their charters about the year 1000‡.

V. Silk, in the form of velvet, may be seen on some of the ancient armor in the Tower of London.

VI. The binding of ancient manuscripts affords specimens of silk. A French translation of Ludolphus Saxo's Life of Christ in four folio volumes, among Dr. William Hunter's MSS. at Glasgow, still has its original binding covered with red velvet, which is probably as old as the *fourteenth* century. A curious source of information on the art of book-binding at that period is the Inventory, or Catalogue of the library collected by that ardent lover of books, Charles V. of France. As this catalogue particularly describes the bindings of about 1200 volumes, many of which were very elaborate and splendid, it enables us to judge of the use made of all the most valuable stuffs and materials which could be employed for this purpose, and under the head of silk we find the following: "soie,"

* See John Spencer Smythe's Description de la Chasuble de Saint Regnobert, in the Procès Verbal de l'Académie Royale des Sciences, Arts, et Belles Lettres, de la Ville de Caen, Séance d'Avril 14, 1820.

† Mabillon de Re Diplomatica, l. ii. cap. 19. § 6.

‡ Diplomatarium Arna-Magnæanum, a Thorkelin, tom. i. p. xlv.

silk; "veluyau," velvet; "satanin," satin; "damas," damask; "taffetas," taffetas; "camocas;" "cendal;" and "drap dor," cloth of gold, having probably a basis or ground of silk*.

From the few examples of ancient Catholic vestments that have escaped destruction, the generality of persons are but little acquainted with the extreme beauty of the embroidery worked for ecclesiastical purposes during the Middle Ages. The countenances of the images were executed with perfect expression, like miniatures in illuminated manuscripts. Every parochial church, previous to the Reformation, was furnished with complete sets of frontals and hangings for the altars. One of the great beauties of the ancient embroidery was its appropriate design; each flower, leaf, and device having a significant meaning with reference to the festival to which the vestment belonged. Such was the extreme beauty of the English vestments in the reign of Henry III., that Innocent IV. forwarded bulls to many English bishops, enjoining them to send a certain quantity of embroidered vestments to Rome, for the use of the clergy†.

* See *Inventaire de l'Ancienne Bibliothèque due Louvre, fait en l'année 1373.* Paris, 1836, 8vo.

† The art of embroidery seems to have attained a higher degree of perfection in France, than any other country in Europe;—it is not, however, so much practised now. Embroiderers formerly composed a great portion of the working population of the largest towns; laws were specially framed for their protection, some of which would astonish the working people of the present day. They were formed into a company as early as 1272, by Etienne Boileau, Prévot de Paris, under their respective names of "Brodeurs, Decoupeurs, Egratigneurs, and Chasubiters."

In the last and preceding centuries, when embroidery, as an article of dress both for men and women, was an object of considerable importance, the Germans, and more particularly those of Vienna, disputed the palm of excellence with the French. At the same period, Milan and Venice were also celebrated for their embroidery; but the prices were so extravagantly high, that according to Lamarre, its use was forbidden by sumptuary laws.

CHAPTER V.

SILK AND GOLDEN TEXTURES OF THE ANCIENTS.

HIGH DEGREE OF EXCELLENCE ATTAINED IN THIS MANUFACTURE.

Manufacture of golden textures in the time of Moses—Homer—Golden tunics of the Lydians—Their use by the Indians and Arabians—Extraordinary display of scarlet robes, purple, striped with silver, golden textures, &c., by Darius, king of Persia—Purple and scarlet cloths interwoven with gold—Tunics and shawls variegated with gold—Purple garments with borders of gold—Golden chlamys—Attalus, king of Pergamus, *not* the inventor of gold thread—Bostick—Golden robe worn by Agrippina—Caligula and Heliogabalus—Sheets interwoven with gold used at the obsequies of Nero—Babylonian shawls intermixed with gold—Silk shawls interwoven with gold—Figured cloths of gold and Tyrean purple—Use of gold in the manufacture of shawls by the Greeks—4,000,000 sesterces (about \$150,000) paid by the Emperor Nero for a Babylonish coverlet—Portrait of Constantius II.—Magnificence of Babylonian carpets, mantles, &c.—Median sindones.

THE use of gold in *weaving* may be traced to the earliest times, but seems to be particularly characteristic of oriental manners.

It was employed in connexion with woollen and linen thread of the finest colors to enrich the ephod, girdle, and breast-plate of Aaron*. The sacred historian goes so far as to describe the

* “And they shall take gold, and blue, and purple, and scarlet, and fine linen. And they shall make the ephod of *gold, of blue, and of purple, of scarlet, and fine twined linen, with cunning work.* It shall have the two shoulder-pieces thereof joined at the two edges thereof; and so it shall be joined together. And the curious girdle of the ephod, which is upon it, shall be of the same, according to the work thereof; even of gold, of blue, and purple, and scarlet, and fine twined linen. And thou shalt take two onyx stones, and grave on them the names of the children of Israel: six of their names on one stone, and the other six names of the rest on the other stone, according to their birth. With the work of an engraver in stone, like the engravings of a signet shalt thou engrave the two stones with the names of the children of Israel: thou shalt make them to be set in ouches of gold. And thou shalt put the two stones upon the shoulders of the ephod for stones of memorial unto the children of Israel: and Aaron shall

mode of preparing the gold to be used in weaving: "And they did beat the gold into thin plates, and cut it into wires, to work it in the blue, and in the purple, and in the scarlet, and in the fine linen, with cunning work."—Ex. xxxix. 2-8. The historian certainly does not intend to describe the process of wire-drawing, nor probably the art of making gold thread. It seems likely, that neither of these ingenious manufactures were invented in his time. The queen described in Ps. xiv., wears "clothing of wrought gold*." Homer mentions "a golden girdle," (Od. ε. 232. κ. 543.). He also describes an upper garment, which Penelope made for Ulysses before going to Illium. On the front part of it a beautiful hunting piece was wrought in gold. It is thus described. "A dog holds a fawn with its fore feet, looking at it as it pants with fear and strives to make its escape." This, he says, was the subject of universal admiration†.

Pisander, who probably lived at the same period with Homer, speaks of the Lydians as wearing tunics adorned with gold. Lydus, who has preserved this expression of the ancient cyclic poet, observes that the Lydians were supplied with gold from the sands of the Pactolus and the Hermus‡.

Virgil also represents the use of gold in weaving, as if it had existed in Trojan times. One of the garments so adorned was made by Dido, the Sidonian, another by Andromache, and a third was in the possession of Anchises§. In all these instances the reference is to the habits of Phœnice, Lycia, or other parts of Asia.

Among all the Asiatics, none were more remarkable than

bear their names before the Lord upon his two shoulders for a memorial. And thou shalt make ouches of gold; and two chains of pure gold at the ends; of *wreathen work* shalt thou make them, and fasten the wreathen chains to the ouches. And thou shalt make the breast-plate of judgment with cunning work; after the work of the ephod shalt thou make it; of gold, of blue, and of purple, and of scarlet, and of fine twined linen shalt thou make it."—Ex. xxviii. 5-15.

* "The king's daughter is all glorious within: her clothing is of wrought gold."—Ps. xlv. 13.

† Od. τ. 225-235.

‡ De Magistratibus Rom. L. iii. § 64.

§ Æin. iii. 483.; iv. 264.; viii. 167.; xi. 75.

the Persians for the display of textures of gold, as well as every other kind of luxury in dress. A tiara interwoven with gold was one of the presents which Xerxes gave as an expression of his gratitude to the citizens of Abdera (*Herod.* viii. 120.). The Indians also employed the same kind of ornament (*Strabo*, L. xv. c. i. § 69.); and the *Periegesis* (l. 881.) of Priscian attributes the use of it to the Arabians*.

The history of Alexander the Great affords frequent traces of the use of cloth *interwoven with gold* in Persia. Garments made of such cloth were among the most splendid of the spoils of Persepolis.

Justin (L. xii.) says that Alexander, to avoid offending the Persians, ordered his principal attendants to adopt for their dress "longam vestem auream purpureamque." The dress prescribed was therefore of fine woollen cloth, or probably of silk, dyed purple, and *interwoven with gold*. Among the vast multitudes which preceded the King of Persia when he advanced to oppose Alexander, was the band of ten thousand called the Immortals, whose dress was carried to the 'ne plus ultra' of barbaric splendor, some wearing golden collars, others "cloth variegated with gold." Some idea of the extravagance and pomp of the Persians on this occasion may be formed from the following passage, taken from Rollin's "Ancient History."

"The order Darius observed in his march was as follows. Before the army were carried silver altars, on which burned the fire, called by them sacred and eternal; and these were followed by the magi, singing hymns, and 365 youths *in scarlet robes*. After these proceeded a consecrated car, drawn by white horses and followed by one of an extraordinary size, which they called "The horse of the sun." The equerries were dressed in white, each bearing in his hand a golden rod. Next appeared ten sumptuous chariots, enriched with curious sculptures in gold and silver; and then the vanguard of the horse, composed of twelve different nations, in various armor. This body was succeeded by those of the Persians, called "The Immortals," amounting to 10,000, who surpassed the rest of the barbarians in the extravagant richness and splendor of their dress; for they all wore *collars of gold*, and were clothed in robes of *gold tissue*, having large sleeves, garnished with precious stones. About thirty paces from them came the

* In Europe the nearest approach to oriental habits in regard to dress was made by the Gauls. Their principal men wore collars, armlets, and bracelets of gold, and clothes enriched with the same metal.—*Strabo*, L. iv. cap. 4. § 5.

† *Diod. Sic.* L. xvii. 70. p. 214. *Wessel.*

king's relations or cousins, to the number of 15,000, apparelled like women, and more remarkable for the pomp of their dress than the glitter of their arms; and after these Darius attended by his guards, seated on a chariot, as on a throne. The chariot was enriched, on both sides, with images of the gods in gold and silver; and from the middle of the yoke, which was covered with jewels, rose two statues, a cubit in height; the one representing War, the other Peace, having between them a golden eagle with wings extended. The king was attired in *a garment of purple striped with silver*; over which was a long robe, glittering with gold and precious stones, and whereon two falcons were represented as if rushing from the clouds at each other. Around his waist he wore a *golden girdle*, from whence hung scimitar, the scabbard of which was covered with gems. On each side of Darius walked 200 of his nearest relations, followed by 10,000 horsemen, whose lances were plated with silver, and tipped with gold. After these marched 30,000 foot, the rear of the army, and, lastly, 400 horses belonging to the king.

“About 100 paces from the royal divisions of the army came Sisymbria, the mother of Darius, seated on a chariot, and his consort on another, with female attendants of both queens riding on horseback. Afterwards came fifteen chariots, in which were the king's children, and their tutors. Next to these were the royal concubines, to the number of 360, all attired like so many queens. These were followed by 600 mules, and 300 camels, carrying the king's treasure, and guarded by a body of bowmen. After these came the wives of the crown officers, and the lords of the court; then the sutlers, servants; and, lastly, a body of light armed troops, with their commanders.”

At the nuptials of Alexander purple and scarlet cloths, *interwoven with gold*, were expanded over the guests: and a pall of the same description covered the golden sarcophagus made to contain his body. Among the splendid ornaments of the tent erected not long after at Alexandria by Ptolemy Philadelphus, there were tunics interwoven with gold: and in the procession on the same occasion, the colossal statues of Bacchus and his nurse Nysa were attired; the former in a shawl; the latter in a tunic variegated with gold. Probably we may refer to the same country and age the “golden tunic” mentioned in one of the Arundle marbles (No. xxii. 2.). Also the tent pitched by Arsace with hangings of gold and purple tissues, and the robe of similar materials worn by Arsace herself, as described by Heliodorus (*Æthiop.* vii.), relate to the customs of the same country.

Another of the successors of Alexander, viz. Demetrius Poliorcetes, wore purple garments with *borders of gold**.

* Plutarch, Demet. 41.

Themistius describes a portrait of one of the kings of Persia, who wore, together with the tiara and the collar or necklace, *a purple shawl interwoven with gold* (*Orat.* 24. p. 369. *ed.* Dindorf.).

During the periods to which the preceding evidence has allusion, it is not probable that cloth of gold was in use among the Greeks and Romans except to a very limited extent. Nevertheless it does not appear to have escaped the avidity for every species of excellence, which in early times distinguished the inhabitants of Magna Græcia. For, when Pythagoras became a teacher of wisdom and philosophy at Crotona, among other lessons of frugality he persuaded the matrons to put off their "golden garments" with other fashionable ornaments, and deposit them in the temple of Juno as offerings to the goddess*. In a passage attributed to Menander we meet with the mention of a "golden or purple chlamys" as a suitable offering to the gods†. Hedyllus of Samos, a writer of the same age, describes a woman of loose morals, by name Niconoe, as wearing a tunic striped with gold (*Brunck's Analecta*, i. 483.).

Attalus, king of Pergamus, is said by Pliny (L. viii. cap. 48.) to have invented the art of embroidering with gold thread‡. Nevertheless we have seen, that gold was thus used long before the time of Attalus. But there can be no doubt, that he established and maintained a great manufacture of these stuffs at Pergamus; thus contributing greatly to improve the art, and bring these cloths into more general use.

The next passage is from Dr. Bostock's translation of the 33rd Book, ch. xix. "Gold may be spun or woven like wool, without the latter being mixed with it. We are informed by Verrius, that Tarquinius Priscus rode in triumph in a tunic of gold; and we have seen Agrippina, the wife of the Emperor Claudius, when he exhibited the spectacle of a naval combat, sitting by him covered with a robe made *entirely* of *woven gold*. In what are called the Attalic stuffs, the gold is woven

* Justin, L. XX. c. 4.

† Menandri Reliquiæ, à Meineke, p. 306. Böckh, Gr. Trag. Principes, p. 157.

‡ See Appendix A.

with some other substance. This art was the invention of one of the kings of Asia."

In Book xxxv. c. 36. Pliny says that Zeuxis, to display his wealth at Olympia, caused his name to be woven *in gold* in the compartments of his outer garment.

Caligula once wore a tunic interwoven with gold. Heliogabalus was far more profuse in regard to this kind of splendor. White sheets, *interwoven with gold*, were used at the funeral obsequies of Nero*. We may here observe, that the use of gold in dress almost invariably accompanied that of silk. The same Emperors who took delight in the one, indulged themselves with the other also. On the contrary, Alexander Severus, as we shall show when treating of linen in Part IV., was economical in both these respects.

In Chapters II. and III., we quoted several passages which make mention of cloth of gold, from Tibullus, Ovid, Seneca the Tragedian, Lucan, Dio Cassius, Claudian, Virgil, Gregorius Nazienzenus, and Basil, all of which speak of cloth of gold. Ovid mentions purple garments variously colored and interwoven with gold, as belonging to Bacchus.—*Met.* iii. 556.

Publius Syrus was a writer of the same period. In the following fragment preserved by Petronius Arbitrator, he compares the train of the peacock to Babylonian stuffs enriched with gold and various colors :

Thy food the peacock, which displays his spotted train,
As shines a Babylonian shawl with feather'd gold !

Shawls, interwoven with gold, are mentioned by Galen†, and by Valerius Flaccus‡ ; also by Lucan in the following passage, where he is describing the furniture of Cleopatra's palace (x. 125, 126.):

Part shines with feather'd gold, part sheds a blaze
Of scarlet, *intermixed* by *Pharian looms* !

The following passages also contain evidence on the same subject.

* Suetonius, Nero, 50.

† Quoted in Chapter II.

‡ *Auro depicta chlamys*.

SENECA, THE PHILOSOPHER.

As yet figured cloths did not exist: gold was not woven, it was not even extracted from the ground.—*Epist.* 91.

LUCIAN

describes the tragic actors, when they performed the part of kings, as wearing a chlamys interwoven with gold*.

APULEIUS.

They carefully spread over the couches, cloths figured with gold and Tyrian purple.—*Met.*

PHILOSTRATUS

depicts Midas wearing a golden robe†.

NEMESIANUS.

In thy scarf's woof much sportive gold display.—*Cyneg.* 91.

The poet is addressing Diana and describing her attire.

AUSONIUS.

Weave flexile gold within thy shawls, O Greece‡.

This is the *first* passage since the time of Homer, which mentions Greece as concerned in weaving with gold. But Ausonius probably alluded to the Greeks of Asia Minor, as, besides the evidence produced from Basil, we have seen that Pergamus was one of the most noted places for these productions, which were on that account called “Attalicæ vestes§.”

* *Somnium*, vol. ii. p. 742. ed. Hemsterhusii.

† *Imag.* i. 22.

‡ Epigram 37.

§ “I find evidence that kings wore the *striped toga*; that figured cloths were in use even in the days of Homer; and that these gave rise to the *triumphal*. To produce this effect with the needle was the invention of the Phrygians, on which account cloths so embroidered have been called *Phrygionic*. In the same part of Asia king Attalus discovered the art of inserting a woof of gold (?); from which circumstance the *Attalic* cloths received their name (?). Babylon first obtained celebrity by its method of *diversifying the picture with different colors*, and gave its name to textures of this description. But to weave with a *great number of leashes*, so as to produce the cloths called *polymita* (the *polymita* were damask cloths), was *first* taught in Alexandria; to divide by squares (*plaids*) in

When Ausonius was appointed Consul at Rome A. D. 379, his friend and former pupil, the Emperor Gratian, sent him as a present a toga in which was inserted a figure of Constantius II., *wrought in gold*.—Ausonii Gratiarum Actio, § 53.

CLAUDIAN

mentions with delight the use of gold in dress as well as of silk. His testimony has been given in chapter III. of this Part.

SIDONIUS APOLLINARIS

mentions the gold in the dress of Prince Sigismer. His testimony is also given in chapter III.

CORIPPUS,

describing the accession of Justin II. to the Empire (A. D. 565), mentions (L. ii.) his tunic enriched with gold as part of his imperial costume.

PAULINUS.

Misceturque ostro mollitum in fila metellum.

De Vita Martini, L. iii.

We find the following law in the Codex Justinianus:

Nemo vir auratas in tunicis aut in lincis habeat paragaudas: nisi hi tantummodo, quibus hoc propter Imperiale ministerium concessum est.

Corpus Juris Civilis, tom. v. tit. viii. leg. 2.

The “aurata paragauda” was a border of gold lace or thread. It appears that ladies might wear it on their tunics, while men were only permitted to use it in token of their official character as being in the service of the emperor. In allusion to these or similar regulations, Ælius Lampridius (34) says of the emperor Alexander Severus,

Gaul. Metellus Scipio brought it as an accusation against Cato, that even in his time Babylonian *coverlets* for triclinia were sold for 800,000 sesterces (about \$30,000), although the emperor Nero lately gave for them no less than 4,000,000 sesterces (about \$150,000). The *prætexta* of Servius Tullius, covering the statue of Fortune which he dedicated, remained until the death of Sejanus, and it is wonderful that they had neither decayed of themselves nor been injured by moths during the space of 560 years.—*Plin. H. N.* viii. 64. (See Appendix A.)

Auratam vestem ministerium nullus vel in publico convivio habuit.

The testimony of Ambrose, Jerome, and Basil has been given in Chapter III., which see.

From the book of Joshua we learn that the woven stuffs of Babylon were not confined to domestic use, but exported into foreign countries. The two chief productions of Babylonian looms were *carpets* and *shawls*. One of the principal objects of luxury in Asia from the remotest ages, were nowhere so finely woven, and in such rich colors as at Babylon. On the Babylonian carpets were woven or depicted representations of those fabulous animals the dragon and griffin, together with other unnatural combinations of form, probably originating in India, and with which we have become acquainted by the ruins of Persepolis. It was by means of the Babylonian manufactures, that the knowledge of these fanciful and imaginary beings, was conveyed to the Western world, and from them transferred to the Greek vases. "A mantle of Shinar," or as our translators have rendered it, "A Babylonish garment," was secreted by Achan from the spoils of Jericho; and the delinquent speaks of this as being the most valuable part of his plunder*. Next to carpets and shawls, the Babylonian garments called *Sindones* were held in the highest estimation. The most costly *Sindones*, were so much valued for their fineness of texture and brilliancy of color, as to be compared to those of Media, and set apart for royal use; they were even to be found at the tomb of Cyrus, which was profusely decorated with every species of furniture in use among the Persian monarchs during their lives.

* "When I saw among the spoils a goodly Babylonish garment, and two hundred shekels of silver, and a wedge of gold of fifty shekels weight, then I coveted them, and took them, and behold, they are hid in the earth in the midst of my tent, and the silver under it."—Joshua vii. 21.



From a manuscript

EGYPTIAN LOOMS,
with the processes of Spinning and Winding.

CHAPTER VI.

SILVER TEXTURES, &c., OF THE ANCIENTS.

EXTREME BEAUTY OF THESE MANUFACTURES.

Magnificent dress worn by Herod Agrippa, mentioned in Acts xii. 21—Josephus's account of this dress, and dreadful death of Herod—Discovery of ancient Piece-goods—Beautiful manuscript of Theodolphus, Bishop of Orleans, who lived in the ninth century—Extraordinary beauty of Indian, Chinese, Egyptian, and other manufactured goods preserved in this manuscript—Egyptian arts—Wise regulations of the Egyptians in relation to the arts—Late discoveries in Egypt by the Prussian hierologist, Dr. Lepsius—Cloth of glass.

THE Evangelist Luke, in Acts xii. 21. speaks of the “royal apparel,” in which Herod Agrippa, king of Judea, was arrayed when he received the ambassadors of Tyre and Sidon, sitting in great state upon his throne at Cæsarea. “And upon a set day, Herod arrayed in royal apparel, sat upon his throne, and made an oration unto them. And the people gave a shout, saying, It is the voice of a god, and not of a man. And immediately the angel of the Lord smote him, because he gave not God the glory: and he was eaten of worms, and gave up the ghost.”

Josephus describes the same garment, which was a tunic, as “all made of *silver*, and wonderful in its texture.” He adds, that the king appeared in this dress at break of day in the theatre, and that the silver, illuminated by the first rays of the sun, glittered in such a manner as to terrify the beholders, so that his flatterers began to call out aloud, saluting him as a god. *He was then seized with the painful and loathsome distemper, of which he soon after died*.*

We extract the following curious account of the discovery of Ancient Piece-goods and manufactured stuffs from a late

* *Ant. Jud.* L. xix. cap. 8. § 2. p. 871. *Hudson.*

number of an English publication called the "Mining Review."

Discovery of ancient Piece-goods and manufactured stuffs.—
"It is more than a thousand years since Theodolphus, Bishop of Orleans, gave to Notre Dame du Puy en Velay a beautiful manuscript, containing the ancient Testament, the chronography of St. Isidor, and other pieces, the whole distributed into 138 articles; which he presented in token of gratitude for his deliverance from the prison of Angers, where he was confined in the year 835. It was on Palm Sunday that year, while Louis Le Debonnaire was passing, that he began to sing a well-known Canticle, which the Catholic church *has since then* introduced into its ceremonies. This precious manuscript, in a state of perfect preservation, is to be seen in the archives of the Bishopric of the Puy en Velay, department of the Haute Loire. A portion of the manuscript is written on leaves of common parchment, in letters of red and black, with a few of gold intermixed. The other portion is inscribed on leaves of parchment, dyed purple, with *letters of gold and silver*, among which are observed, ornaments of different kinds and colors, designated the "*Byzantine style*." The manuscript, remarkable for its beauty and preservation, is still more valuable for the manufactured stuffs which it contains. When Theodolphus composed his manuscript, with the intention of preserving from contact and friction the gold and silver characters (which, in time, would have tended to displace and obliterate them), he placed between each page a portion of the manufactured tissues peculiar to the era in which he lived. These specimens of the silk, and other pieces of goods of the time are thus curiously preserved*. Till lately, little attention was paid to these tissues, which are principally of India manufacture, bearing scarcely *any analogy* to the products of the *modern loom*. Some are CASHMERE SHAWLS of those patterns, which the French call *broucha* and *espouline*, and are

* A shred of gold cloth is preserved in the Museum of Antiquities at Leyden, which is supposed to have been discovered in one of the ancient tombs at Tarquinia in Etruria. In this tissue the gold forms a compact covering over bright yellow silk.

made in the Indian fashion, but with this difference, that they are limited to *four* colors, and demonstrate the greatest antiquity by the primitive simplicity of their colors and design. Others are CRAPES and GAUZES, against the luxury of whose transparent tissues, the fathers of the church at that time so perseveringly fulminated their censures. The rest consist of *muslins* and *China-crape of exquisite beauty*. The components of the majority of these tissues are of goats' or camels' hair of exceeding delicacy and fineness. Like the manufactured stuffs of ancient Egypt, painted on the walls of its palaces and tombs, or substantially preserved amidst the envelopes of mummies, the designs are limited to four colors, which are in fact the *four sacred ones of China, India, Egypt, and the Hebrew Tabernacle*. Nevertheless, the Egyptian designs, *identical with those of India*, are many of them of exquisite beauty. The consummate skill of the silk and cotton manufacturers of ancient Egypt, 4000 years ago, *the beauty and richness of their fabrics*—the little alteration which has taken place in the economy or machinery of the factories, as well as in their product, has been recently demonstrated in the great work of Champollion. All the details of the silk and cotton factories of Egypt, under the Pharaohs of the 18th dynasty (which then monopolized the commerce of the world, and sent a colony of weavers, from the overburdened population of Lower Egypt, to found Athens, and the subsequent civilization of Europe), are laid open with vivid accuracy in that splendid work*, and brought with all their startling analogies before the eye of the modern reader by drawings from the temples, palaces, and tombs which it contains. It proves, indeed, that there is "*nothing new under the sun.*"

That the Egyptians excelled in science and art is evident from their monuments, paintings, and sculptures, whereon they are depicted. It is also proved by Scripture, which speaks of the "wisdom of Egypt" with reference to art; and from the fact that Egypt was deemed by other nations the fountain of arts and sciences, and that their philosophers were wont to re-

* See Plate II.

sort thither to collect some of the "droppings of Egyptian wisdom." According to Diodorus, all trades vied with each other in improving their own particular branch, no pains being spared to bring each to perfection. To promote the more effectually this object, it was enacted that no artisan should follow any trade or employment but that defined by law, and *pursued by his ancestors*. No tradesman was permitted to meddle with political affairs, or hold any civil office in the state, *lest his thoughts should be distracted by the inconsistency of his pursuits*, or the jealousy and displeasure of the master in whose service he was employed. They foresaw that without such a law constant interruptions would take place, in consequence of the necessity or desire of becoming conspicuous in a public station; that their proper occupations would be neglected, and many would be led by *vanity* and *self-sufficiency* to interfere in matters which were out of their sphere. They considered, moreover, that to pursue more than one avocation would be detrimental to their own interests, and those of the community at large; and that, when men, from a motive of avarice, engage in numerous branches of art, the general result is, that they are unable to excel in any. If any artisan interfered in political matters, or engaged in any employment other than the one to which he had been brought up, a severe punishment was immediately inflicted upon him.

The eminent German hierologist, Dr. Lepsius, now employed in Egypt by the Prussian government, after mentioning, in a recent letter, the many discoveries he had made of ancient ruins, tombs, &c., writes as follows:

"With the exception of about twelve, which belong to a later period, all these tombs were erected contemporaneously with, or soon after, the building of the great pyramid, and consequently their dates throw an invaluable light on the study of human civilization in the most remote period of antiquity.—The *sculptures* in relief are surprisingly numerous, representing whole figures, some the size of life, and others of various dimensions. The *paintings* are on back grounds of the finest chalk. They are numerous and beautiful beyond conception—as *fresh and perfect as if finished yesterday!* The pictures and sculp-

tures on the walls of the tombs, represent, for the most part, scenes in the lives of the deceased persons, whose wealth in cattle, fish-boats, servants, &c., is ostentatiously displayed before the eye of the spectator. All this gives an insight into the details of private life among the ancient Egyptians. By the help of these inscriptions I think I could, without difficulty, make a "Court Calendar" of the reign of King Cheops*. In some instances I have traced the graves of father, son, grandson, and even great-grandson—all that now remains of the distinguished families, which five thousand years ago, formed the nobility of the land."

* We do not find in these researches, that the ancients were acquainted with the arts of spinning and weaving glass, or of giving it any required shade of color. This invention, therefore, must be considered as belonging to the nineteenth century, and the honor of the discovery is due to M. Dubus Bonnel, an ingenious Frenchman, a native of Lille, and for which he obtained patents in Great Britain, and various countries of the European continent in 1837.

"When we figure to ourselves an apartment decorated with cloth of glass, and resplendent with lights, we must be convinced that it will equal in brilliancy all that the imagination can conceive; and realise, in a word, the wonders of the enchanted palaces mentioned in the Arabian tales. The lights flashing from the polished surface of the glass, to which any color or shade may be given, will make the room have the appearance of an apartment composed of pearls, mother-of-pearl, diamonds, garnets, sapphires, topazes, rubies, emeralds, or amethysts, &c., or, in short, of all those precious stones united and combined in a thousand ways, and formed into stars, rosettes, boquets, garlands, festoons, and graceful undulations, varied almost ad infinitum."—*L'Echo du Monde Savant*, &c. No. 58, Feb. 15, 1837.—*Translated from the French.*

The warp is composed of silk, forming the body and groundwork on which the pattern in glass appears, as effected by the weft. The requisite flexibility of glass thread for manufacturing purposes is to be ascribed to its extreme fineness; as not less than from fifty to sixty of the original threads (spun by steam engine power) are required to form one thread of the weft. The process is slow; for no more than a yard of cloth can be produced in twelve hours. The work, however, is extremely beautiful and comparatively cheap, inasmuch as no similar stuff, where bullion is really introduced, can be purchased for anything like the price for which this is sold; added to this, it is, as far as the glass is concerned, imperishable. Glass is more durable than either gold or silver, and, besides, possesses the advantage of never tarnishing.

CHAPTER VII.

DESCRIPTION OF THE SILK-WORM, &c.

Preliminary observations—The silk-worm—Various changes of the silk-worm—Its superiority above other worms—Beautiful verses on the May-fly, illustrative of the shortness of human life—Transformations of the silk-worm—Its small desire of locomotion—First sickness of the worm—Manner of casting its *Exuvie*—Sometimes cannot be fully accomplished—Consequent death of the insect—Second, third, and fourth sickness of the worm—Its disgust for food—Material of which silk is formed—Mode of its secretion—Manner of unwinding the filaments—Floss-silk—Cocoon—Its imperviousness to moisture—Effect of the filaments breaking during the formation of the cocoon—Mr. Robinet's curious calculation on the movements made by a silk-worm in the formation of a cocoon—Cowper's beautiful lines on the silk-worm—Periods in which its various progressions are effected in different climates—Effects of sudden transitions from heat to cold—The worm's appetite sharpened by increased temperature—Shortens its existence—Various experiments in artificial heating—Modes of artificial heating—Singular estimate of Count Dandolo—Astonishing increase of the worm—Its brief existence in the moth state—Formation of silk—The silken filament formed in the worm before its expulsion—Erroneous opinions entertained by writers on this subject—The silk-worm's Will.

It can never be too strongly impressed upon a mind anxious for the acquisition of knowledge, that the commonest things by which we are surrounded are deserving of minute and careful attention. The most profound investigations of Philosophy are necessarily connected with the ordinary circumstances of our being, and of the world in which our every-day life is spent. With regard to our own existence, the pulsation of the heart, the act of respiration, the voluntary movement of our limbs, the condition of sleep, are among the most ordinary operations of our nature; and yet how long were the wisest of men struggling with dark and bewildering speculations before they could offer anything like a satisfactory solution of these phenomena, and how far are we still from an accurate and complete knowledge of them! The science of Meteorology, which attempts to explain to us the philosophy of matters constantly before our eyes, as dew, mist, and rain, is dependent for its illustrations upon a knowledge of the most complicated facts, such as the

influence of heat and electricity upon the air ; and this knowledge is at present so imperfect, that even these common occurrences of the weather, which men have been observing and reasoning upon for ages, are by no means satisfactorily explained, or reduced to the precision that every science should aspire to. Yet, however difficult it may be entirely to comprehend the phenomena we daily witness, everything in nature is full of instruction. Thus the humblest flower of the field, although, to one whose curiosity has not been excited, and whose understanding has, therefore, remained uninformed, it may appear worthless and contemptible, is valuable to the botanist, not only with regard to its place in the arrangement of this portion of the Creator's works, but as it leads his mind forward to the consideration of those beautiful provisions for the support of vegetable life, which it is the part of the physiologist to study and admire*.

This train of reasoning is peculiarly applicable to the economy of insects. They constitute a very large and interesting part of the animal kingdom. They are everywhere about us. The *spider* weaves his curious web in our houses ; the *caterpillar* constructs his silken cell in our gardens ; the *wasp* that hovers over our food has a nest not far removed from us, which she has assisted to build with the nicest art ; the *beetle* that crawls across our path is also an ingenious and laborious mechanic, and has some curious instincts to exhibit to those who will feel an interest in watching his movements ; and the *moth* that eats into our clothes has something to plead for our pity, for he came, like us, naked into the world, and he has destroyed our garments, not in malice or wantonness, but that he may clothe himself with the same wool which we have stripped from the sheep. An observation of the habits of these little creatures is full of valuable lessons, which the abundance of the examples has no tendency to diminish. The more such observations are multiplied, the more we are led forward to the freshest and the most delightful parts of knowledge ; the more do

* "Insect Architecture," vol. i. p. 9. London : Charles Knight & Co., Ludgate St. 1845.

we learn to estimate rightly the extraordinary provisions and most abundant resources of a creative Providence ; and the better do we appreciate our own relations with all the infinite varieties of Nature, and our dependence, in common with the *ephemeron* that flutters its little hour in the summer sun, upon that Being in whose scheme of existence the humblest as well as the highest creature has its destined purposes. "If you speak of a *stone*," says St. Basil, "if you speak of a *fly*, a *gnat*, or a *bee*, your conversation will be a sort of demonstration of his power whose hand formed them, for the wisdom of the workman is commonly perceived in that which is of little size. He who has stretched out the Heavens, and dug up the bottom of the sea, is also He who has pierced a passage through the sting of the bee for the ejection of its poison."

If it be granted that making discoveries is one of the most satisfactory of human pleasures, then we may without hesitation affirm, that the study of insects is one of the most delightful branches of natural history, for it affords peculiar facilities for its pursuit. These facilities are found in the almost inexhaustible variety which insects present to the curious observer.

There is, perhaps, no situation in which the lover of nature and the observer of animal life may not find opportunities for increasing his store of facts. It is told of a state prisoner under a cruel and rigorous despotism, that when he was excluded from all commerce with mankind, and was shut out from books, he took an interest and found consolation in the visits of a *spider* ; and there is no improbability in the story. The operations of that persecuted creature are among the most extraordinary exhibitions of mechanical ingenuity ; and a daily watching of the workings of its instinct would beget admiration in a rightly constituted mind. The poor prisoner had abundant leisure for the speculations in which the spider's web would enchain his understanding. We have all of us, at one period or other of our lives, been struck with some singular evidence of contrivance in the economy of insects, which we have seen with our own eyes. Want of leisure, and probably want of knowledge, have prevented us from following up the curiosity which for a moment was excited. And yet some such

accident has made men Naturalists, in the highest meaning of the term. Bonnet, evidently speaking of himself, says, "I knew a naturalist, who, when he was seventeen years of age, having heard of the operations of the ant-lion, began by doubting them. He had no rest till he had examined into them ; and he verified them, he admired them, he discovered new facts, and soon became the disciple and the friend of the Pliny of France*" (Reamur). It is not the happy fortune of many to be able to devote themselves exclusively to the study of nature, unquestionably the most fascinating of human employments ; but almost every one may acquire sufficient knowledge to be able to derive a high gratification from beholding the more common operations of animal life. His materials for contemplation are always before him.

The silk-worm is a species of caterpillar which, like all other insects of the same class, undergoes a variety of changes during the short period of its life ; assuming, in each of three successive transformations, *a form wholly dissimilar to that with which it was previously invested.*

Among the great variety of caterpillars, the descriptions of which are to be found in the records of natural history, the silk-worm occupies a place far above the rest. Not only is our attention called to the examination of its various transformations, by the desire of satisfying our curiosity as entomologists, but our artificial wants incite us likewise to the study of its nature and habits, that we may best and most profitably apply its instinctive industry to our own advantage.

It has been well observed by Pulein, a writer on this subject, that "there is scarcely anything among the various wonders which the animal creation affords, more admirable than the variety of changes which the silk-worm undergoes ;" but the curious texture of that silken covering with which it surrounds itself when it arrives at the perfection of its animal life, vastly surpasses what is made by other animals of this class. All the caterpillar kind do, indeed, pass through changes like those of the silk-worm, and the beauty of many in their butterfly state

* Contemplation de la Nature, part ii. ch. 42.

greatly exceeds it; but the covering which they put on before this mutation is poor and mean, when compared to that golden tissue in which the silk-worm wraps itself. They, indeed, come forth in a variety of colors, their wings bedropped with gold and scarlet, yet are they but the beings of a summer's day; both their life and beauty quickly vanish, and they leave no remembrance after them; but the silk-worm leaves behind it such beautiful, such beneficial monuments, as at once to record both the wisdom of their Creator and his bounty to man."

We may without impropriety, here introduce the following truly beautiful comparison of the shortness of human life, as well as in illustration of this part of our subject, as evidenced in the May-fly.

"The angler's May-fly, the most short-lived in its perfect state of any of the insect race, emerges from the water, where it passes its *aurelia* state, about six in the evening, and dies about eleven at night."—WHITE'S *Selborne*.

The sun of the eve was warm and bright
 When the May-fly burst his shell,
 And he wanton'd awhile in that fair light
 O'er the river's gentle swell;
 And the deepening tints of the crimson sky
 Still gleam'd on the wing of the glad May-fly.

The colors of sunset pass'd away,
 The crimson and yellow green,
 And the evening-star's first twinkling ray
 In the waveless stream was seen;
 Till the deep repose of the stillest night
 Was hushing about his giddy flight.

The noon of the night is nearly come—
 There's a crescent in the sky;—
 The silence still hears the myriad hum
 Of the insect revelry.
 The hum has ceas'd—the quiet wave
 Is now the sportive Mayfly's grave.

Oh! thine was a blessed lot—to spring
 In thy lustihood to air,
 And sail about, on untiring wing,
 Through a world most rich and fair,
 To drop at once in thy watery bed,
 Like a leaf that the willow branch has shed.

And who shall say that his thread of years
 Is a life more blest than thine !
 Has his feverish dream of doubts and fears
 Such joys as those which shine
 In the constant pleasures of thy way,
 Most happy child of the happy May ?

For thou wert born when the earth was clad
 With her robe of buds and flowers,
 And didst float about with a soul as glad
 As a bird in the sunny showers ;
 And the hour of thy death had a sweet repose,
 Like a melody, sweetest at its close.

Nor too brief the date of thy cheerful race—
 'Tis its use that measures time—
 And the mighty Spirit that fills all space
 With His life and His will sublime,
 May see that the May-fly and the Man
 Each flutter out the same small span ;

And the fly that is born with the sinking sun,
 To die ere the midnight hour,
 May have deeper joy, ere his course be run,
 Than man in his pride and power ;
 And the insect's minutes be spared the fears
 And the anxious doubts of our threescore years.

The years and the minutes are as one—
 The fly drops in his twilight mirth,
 And the man, when his long day's work is done,
 Crawls to the self-same earth.
 Great Father of each ! may *our* mortal day
 Be the prelude to an endless May* !

* "See," exclaims Linnæus, "the large, elegant painted wings of the butterfly, four in number, covered with delicate feathery scales ! With these it sustains itself in the air a whole day, rivalling the flight of birds and the brilliancy of the peacock. Consider this insect through the wonderful progress of its life,—how different is the first period of its being from the second, and both from the parent insect ! Its changes are an inexplicable enigma to us: we see a green caterpillar, furnished with sixteen feet, feeding upon the leaves of a plant ; this is changed into a chrysalis, smooth, of golden lustre, hanging suspended to a fixed point, without feet, and subsisting without food ; this insect again undergoes another transformation, acquires wings, and six feet, and becomes a gay butterfly, sporting in the air, and living by suction upon the honey of plants. What has Nature

Silk-worms proceed from eggs which are deposited during the summer by a grayish kind of moth, of the genus *palæna*. These eggs are about equal in size to a grain of mustard seed: their color when first laid is yellow; but in three or four days after, they acquire a bluish cast. In temperate climates, and by using proper precautions, these eggs may be preserved during the winter and spring, without risk of premature hatching. The period of their animation may be accelerated or retarded by artificial means, so as to agree with the time when the natural food of the insect shall appear in ample abundance for its support.

All the curious changes and labors which accompany and characterize the life of the silk-worm are performed within the space of a very few weeks. This period varies, indeed, according to the climate or temperature in which its life is passed; all its vital functions being quickened, and their duration proportionally abridged, by warmth. With this sole variance, its progressions are alike in all climates, and the same mutations accompany its course.

The three successive states of being put on by this insect are, that of the worm or caterpillar, of the chrysalis or aurelia, and moth. In addition to these more decided transformations, the progress of the silk-worm in its *caterpillar state* is marked by *five distinct stages of being*.

When first hatched, it appears as a small black worm about

produced more worthy of our admiration than such an animal coming upon the stage of the world, and playing its part there under so many different masks?" The ancients were so struck with the transformations of the butterfly, and its revival from a seeming temporary death, as to have considered it an emblem of the soul, the Greek word *psyche* signifying both the soul and a butterfly; and it is for this reason that we find the butterfly introduced into their allegorical sculptures as an emblem of immortality. Trifling, therefore, and perhaps contemptible, as to the unthinking may seem the study of a butterfly, yet when we consider the art and mechanism displayed in so minute a structure,—the fluids circulating in vessels so small as almost to escape the sight—the beauty of the wings and covering—and the manner in which each part is adapted for its peculiar functions,—we cannot but be struck with wonder and admiration, and allow, with Paley, that "the production of beauty was as much in the Creator's mind in painting a butterfly as in giving symmetry to the human form."

a quarter of an inch in length. Its first indication of animation is the desire which it evinces for obtaining food, in search of which, if not immediately supplied, it will exhibit more power of locomotion than characterizes it at any other period. So small is the desire of change on the part of these insects, that of the generality it may be said, their own spontaneous will seldom leads them to travel over a greater space than three feet throughout the whole duration of their lives. Even when hungry, the worm still clings to the skeleton of the leaf from which its nourishment was last derived. If, by the continued cravings of its appetite, it should be at length incited to the effort necessary for changing its position, it will sometimes wander as far as the edge of the tray wherein it is confined, and some few have been found sufficiently adventurous to cling to its rim; but the smell of fresh leaves will instantly allure them back. It would add incalculably to the labors and cares of their attendants, if silk-worms were endowed with a more rambling disposition. So useful is this peculiarity of their nature, that one is irresistibly tempted to consider it the result of design, and a part of that beautiful system of the fitness of things, which the student of natural history has so many opportunities of contemplating with delight and admiration.

In about eight days from its being hatched, its head becomes perceptibly larger, and the worm is attacked by its first sickness. This lasts for three days; during which time it refuses food, and remains motionless as in a kind of lethargy. Some have thought this to be sleep, but the fatal termination which so frequently attends these sicknesses seems to afford a denial to this hypothesis. The silk-worm increases its size so considerably, and in so short a space of time,—its weight being multiplied many thousand fold in the course of one month,—that if only one skin had been assigned to it, which should serve for its whole caterpillar state, it would with difficulty have distended itself sufficiently to keep pace with the insect's growth. The economy of nature has therefore admirably provided the embryos of other skins, destined to be successively called into use; and this sickness of the worm, and its disinclination for food,

may very probably be occasioned by the pressure of the skin, now become too small for the body which it encases.

At the end of the third day from its first refusal of food, the animal appears, on that account, much wasted in its bodily frame; a circumstance which materially assists in the painful operation of casting its skin: this it now proceeds to accomplish. To facilitate this moulting, a sort of humor is thrown off by the worm, which, spreading between its body and the skin about to be abandoned, lubricates their surfaces, and causes them to separate the more readily. The insect also emits from its body silken traces, which, adhering to the spot where it rests, serves to confine the skin to its then existing position. These preliminary steps seem to call for some considerable exertion, as after them the worm remains quiet for a short space of time, to recover from its fatigue. It then proceeds, by rubbing its head among the leafy fibres surrounding it, to disencumber itself of the scaly covering. Its next effort is to break through the skin nearest to the head, which, as it is there the smallest, calls for the greatest exertion; and no sooner is this accomplished and the two front legs are disengaged, than the remainder of the body is quickly drawn forth, the skin being still fastened to the spot in the manner already described.

This moulting is so complete, *that not only is the whole covering of the body cast off, but that of the feet, the entire skull, and even the jaws, including the teeth.* These several parts may be discerned by the unassisted eye; but become very apparent when viewed through a magnifying lens of moderate power.

In two or three minutes from the beginning of its efforts the worm is wholly freed, and again puts on the appearance of health and vigor; feeding with recruited appetite upon its leafy banquet. It sometimes happens that the outer skin refuses to detach itself wholly, but breaks and leaves an annular portion adhering to the extremity of its body, from which all the struggles of the insect cannot wholly disengage it. The pressure thus occasioned induces swelling and inflammation in other parts of the body; and, after efforts of greater or less duration, death generally terminates its sufferings.

Worms newly freed from their exuviae are easily distinguished from others by the pale color and wrinkled appearance of their new skin. This latter quality, however, soon disappears, through the repletion and growth of the insect, which continues to feed during five days. At this time its length will be increased to half an inch ; when it is attacked by a second sickness, followed by a second moulting, the manner of performing which is exactly similar to the former. Its appetite then again returns, and is indulged during other five days, in the course of which time its length increases to three quarters of an inch : it then undergoes its third sickness and moulting. These being past in all respects like the former, and five more days of feeding having followed, it is seized by its fourth sickness, and casts its skin for the last time in the caterpillar state. The worm is now about one and a half or two inches long. This last change being finished, the worm devours its food most voraciously, and increases rapidly in size during ten days.

The silk-worm has now attained to its full growth, and is a slender caterpillar from two and a half to three inches in length (See Figure 1. Plate III.). The peculiarities of its structure may be better examined now than in its earlier stages. It can readily be seen that the worm has twelve membranous rings round its body, parallel to each other ; and which, answering to the movements of the animal, mutually contract and elongate. It has sixteen legs, in pairs : six in front, which are covered with a sort of shell or scale, and are placed under the three first rings, and cannot be either sensibly lengthened, or their position altered. The other ten legs are called holders : these are membranous, flexible, and attached to the body under the rings, being furnished with little hooks, which assist the insect in climbing. The skull is inclosed in a scaly substance, similar to the covering of the first six legs. The jaws are indented or serrated like the teeth of a saw, and their strength is great considering the size of the insect. Its mouth is peculiar, having a vertical instead of an horizontal aperture ; and the worm is furnished with eighteen breathing holes, placed at equal distances down the body, nine on each side. Each of these holes is supposed to be the termination of a particular organ of respiration.

On either side of the head, near to the mouth, seven small eyes may be discerned. The two broad appearances higher upon the head, which are frequently mistaken for eyes, are bones of the skull. The two apertures through which the worm draws its silken filament are placed just beneath the jaw, and close to each other; these being exceedingly minute.

At the period above-mentioned the desire of the worm for food begins to abate: the first symptom of this is the appearance of the leaves nibbled into small portions and wasted. It soon after entirely ceases even to touch the leaves; appears restless and uneasy; erects its head; and moves about from side to side, with a circular motion, in quest of a place wherein it can commence its labor of spinning. Its color is now light green, with some mixture of a darker hue. In twenty-four hours from the time of its abstaining from food, the material for forming its silk will be digested in its reservoirs; its green color will disappear; its body will have acquired a degree of glossiness, and have become partially transparent towards its neck. Before the worm is quite prepared to spin, its body will have acquired greater firmness, and be in a trifling measure lessened in size.

“The substance,” says Mr. Porter, “of which the silk is composed, *is secreted in the form of a fine yellow transparent gum in two separate vessels of slender dimensions, wound, as it were, on two spindles in the stomach; and if unfolded, these vessels would be about ten inches in length*.” This statement is proved to be erroneous, as the reader will perceive, at the conclusion of this chapter.

When the worm has fixed upon some angle, or hollow place, whose dimensions agree with the size of its intended silken ball or cocoon, it begins its labor by throwing forth thin and irregular threads, see Figure 2. Plate III., which are intended to support its future dwelling.

During the first day, the insect forms upon these a loose structure of an oval shape, which is called floss silk, and within which covering, in the three following days, it forms the firm

* Porter's "Treatise on the Silk Manufacture," p. 111.

and consistent yellow ball; the laborer, of course, always remaining on the inside of the sphere which it is forming*.

The silken filament, which when drawn out appears to be one thread, is composed of two fibres, unwound through the two orifices before described; and these fibres are brought together by means of two hooks, placed within the silk-worm's mouth for the purpose. The worm rests on its lower extremity throughout the unwinding operation, and employs its mouth and front legs in the task of directing and uniting the two filaments. The filament is not wound in regular concentric circles round the interior surface of the ball, but in spots, going backwards and forwards with a sort of wavy motion. This apparently irregular manner of proceeding is plainly perceptible when the silk is being reeled off the ball; which does not make more than one or two entire revolutions while ten or twelve yards of silk are being transferred to the reel†.

At the end of the third or fourth day, the worm will have completed its task; and we have then a *silk cocoon* (See Figure 3. plate III.), with the worm imprisoned in its centre; the

* If at this time any of the threads intended for the support of the cocoon should be broken, the worm will find, in the progress of its work, that the ball, not being properly poised, becomes unsteady, so that the insect is unable properly to go forward with its labors. Under these circumstances the worm pierces and altogether quits the unfinished cocoon, and throws out its remaining threads at random wherever it passes; by which means the silk is wholly lost, and the worm, finding no place wherein to prepare for its change, dies without having effected it. It may sometimes happen, but such a thing is of unfrequent occurrence, that the preparatory threads before mentioned are broken by another worm working in the neighborhood, when the same unsatisfactory result will be experienced.—*Obs. on the Culture of Silk*, by A. STEPHENSON.

† Mr. Robinet, of Paris, made the following curious calculation on the movements a silk-worm must make in forming a cocoon supposed to contain a thread of 1500 metres. It is known, says Mr. Robinet, that the silk-worm, in forming his cocoon, does not *spin* the silken filament in concentric circles round the interior surface of the ball, but in a zigzag manner. This it effects by the motions of its head. Now if each one of these motions gives half a centimetre of the silken filament; it follows that the worm must make 300,000 motions of its head to form it; and if the labor requires 72 hours in the performance, the creature makes 100,000 motions every 24 hours, 4,166 per hour, 69 per minute, and a little more than one in a second!

cocoon being from an inch to an inch and a half long, and of a yellow or orange color.

When the insect has finished its labor of unwinding, it smears the entire internal surface of the cocoon with a peculiar kind of gum, very similar in its nature to the matter which forms the silk itself; and this is no doubt designed as a shield against rain or the humidity of the atmosphere, for the chrysalis in its natural state; when of course it would be subject to all varieties of weather. The silken filament of which the ball is made up, is likewise accompanied, throughout its entire length, by a portion of gum, which serves to give firmness and consistency to its texture; and assists in rendering the dwelling of the chrysalis impervious to moisture. This office it performs so well, that when, for the purpose of reeling the silk with greater facility, the balls are thrown into basins of hot water, they swim on the top with all the buoyancy of bladders; nor, unless the ball be imperfectly formed, does the water penetrate within until the silk is nearly all unwound. In figure 4, plate III., the cocoons are drawn two-thirds of the usual size, and are shown with part of the outward floss silk removed.

The continual emission of the silken material during the formation of its envelope, together with its natural evaporation, uncompensated by food, causes the worm gradually to contract in bulk; it becomes wrinkled, and the rings of its body approach nearer to each other and appear more decidedly marked. When the ball is finished, the insect rests awhile from its toil, and then throws off its caterpillar garb. If the cocoon be now opened, its inhabitant will appear in the form of a chrysalis or aurelia, in shape somewhat resembling a kidney-bean (See Figure 5, plate III.), but pointed at one end, having a smooth brown skin. Its former covering, so dissimilar to the one now assumed, will be found lying beside it.

The account which has been given of the progressions of the silk-worm shows, that, in its various modifications, *the animal organization of the insect has been always tending towards its simplification.* Count Dandolo, writing upon this subject, observes, "Thus the caterpillar is in the first instance composed

of animal, silky, and excremental particles ; this forms the state of the *growing caterpillar* : in the next stage it is composed of animal and silky particles ; it is then the *mature caterpillar* : and lastly, it is reduced to the animal particles alone ; and is termed in this state the *chrysalis*. The poet Cowper, in the following lines, beautifully illustrates this subject :

The beams of April, ere it goes,
 A worm, scarce visible, disclose ;
 All winter long content to dwell
 The tenant of his native shell.
 The same prolific season gives
 The sustenance by which he lives,
 The mulberry leaf, a simple store,
 That serves him—till he needs no more !
 For, his dimensions once complete,
 Thenceforth none ever sees him eat ;
 Though till his growing time be past
 Scarce ever is he seen to fast.
 That hour arrived, his work begins.
 He spins and weaves, and weaves and spins ;
 Till circle upon circle, wound
 Careless around him and around,
 Conceals him with a veil though slight,
 Impervious to the keenest sight.
 Thus self-inclosed, as in a cask,
 At length he finishes his task :
 And, though a worm when he was lost,
 Or caterpillar at the most,
 When next we see him, wings he wears,
 And in papilio pomp appears ;
 Becomes oviparous ; supplies
 With future worms and future flies
 The next ensuing year—and dies !
 Well were it for the world if all
 Who creep about this earthly ball,
 Though shorter-lived than most he be,
 Were useful in their kind as he.

It has been already noticed that the progressions of the insects are accelerated by an increase of temperature ; and some variation will equally be experienced where different modes of treatment are followed ; and, in particular, where different periods of the year are chosen in which to produce and rear the worm. Malpighius, in his “Anatomy of the Silk-worm,” says,

that worms which he hatched in May were eleven days old ere they were attacked by their first sickness; others hatched in July were ten days, and those brought forth in August nine days, before they refused their food, preparatory to their first moulting. Eight days appear to be the most usual term for their first attack; and by his judicious treatment Count Dandolo shortened even this term by two days. In Europe, except where recourse is had to artificial aid, the term of the caterpillar state is usually that which has been already mentioned.

Sudden transitions from cold to heat, or vice versa, are highly injurious to the silk-worm; but it can bear a very high degree of heat, if uniformly maintained, without sustaining injury. Count Dandolo observed, that "the greater the degree of heat in which it is reared, the more acute are its wants, the more rapid its pleasures, and the shorter its existence." Monsieur Boissier de Sauvagues made many experiments on this point. One year, when by the early appearance of the mulberry leaves, which were developed by the end of April, he was forced to hurry forward the operations of his filature, he raised the heat of the apartment in which the newly-hatched worms were placed to 100° ; gradually diminishing this during their first and second ages to 95° . In consequence of the animal excitement thus induced, there elapsed only nine days between the hatching and the second moulting inclusively. It was the general opinion of those cultivators who witnessed the experiment, that the insects would not be able to exist in so intensely heated an atmosphere. The walls of the apartment, and the wicker hurdles on which the worms were placed, could scarcely be touched from the great heat, and yet all the changes and progressions went forward perfectly well, and a most abundant crop of silk was the result.

The same gentleman, on a subsequent occasion, exposed his brood to the temperature of 93° to 95° during their first age; of 89° to 91° in the second age; and remarked that the attendant circumstances were the same as in his former experiment, the changes of the worm being performed in the same space of time; whence he came to the conclusion, that it is not practicable to accelerate their progress beyond a certain point

by any superadditions of heat. In both of these experiments the quantity of food consumed, was as great as is usually given during the longer period employed in the common manner of rearing. After the second moulting had taken place in the last experiment, the temperature was lowered to 82° ; and it is remarkable that the worms occupied only five days in completing their third and fourth changes, although others which had been accustomed to this lower degree from their birth occupied seven or eight days for each of these moultings. It would therefore seem that the constitution of the insects can be affected, and an impetus given to their functions at the period of their first animation, which accompanies them through their after stages. So far from this forcing system proving injurious to the health of silk-worms, M. de Sauvagues found that his broods were unusually healthy; and that while the labors of cultivation were abridged in their duration, much of the attendant anxiety was removed.

Like other caterpillars, the silk-worm is not a warm-blooded animal, and its temperature is therefore always equal to that of the atmosphere in which it is placed. In the silk-producing countries, where modes of artificial heating have not been studied practically and scientifically, the difficulty and expense that must attend the prosecution of this heating system, form abundant reasons why it cannot be generally adopted. The great susceptibility of the insect to atmospheric influences would also in a great degree render unsuitable the more common arrangements for the purpose. The plan of warming apartments by means of stoves, in its passage through which the air becomes highly heated before it mixes with and raises the general temperature of the air in the chamber, is liable to this inconvenience,—that the portion so introduced, having its vital property impaired by the burning heat through which it has passed, injures, proportionably, the respirable quality of the whole atmosphere; an effect which is easily perceptible by those who inhale it. A better plan of heating has lately been suggested, and is rapidly coming into practice, viz., of warming buildings by a current of hot water (an American invention), which is, by a very simple process, kept constantly flowing in

close channels through the apartment, where it continually gives off its heat by radiation; and the degree of this being far below the point which is injurious to the vital quality of air, the evil before alluded to is avoided. If the expense of fuel be not too great, as compared with that of the labor which would be saved by this invention, the adoption in silk countries of such a mode of raising and regulating the temperature might, probably, prove advantageous.

The silk-worm remains in the form of a chrysalis for periods which, according to the climate or the temperature wherein it may be placed, vary from fifteen to thirty days. In India, the time is much shorter (See Chapter VIII.); in Spain and Italy, eighteen to twenty days. In France three weeks; and in the climate of England, when unaccelerated by artificial means, thirty days will elapse from the time the insect begins to spin until it emerges in its last and perfect form. It then throws off the shroud which had confined it in *seeming lifelessness*, and appears as a large moth of a grayish-white color, furnished with four wings, two eyes, and two black horns or antlers which present a feathery appearance (See Figure 6. plate III.).

If left until this period within the cocoon, the moth takes immediate measures for its extrication: ejecting from its mouth a liquor with which it moistens and lessens the adhesiveness of the gum wherewith it had lined the interior surface of its dwelling, and the insect is enabled, by frequent motions of its head, to loosen, without breaking, the texture of the ball; then using its hooked feet, it pushes aside the filaments and makes a passage for itself into light and freedom. It is erroneously said that the moth recovers its liberty by gnawing the silken threads; but it is found, on the contrary, that if carefully unwound, their continuity is by this means rarely broken.

One of the most remarkable circumstances connected with the natural history of silk-worms, is the degree in which their bulk and weight is increased, and the limited time wherein that increase is attained. Count Dandolo, who appears to have neglected nothing that could tend to the right understanding of the subject, and to the consequent improvement of the processes employed, had patience enough to count and

weigh many hundred thousand eggs, as well as follow out to the ultimate result his inquiries respecting their produce. He found that on an average sixty-eight sound silk-worm's eggs weighed one grain. One ounce*, therefore, comprised, 39,168 eggs. But one twelfth part of this weight evaporates previous to hatching, and the shells are equal to one fifth more. If, therefore, from one ounce, composed of 576 grains, 48 grains be deducted for evaporation, and 115 for the shells, 413 grains will remain equal to the weight of 39,168 young worms; and, at this rate, 54,526 of the insects when newly hatched, are required to make up the ounce. After the first casting of the skin, 3840 worms are found to have this weight, so that the bulk and weight of the insects have in a few days been multiplied more than *fourteen times*. After the second change 610 worms weigh an ounce, their weight being increased in the intermediate time six fold. In the week passed between the second and third ages, the number of insects required to make up the same weight, decreases from 610 to 144, their weight being therefore more than quadrupled. During the fourth age, a similar rate of increase is maintained: thirty-five worms now weigh an ounce. The fifth age of the caterpillar comprises nearly a third part of its brief existence, and has been described, by an enthusiastic writer on the subject, as the happiest period of its life, during which it rapidly increases in size, preparing and secreting the material it is about to spin. When the silk-worms are fully grown, and have arrived at their period of finally rejecting food, six of them make up the weight of an ounce. They have, therefore, since their last change, again added to their weight *six fold*.

It is thus seen that, in a few short weeks, the insect has multiplied its weight more than *nine thousand fold*! From this period, and during the whole of its two succeeding states of being, the worm imbibes no nourishment, and gradually diminishes in weight; being supported by its own substance, and

* This ounce contains 576 grains; 8.5325 of these grains equal seven grains troy. One ounce avoirdupoise is therefore equal to about 533 grains, and between 11-12 and 11-13 ounce avoirdupoise equals one of the above ounces.

appearing to find sufficient occupation in forming its silken web, and providing successors for our service, without indulging that grosser appetite which forms the beginning and the end of their desires during their caterpillar existence.

The moth enjoys its liberty for only a very brief space. Its first employment is to seek its mate; after which the female deposits her eggs; and both in the course of two or three days after, end their being.

Formation of Silk. By M. H. Straus, of Durckheim.—“It is generally admitted by naturalists that the thread of the caterpillar is produced by a simple emission of liquid matter through the orifice of the spinner, and that it acquires solidity at once from the drying influence of the air. It was easy to entertain such an hypothesis, for nothing is more simple than the formation of a very fine thread by such a process. But a little reflection will soon show us, even *à priori*, that it is not possible; for how can we comprehend that so fine a fibre, liquid at the instant of its issue from the aperture, should *instantly* acquire such a consistence as to bear the weight of the animal suspended by it, and at the same time that it is rapidly produced? Though the fluid, holding the silk in solution, should be quickly volatilised, it must still be a matter of conjecture, how the animal suspended by this thread could be able to arrest its issue, holding on only by the thread itself, for it cannot pinch the thread, seeing that it is only in a liquid state inside, and the thread cannot be glued to the edge of the opening, as its rapid adhesion would prevent its issue while the animal is spinning. A little examination would satisfy us that silk cannot be produced in this manner, but that it is secreted in the *form of silk* in the silk vessels, and that the spinning apparatus *only winds it*. The thread is produced in the slender posterior part of the vessel, the inflated portion of which consists of the reservoir of ready formed silk, where it is found in the form of a skein; each thread being rolled up so as to occupy in the silk-worm (*Bombex mori*) a space of only about a sixth part of the real length of the skein. The fact is shown by the following experiment I made for the purpose of ascertaining whether the silk is formed in the body of the caterpillars.

‘ Take one of the animals when about to form its cocoon, clean it in common vinegar, in which it may remain from four to six hours, open it on the back and extract the silk vessels, there being one on each side of the alimentary canal. Take them up by the hinder end, just where they begin to swell (further back the silk is not solid enough), and draw them out. The membrane forming the vessel is easily torn open, and the contents expand to six or seven times its original length. The skein having attained its full length by the letting out of its gathers, we obtain a cord perfectly equal in size throughout, except at the end, where it is attenuated. This cord resembles a large horse-hair, and constitutes what fishermen call “*Florence hair.*” I ought to add that in simply drawing out the silk vessel, the Florence hair is found enveloped in a golden yellow gummy matter, forming the glutinous portion by which the worm fastens its thread. This must be got rid of by drawing the cord through the fold formed on the inside of the joint of the left fore finger, converted into a canal by applying to it the end of the thumb. The glutinous substance and the membranes being thus separated, we have the *naked hair*. In this state, before the silk becomes dry and hard, not only will it be indefinitely divided longitudinally, which proves its fibrous structure, but in trying to split it by drawing it transversely, *the little filaments of silk which form it are perfectly separated, making a bundle of extremely fine fibrils.*”

We cannot better conclude this interesting portion of our subject, than by quoting the following beautiful lines by Miss H. F. Gould :—

THE SILK-WORM'S WILL.

On a plain rush hurdle a silk-worm lay,
 When a proud young princess came that way :
 The haughty child of a human king,
 Threw a sidelong glance at the humble thing,
 That took, with a silent gratitude,
 From the mulberry leaf, her simple food ;
 And shrunk, half scorn and half disgust,
 Away from her sister child of dust—

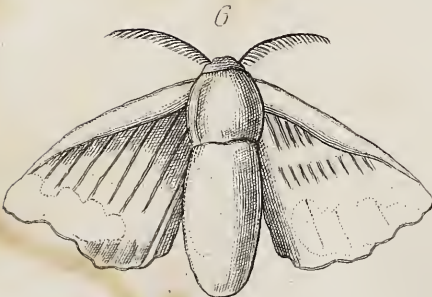
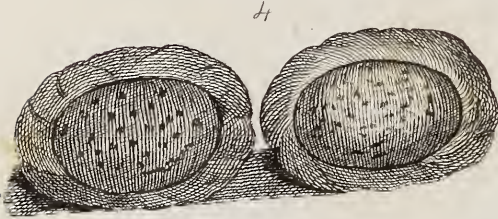
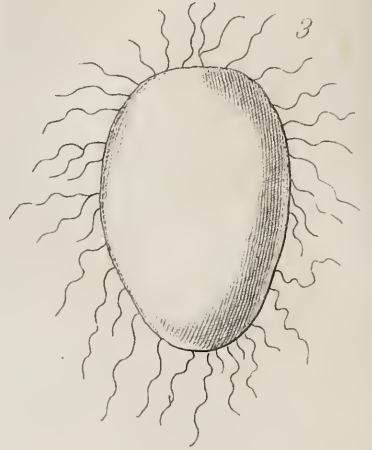
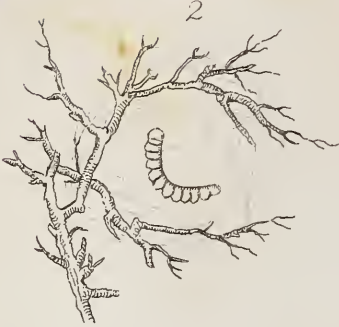
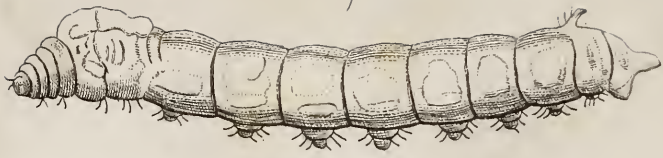
Declaring she never yet could see
 Why a reptile form like this should be,
 And that she was not made with nerves so firm,
 As calmly to stand by a "crawling worm !"

With mute forbearance the silk-worm took
 The taunting words, and the spurning look :
 Alike a stranger to self and pride,
 She'd no disquiet from aught beside—
 And lived of a meekness and peace possessed,
 Which these debar from the human breast.
 She only wished, for the harsh abuse,
 To find some way to become of use
 To the haughty daughter of lordly man ;
 And thus did she lay a noble plan,
 To teach her wisdom, and make it plain,
 That the humble worm was not made in vain ;
 A plan so generous, deep and high,
 That, to carry it out, she must even die !

"No more," said she, "will I drink or eat !
 I'll spin and weave me a winding-sheet,
 To wrap me up from the sun's clear light,
 And hide my form from her wounded sight.
 In secret then, till my end draws nigh,
 I'll toil for her ; and when I die,
 I'll leave behind, as a farewell boon,
 To the proud young princess, my whole cocoon,
 To be reeled and wove to a shining lace,
 And hung in a veil o'er her scornful face !
 And when she can calmly draw her breath
 Through the very threads that have caused my death ;

When she finds, at length, she has nerves so firm
 As to wear the shroud of a crawling worm,
 May she bear in mind, that she walks with pride
 In the winding-sheet where the silk-worm died !"





CHAPTER VIII.

GENERAL OBSERVATIONS ON THE CHINESE MODE OF REARING SILK-WORMS, &c.

Great antiquity of the silk-manufacture in China—Time and mode of pruning the Mulberry-tree—Not allowed to exceed a certain height—Mode of planting—Situation of rearing-rooms, and their construction—Effect of noise on the silk-worm—Precautions observed in preserving cleanliness—Isan-mon, mother of the worms—Manner of feeding—Space allotted to the worms—Destruction of the Chrysalides—Great skill of the Chinese in weaving—American writers on the Mulberry-tree—Silk-worms sometimes reared on trees—(M. Marteloy's experiments in 1764, in rearing silk-worms on trees in France)—Produce inferior to that of worms reared in houses—Mode of delaying the hatching of the eggs—Method of hatching—Necessity for preventing damp—Number of meals—Mode of stimulating the appetite of the worms—Effect of this upon the quantity of silk produced—Darkness injurious to the silk-worm—Its effect on the Mulberry-leaves—Mode of preparing the cocoons for the reeling process—Wild silk-worms of India—Mode of hatching, &c.—(Observations on the cultivation of silk by Dr. Stebbins—Dr. Bowring's admirable illustration of the mutual dependence of the arts upon each other.)

IN China, the tradition of the silk culture is, as already shown, carried back into the mythological periods, and dates with the origin of agriculture itself. These two pursuits or avocations, namely, husbandry and the silk-manufacture, form the subject of one of the sixteen discourses to the people. It is there observed, that "from ancient times the Son of Heaven directed the plough: the Empress planted the mulberry-tree. Thus have these exalted personages, not *above* the practice of labor and exertion, set an example to all men, with a view to leading the millions of their subjects to attend to their essential interests."

In the work published by Imperial authority, entitled "Illustrations of Husbandry and Weaving*," there are numerous

* The drawing, plate I. (Frontispiece) is a faithful copy of a loom represented in this curious work. For this representation of a Chinese weaving engine, as well as several translations, explanatory of the silk-manufacture, &c., we are in-

wood-cuts, accompanied by letter-press explanatory of the different processes of farming and the silk-manufacture. The former head is confined to the production of rice, the staple article of food, and proceeds from the ploughing of the land to the packing of the grain; the latter details all the operations connected with planting the mulberry and gathering its leaves, up to the final weaving of the silk.

The mulberry-tree is chiefly cultivated in Chē-kiang, which province, together with the only three others that produce fine silk, namely, Kiang-nân, Woo-pé, and Sze-chuen, is crossed by the *thirtieth* parallel of latitude. Chē-kiang is a country highly alluvial, intersected by numerous rivers and canals, with a climate that corresponds pretty nearly to the same latitude as that in the United States of America. The soil is manured with mud, dug from the rivers, assisted with ashes or dung; and the spaces between the trees are generally filled with millet, pulse, or other articles of food. The time for pruning the young trees, so as to produce fine leafy shoots, is at the commencement of the year. About four eyes are left on every shoot, and care is taken that the branches be properly thinned, with a view to giving plenty of light and air to the leaves. In gathering these, they make use of steps, as the young trees could not support a ladder, and would besides be injured in their branches by the use of one. The trees, with their foliage, are carefully watched, and the mischiefs of insects prevented by the use of various applications, among which are some essential oils.

The young trees of course suffer by being stripped of their leaves, which are the *lungs* of plants, and this is an additional reason for renewing them after a certain time. They endeavor in part to counteract the evil effect, by pruning and lopping the tree, so as to diminish the wood when the leaves have

debted to Walter Lowry, Esq., Sec. to the Presbyterian Board of Foreign Missions in this city; who kindly permitted us to copy it from the original plate, forming a part of the interesting work above referred to, which is composed of seventy-five volumes, and was, as we understand, presented to the Board by a New York merchant. Many of the illustrations are extremely beautiful, reflecting the highest credit upon the artisans of the "Celestial Empire."

been gathered. It is surprising, however, to observe how soon a tree in those climates will recover its leaves in the summer or autumn, after having been entirely stripped of them by a typhoon or hurricane. Fresh plants are procured by cuttings or layers, and sometimes from seed. When the trees grow too old for the production of the finest leaves, and show a greater tendency to fruiting, they are either removed or so cut and managed as to produce young branches.

The principal object, in the cultivation of the mulberry, is to produce the greatest quantity of young and healthy leaves without fruit. For this reason the trees are not allowed to exceed a certain age and height. They are planted on the plan of a quincunx*, and said to be in perfection in about three years.

Mr. Barrow, who observed the management of the trees and silk-worms in Chě-kiang, confirms the usual Chinese accounts, by saying that "the houses in which the worms are reared are placed generally in the centre of each plantation, in order that they may be removed as far as possible from every kind of noise; experience having taught them that a sudden shout, or the bark of a dog, is destructive of the young worms. A whole brood has sometimes perished from the effects of a thunder-storm."

Some notion of the extent of the care required in the management of the worms may be formed from the following extract, taken from the Chinese work referred to at the beginning of this chapter.

"The place where their habitation is built must be retired, free from noise, smells, and disturbances of every kind. The least fright, makes great impressions on these sensitive creatures; even the barking of dogs, &c., is capable of throwing them into the utmost disorder.

For the purpose of paying them every attention an affectionate mother is provided, who is careful to supply their wants;

* In *gardening*, the *quincunx* order is a plantation of trees disposed in a square, consisting of five trees, one at each corner and a fifth in the centre, which order repeated indefinitely, forms a regular grove or wood, viewed by an angle of the square or parallelogram, presents equal or parallel alleys.

she is called *Isan-mon*, 'mother of the worms.' She takes possession of the chamber, but not before she has washed herself and put on clean clothes, which have not the least repulsive smell; she must not have eaten anything immediately before, or handled any wild succory, the smell of which is very prejudicial. She must be clothed in a plain habit, without any lining, that she may be more sensible of the warmth of the place, and accordingly increase or lessen the fire. She must also carefully avoid making a smoke or raising a dust, which would also be offensive."

Silk-worms require to be carefully humored before the time of casting their slough. Every day is to them a year, having in a manner, the four seasons; the morning being the Spring; the middle of the day: Summer; the evening: Autumn; and the night, Winter.

The chambers are so contrived as to admit of the use of artificial heat when necessary. Great care is taken of the sheets of paper on which the eggs have been laid; and the hatching is either retarded or advanced, by the application of cold or heat according to circumstances, so as to time the simultaneous exit of the young worms exactly to the period when the tender spring-leaves of the mulberry are most fit for their nourishment.

They proportion the food very exactly to the young worms by weighing the leaves, which in the first instance are cut, but as the insects become larger, are given to them whole. The greatest precautions being observed in regulating the temperature of the apartments. The worms are fed upon a species of small hurdles of basket-work, strewed with leaves, which are constantly shifted for the sake of cleanliness, the insects readily moving off to a fresh hurdle with new leaves, as the scent attracts them. In proportion to their growth, room is afforded to them by increasing the number of these hurdles, the worms of one being shifted to three, then to six, and so on until they attain their greatest size. When they have cast their several skins, reached their greatest size, and assumed a transparent yellowish color, they are removed to places divided into compartments, preparatory to casting forth their silken filaments.

In the course of a week after the commencement of this op-

eration, the cocoons are complete, and it now becomes necessary to take them in hand before the pupæ turn into *moths*, which would immediately bore their way out, and spoil the cocoons. When a certain number, therefore, have been laid aside for the sake of future eggs, the chrysalides are killed by being placed in jars under layers of salt and leaves, with a complete exclusion of air. They are subsequently placed in moderately warm water, which dissolves the glutinous substance that binds the silk together, and the filament is wound off upon reels. This is put up in bundles of a certain size and weight, and either becomes an article of merchandise under the name of "raw silk," or is subjected to the loom, and manufactured into various stuffs, for home or foreign consumption. The Chinese notwithstanding the simplicity of their looms (see frontispiece), will imitate *exactly* the newest and most elegant patterns from France. They particularly excel in the production of *damasks*, *figured-satins*, and *embroidery*. Their crape has never yet been perfectly imitated; and they make a species of washing silk, called at Canton "ponge," which, the longer it is used, the softer it becomes.

The Chinese have from time immemorial been celebrated for the beauty of their embroideries; indeed, it has been doubted whether the art was not originally introduced into Europe by them, through the Persians.

From what has been said, it is evident that the raising of the *mulberry-tree* should first engage the attention of the cultivator, since its leaves form the almost exclusive nourishment of the silk-worm. It is scarcely necessary that we should in a work of this description enter more fully into the cultivation of the mulberry-tree. This has already been so ably done by Jonathan Cobb, Esq. of Dedham, Mass., Dr. Pascalis of New York, Judge Comstock of Hartford, Conn., and E. P. Roberts, Esq. of Baltimore, as to leave no stone unturned, or any want upon the subject.

In such parts of the Chinese empire where the climate is favorable to the practice, and where alone, most probably, the silk-worm is indigenous, it remains at liberty, feeding on the leaves of its native mulberry-tree, and going through all its mu-

tations among the branches, uncontrolled by the hand and unassisted by the cares of man. As soon, however, as the silken balls have been constructed, they are appropriated by the universal usurper, who spares only the few required to reproduce their numbers, and thus furnish him with successive harvests*.

This silk, the spontaneous offering of nature, is not, however, equal in fineness to that produced by worms under shelter, and whose progressions are influenced by careful management. Much attention is, therefore, bestowed by the Chinese in the artificial rearing of silk-worms. One of their principal cares, is to prevent the too early hatching of the eggs, to which the nature of the climate so strongly disposes them. The mode of insuring the requisite delay, is, to cause the moth to deposit her eggs on large sheets of paper: these, immediately upon their production, are suspended from a beam in the room, while the windows are opened to expose them to the air. In a few days the papers are taken down and rolled loosely up with the eggs inside, in which form they are again hung during the remainder of the summer and autumn. Towards the end of the year they are immersed in cold water wherein a small portion of salt has been dissolved. In this state the eggs are left during two days; and on being taken from the salt and water are first hung to dry, and then rolled up rather more tightly than before, each sheet of paper being thereafter inclosed in a

* Mons. Marteloy of Montpellier, who made many experiments upon the rearing of silk-worms, presented a memorial upon the subject to the French minister, in compliance with whose recommendation, a few silk growers of Languedoc caused an experiment to be publicly made in the open air, in the garden belonging to the Jesuits' college at Montpellier. The whole was placed under the direction of Mons. Marteloy, who had 1200 livres assigned to him to defray the necessary expenses. The experiment succeeded perfectly. This was in 1764. In the following year a second trial was made, and 1800 livres were set apart for the expenses. Owing, however, to the unfavorable nature of the season, this experiment failed entirely, the heavy and incessant rains making it impossible to keep the food of the worms in a sufficiently dry state. The rearing of silk-worms in the open air was not again attempted in that quarter; but the partial success led to the adoption among cultivators of a better system of ventilation, and the production of silk was about this time very much extended throughout Languedoc.—*Obs. on the Culture of Silk*, by A. STEPHENSON.

separate earthen vessel. Some persons, who are exceedingly particular in their processes, use a lye made of mulberry-tree ashes, and place the eggs likewise, during some minutes, on snow-water.

These processes appear efficacious for checking the hatching, until the expanding leaves of the mulberry-tree give notice to the silk-worm-rearer that he may take measures for bringing forth his brood. For this purpose the rolls of paper are taken from the earthen vessels, and hung up towards the sun, the side to which the eggs adhere being turned from its rays, by being placed inside, and thus allowing the heat to be transmitted to them through the paper. In the evening the sheets are rolled closely up and placed in a warm situation. The same proceeding is repeated on the following day, when the eggs assume a grayish color. On the evening of the third day, after a similar exposure, they are found to be of a much darker color, nearly approaching to black; and the following morning, on the paper being unrolled, they are covered with worms. In the higher latitudes the Chinese have recourse to the heat of stoves, in order to promote the simultaneous hatching of the eggs.

The apartments in which the worms are kept stand in dry situations, in a pure atmosphere, and apart from all noise, which is thought to be annoying to the worms, especially when they are young. The rooms are made very close, but adequate means of ventilation provided: the doors being open to the south. Each chamber is provided with nine or ten rows of frames, placed one above the other. On these frames, rush hurdles are ranged; upon which the worms are fed through their five ages. A uniform degree of heat is constantly preserved, either by means of stoves placed in the corners of the apartments, or by chafing-dishes which from time to time are carried up and down the room. Flame and smoke being always carefully avoided: cow-dung dried in the sun is preferred by the Chinese to all other kinds of fuel for this purpose.

The most unremitting attention is paid to the wants of the worms, which are fed night and day. On their being hatched they are furnished with forty meals for the first day, thirty are given on the second day, and fewer on and after the third.

The Chinese believe that the growth of silk-worms is accelerated, and their success promoted by the abundance of their food, and therefore, in cloudy and damp weather, when the insects are injuriously affected by the state of the atmosphere, their appetites are stimulated by a wisp of very dry straw being lighted and held over them, thus causing the cold and damp air to be dissipated.

The Chinese calculate that the same number of insects which would, if they had attained the full size in twenty-three or twenty-four days, produce twenty-five ounces of silk, would give only twenty ounces if their growth occupied twenty-eight days, and only ten ounces if forty days. In order, therefore, to accelerate their growth, they supply them with fresh food every half-hour during the first day of their existence, and then gradually reduce the number of meals as the worms grow older. It deserves to be remarked as a fact unnoticed in Natural Theology, that the substance on which this valuable caterpillar feeds, is the leaf of the mulberry-tree; and Providence, as if to ensure the continuance of this useful species, has so ordained it that no other insect will partake of the same food; thus ensuring a certain supply for the little spinster.

Many persons believe that light is injurious to silk-worms; but, so far from this opinion being correct, the opposite belief would probably be nearer to the truth. In its native state, the insect is of course exposed to light, and suffers no inconvenience on that account; and it has been observed by one who gave much attention to the subject (Count Dandolo), that in his establishment, "on the side on which the sun shone directly on the hurdles, the silk-worms were stronger and more numerous than in those places where the edge of the wicker hurdle formed a shade." The obscurity wherein the apartments are usually kept has a very pernicious influence on the air: the food of the worms emits in light oxygen, or vital air, while in darkness it exhales carbonic acid gas, unfit for respiration. This well-known fact occurs alike with all leaves similarly circumstanced*. To the bad effects thus arising from the ex-

* "There is in the order of nature a certain and very surprising fact; when

clusion of the sun's rays, another evil is added by the nature of the artificial lights employed, being such as still further to vitiate the air.

An almost incredible quantity of fluid is constantly disengaged by evaporation from the bodies of the insects; and if means be not taken to disperse this as it is produced, another cause of unwholesomeness in the air arises. Noticing this, Count Dandolo observes, "This series of causes of the deterioration of the air which the worms must inhale, may be termed a continual conspiracy against their health and life; and their resisting it, and living throughout shows them to have great strength of constitution."

In seven days from the commencement of the cocoons they are collected in heaps; those which are designed to continue

the leaves of vegetables are struck by the sun's rays, they exhale an immense quantity of vital air necessary to the life of animals, and which they consume by respiration.

"These same leaves in the shade as well as in darkness exhale an immense quantity of mephitic or fixed air, which cannot be inhaled without destruction of life.

"This influence of the sun does not cease even when the leaf has been recently gathered; on the contrary, in darkness, gathered leaves will exhale a still greater quantity of mephitic air.

"Place one ounce of fresh mulberry leaves in a wide-necked bottle of the size of a Paris pint, containing two pounds of liquid; expose this bottle to the sun; about an hour afterwards, according to the intensity of the sun, reverse the bottle and introduce a lighted taper in it; this done, the light will become brighter, whiter, and larger, which proves that the vital air contained in the bottle has increased by that which has disengaged itself from the leaves: to demonstrate this phenomenon more clearly, a taper may be put in a similar bottle, that only contains the air which has entered into it by its being uncorked. Shortly after the first experiment, water will be found in the bottle which contained the mulberry leaves; this water, evaporating from the leaves by means of the heat, hangs on the sides, and runs to the bottom when cooling; the leaves appear more or less withered and dry according to the liquid they have lost. In another similar bottle place an ounce of leaves, and cork it exactly like the former; place it in obscurity, either in a box, or wrap it in cloths, in short, so as totally to exclude light; about two hours after, open the bottle, and put either a lighted taper or a small bird into it; the candle will go out, and the bird will perish, as if they had been plunged into water, which demonstrates that in darkness the leaves have exhaled mephitic air, while in the sun they exhaled vital air."—COUNT DANDOLO'S *Treatise on the Art of Rearing Silk-worms*, p. 144.

the breed being first selected and set apart on hurdles, in a dry and airy situation. The next care, is to destroy the vitality of the chrysalides in those balls which are to be reeled. The most approved method of performing this, is to fill large earthen vessels with cocoons, in layers, throwing in one-fortieth part of their weight of salt upon each layer, covering the whole with large dry leaves resembling those of the water-lilly, and then closely stopping the mouths of the vessels. In reeling their silk the Chinese separate the thick and dark from the long and glittering white cocoons, as the produce of the former is inferior.

We are indebted to Dr. Ure for the two following articles (*extracted from the Journal of the Asiatic Society, for January, 1837*), on wild silk-worms. The first article is from the pen of Thomas Hugon, a resident of Nowgong, and relates to wild silk-worms of Assam.

“The Assamese select for breeding, such cocoons only as have been begun to be formed in the largest number on the same day, usually the second or third after the commencement; those which contain males being distinguishable by a more pointed end. They are put in a closed basket suspended from the roof; the moths, as they come forth, having room to move about, at the expiration of a day, the females (known only by their large body) are taken out, and tied to small wisps of thatching-straw, selected always from over the hearth, its darkened color being thought more acceptable to the insect. If out of a batch, there should be but few males; the wisps with the females tied to them are exposed outside at night; and the males thrown away in the neighborhood, find their way to them. These wisps are hung upon a string tied across the roof, to keep them from vermin. The eggs laid after the first three days, are said to produce weak worms. The wisps are taken out morning and evening, and exposed to the sun, and in ten days after being laid, a few of them are hatched. The wisps being then hung up to the tree, the young^s worms find their way to the leaves. The ant, whose bite is fatal to the worm in its early stages, is destroyed by rubbing the trunk of the tree with molasses, and tying dead fish and toads to it, to

attract these rapacious insects in large numbers, when they are destroyed with fire; a process which needs to be repeated several times. The ground under the trees is also well cleared, to render it easy to pick up and replace the worms which fall down. They are prevented from coming to the ground, by tying fresh plantain-leaves round the trunk, over whose slippery surface they cannot crawl; and then transferred from exhausted trees to fresh ones, on bamboo platters tied to long poles. The worms require to be constantly watched and protected from the depredations of both day and night birds, as well as rats and other vermin. During their moultings, they remain on the branches; but when about beginning to spin, they come down the trunk, and being stopped by the plantain-leaves, are there collected in baskets, which are afterwards put under bunches of dry leaves, suspended from the roof, into which the worms crawl, and form their cocoons—several being clustered together: this accident, owing to the practice of crowding the worms, which is most injudicious, rendering it impossible to wind off their silk in continuous threads, as in the filatures of Italy, France, and even Bengal. The silk is, therefore, spun like flax, instead of being unwound in single filaments. After four days the proper cocoons are selected for the next breed, and the rest are reeled. The total duration of a breed varies from sixty to seventy days; divided into the following periods:—

Four moultings, with one day's illness attending each, - -	20
From fourth moulting to beginning of cocoon, - - -	10
In the cocoon 20, as a moth 6, hatching of eggs 10, - - -	36
	—
	66

“On being tapped with the finger, the body renders a hollow sound; the quality of which shows whether they have come down for want of leaves on the tree, or from their having ceased feeding.

“As the chrysalis is not soon killed by exposure to the sun, the cocoons are put on stages, covered with leaves, and exposed to the hot air from grass burned under them; they are next boiled for about an hour in a solution of the potash, made from

icinerated rice-stalks; then taken out and put on a cloth folded over them to keep them warm. The floss being removed by hand, they are then thrown into a basin of hot water to be unwound; which is done in a very rude and wasteful way.

“The plantations for the mooga silk-worm in Lower Assam, amount to 5000 acres, besides what the forests contain; and yield 1500 maunds of 84 lbs. each per annum. Upper Assam is more productive.

“The cocoon of the *Koutkuri mooga* is of the size of a fowl's egg. It is a wild species, and affords filaments much valued for fishing-lines.

“The *Arrindy*, or *Eria* worm, and moth, is reared over a great part of Hindostan, but entirely within doors. It is fed principally on the *Hera*, or *Palma christi* leaves, and gives sometimes 12 broods of spun silk in the course of a year. It affords a fibre which looks rough at first; but when woven, becomes soft and silky, after repeated washings. The poorest people are clothed with stuff made of it, which is so durable as to descend from mother to daughter. The cocoons are put in a close basket, and hung up in the house, out of reach of rats and insects. When the moths come forth, they are allowed to move about in the basket for twenty-four hours; after which the females are tied to long reeds or canes, twenty or twenty-five to each, and then hung up in the house. Of the eggs that are laid the first three days, about 200, only are kept; then tied up for seed. When a few of the worms are hatched, the cloths are put on small bamboo platters hung up in the house, in which they are fed with tender leaves. After the second moulting, they are removed to bunches of leaves suspended above the ground, beneath which a mat is laid to receive them when they fall. When they cease to feed, they are thrown into basketsfull of dry leaves, among which they form their cocoons, two or three being often discovered joined together.

“The *Saturnia trifenestrata* has a yellow cocoon of a remarkably silky lustre. It lives on the soom-tree in Assam, but seems not to be much used.”

The second article is from the pen of Dr. Helfer, upon those

wild silk-worms which are indigenous to India. Besides the *Bombyx mori*, the Doctor enumerates the following seven species, formerly unknown:—1. “The wild silk-worm of the central provinces, a moth not larger than the *Bombyx mori*.” 2. “The Joree silk-worm of Assam, *Bombyx religiosæ*, which spins a cocoon of a fine filament, with much lustre. It lives upon the pipul tree (*Ficus religiosa*), which abounds in India, and ought therefore to be turned to account in breeding this valuable moth.” 3. “*Saturnia silhetica*, which inhabits the cassia mountains in Silhet and Dacca, where its large cocoons are spun into silk.” 4. “A still larger *Saturnia*, one of the greatest moths in existence, measuring *ten inches* from the *one end of the wing to the other**; observed by Mr. Grant, in *Chirra punjee*.” 5. “*Saturnia paphia*, or the Tusseh silk-worm, is the most common of the native species, and furnishes the cloth usually worn by Europeans in India. It has not hitherto been domesticated, but millions of its cocoons are annually collected in the jungles, and brought to the silk factories near Calcutta and Bhagelpur. It feeds most commonly on the hair-tree (*Zizyphus jujuba*), but it prefers the *Terminalia alata*, or Assam tree, and the *Bombax heptaphyllum*. It is called *Koutkuri mooga*, in Assam.” 6. “Another *Saturnia*, from the neighborhood of Comercolly.” 7. “*Saturnia assamensis*, with a cocoon of a yellow-brown color, different from all others, called *mooga*, in Assam; which, although it can be reared in houses, thrives best in the open air upon trees, of which seven different kinds afford it food. The *Mazankoory mooga*, which feeds on the Adakoory tree, produces a fine silk, which is nearly white, and fetches 50 per cent. more than the fawn colored. The trees of the first year’s growth produce by far the most valuable cocoons. The mooga which inhabits the soom-tree, is found principally in the forests of the plains, and in the villages. The tree grows to a large size, and yields three crops of leaves in the year. The silk is of a light fawn color, and ranks next in value to the Mazankoory. There are generally five breeds of mooga worms in the year; 1. In January and

* See p. 40 Also p. 54. (note *)

February; 2. In May and June; 3. In June and July; 4. In August and September; 5. In October and November; the first and last being the most valuable."

Dr. Anderson informs us, that in Madras the silk-worm goes through all its evolutions in the short space of twenty-two days. It appears, however, that the saving of time, and consequently labor, is the only economy resulting from the acceleration; as the insects consume as much food during their shorter period of life, as is assigned to the longer-lived silk-worms of Europe.

We extract the following paper, with slight emendations, from Ellsworth's Report of the Patent Office for the year 1844, being a communication from Dr. Stebbins, of Northampton, Mass*, to the Editor of the American Agriculturalist, as having some bearing upon the present subject.

"As requested, I forward you a sketch of Mr. Gill's cradle for feeding silk-worms, (It is not necessary for us to give a drawing of it in a work like the present, which is chiefly intended for the general reader, and besides, this machine is already sufficiently known to silk culturists.) I have five patches of mulberry, (in all, ten or twelve acres,) two parcels of which you have seen. The one adjoining my garden, by estimation, may furnish foliage sufficient for a million and a half of worms. The mulberries consist of the white, black, alpine, broosa, moretta, alata, multicaulis, Asiatic, and large-leaf Canton. The two latter I prefer for my own use—the Canton for early feeding with foliage, and the Asiatic for branch feeding. The Canton is highly approved of for producing heavy and firm cocoons, which, by competent testimony and experiments, have been found in favor of the Canton feed as five to eight, and is the true species used by the Chinese, as testified by a resident Missionary, the Rev. E. C. Bridgman, and more recently by Dr. Parker, while on his late visit to the United States. I consider the peanut variety of worms the best for producing the most silk of a good quality.

"From an elevated plat near my cocoonery, you had a view of our extensive meadows spread out at the foot of Mount Ho-

* See Chapter XIII. p. 211.

lyoke. My cocoonery you have examined, with its fixtures for feeding silk-worms—the mode of open feeding, ventilator, and ventilating cradles. Since you left, the whole has been completed, with hammocks suspended over the cradles, easily put in motion, and so constructed that no offal can drop into the cradles beneath, nor interfere with the rocking motion or winding; the arrangement is much admired, and estimated to accommodate half a million of worms, or more, to be fed simultaneously. About half of the cocoonery has hurdles of lattice work, covered in part with gauze netting four feet wide and the same number of tiers in height. The cocoonery is supposed to be sufficiently open on the sides, ends, and roof, to admit a free circulation of pure air. The flooring is the natural earth.

“The past winter has been uncommonly severe on grape-vines and fruit; forest and mulberry trees; the Asiatic I found the most hardy of any other, and the Canton the earliest in foliage. On the 21st and 22d of May there were severe frosts, destroying garden vegetables, and injuring some early mulberry foliage; added to this, ice was formed in many places. The accounts from Vermont and New Hampshire are so disastrous as to delay early feeding; while in Northampton, June 14, at one of my plantations, you saw silk-worms in the act of winding, and others in a good state of forwardness. On the day of your departure, I received a letter from a distant silk grower, a staunch promoter of the *one early* and *open* crop system, that, on account of the unpropitious season and condition of his trees, he would delay fetching out his worms until the last of June, and then make his great effort upon one crop.

“To provide against premature hatching of silk-worms, or the disaster of an early frost, it is advisable to have foliage gathered and dried the year preceding; which, being pulverized and moistened with water, may be given to the worms until new foliage appears; and they will eat it freely.

“To obtain the most and best foliage of the mulberry, it will be necessary every Spring to cut or head them down within three or four inches of the ground, and preserve the stalks for *bark-silk*. I have a quantity of them saved with bark peeled from the large Asiatics to be used for making *bark-silk*, in ad-

dition to a quantity of mulberry-leaves preserved for making paper. The whole process, although not carried out, as yet, in this country, with either, has been successfully accomplished in France, from proof shown by M. Frassinet. I am endeavoring to have it tested here, by subjecting both stalk and peeled bark to the operation of steaming with soap and water, to facilitate the separation of the bark from the wood, and the outside cuticle from the fibrous substance of the bark, before trying the operation of the brake for dressing, carding, spinning, &c. Should it prove successful, it will be made public (See Mr. Zinke's process, Chapter XI.). Hopes are entertained that what has been done may be done again; that Yankee ingenuity and perseverance may prove a match for foreign cheap labor(?).

“The present time has been called the age of invention and improvement. But if “there is nothing new under the sun” (a pretty fair illustration of this assertion of the wise man—Vide Ecclesiastes i. 9, 10.—will be found in this work.); and if what is, has been and may be again, then may we hope to be benefitted by the reproduction of astonishing results in all coming time; and even now, while there has been anxious inquiry for some easy mode to separate the bark of the mulberry from the wood, an *historical fact* has been recently communicated(?); by which, some two hundred and forty years ago, in the year 1600, an accident occurred, which resulted in the manufacture of a handsome fabric from the fibrous bark of the mulberry, with the inference that the bark had been previously used for the manufacture of cordage, on account of the superior strength of the fibrous bark over that of other materials used for cordage*.

“Under date of June 6, 1844, I have been favored with a letter from the president of one of the most eminent literary institutions of our country, who expresses his opinion of the progress of silk culture as follows :

* We have abundant testimony that the most beautiful fabrics, comprising *mantles*, &c., as well as cordage, was produced from the bark of trees, as early as the year 412 B. C. So that Mr. Stebbins's “*historical fact*” is anticipated by 2012 years! (See Chapters XII. and XIII. of this Part.)

‘I am gratified to find a renewed and more general interest excited at the present time. If this awaking up to a scientific and practical consideration of the subject is not soon crowned with signal success, I am satisfied it will not be for want of enterprize or skill in our countrymen, but merely from the high price of labor, compared with the scanty wages given in other silk-growing countries. Even this consideration (though it may retard for a while the complete success of this department of productive industry), will not prevent its ultimate triumph.’

“The above is the opinion of one of the most scientific men of the age, who, in early life, was himself a silk grower. His opinion accords with that of many others of high consideration in the United States.

“While viewing the flourishing condition of one of my mulberry patches, you asked with what it had been manured? and received for answer, *ashes*, and the *deciduous foliage*. The foliage, you thought, could be gathered for making *paper*, and answered, that there would be sufficient defective foliage left to manure the land; the foliage is richer than any stable manure, and stable manure should never be applied to the mulberry. I have not had occasion the last five or six years to use even ashes as a manure, but keep the land in good tilth by frequent hoeing. If you found these mulberries more flourishing than others you had seen, it may be attributed, in a great measure, to frequent hoeing, and dressing with the decayed mulberry foliage.

“The soil is a light sandy loam; and, previous to its being stocked with mulberry, would not yield the value of \$10 in any crop; and now, my feeder says, if his worms do well, he hopes to get \$800 for the crop! A part of this lot being stocked with alpine, broosa, and Asiatic mulberry, of 6 to 10 feet in height, in rows 3 feet apart; and having grown so vigorously as to shade each other, and liable to have spotted leaves. I have, in order to avoid this, and procure more, larger, and better foliage, cut away or headed down every other row, within three or four inches of the ground; and from the stumps have sprung up a multitude of thrifty sprouts, now fit for use, and the leaves three times larger than those on the standard trees, are so fresh and

tender, that in some measure it is hoped, they may answer the purpose of seedling foliage, so highly recommended by M. Frassiniet, who has the following encomium on *seedling* foliage: 'that 100 pounds of such foliage is worth near 200 pounds of old leaves to make the same quantity of cocoons; or in fact, equivalent in value to nearly double the stock of other foliage.' I have caused considerable bark to be stripped from the Asiatic trees cut away for manufacturing purposes; and M. Rouviere, of Lyons, has proved that the bark of young shoots, submitted to the same process as hemp, yields abundant silk-fibre to make beautiful tissues (noticed at the close of Chapter XI.). I should advise silk growers to preserve the shoots, have them barked in the best way, and the silky fibre rotted, carded, spun, and wove. M. Rouviere asserts that it will be not only fine and strong, but take the most beautiful colors. Of the bark, ropes and nets are made in the Morea, and may be applied to great advantage in the manufacture of paper, together with the foliage.

"The Canton and Asiatic seed sown this year are in a flourishing condition for plantation use, exclusive of several mulberry plantations which will be for rent, or growing silk on shares, next spring. Up to the first of July, worms have been uncommonly healthy—the probable effect of more open ventilation than in former years.

"Mr. Dabney, consul at Fayal, (now in Boston) has two millions of worms at present on feed. S. Whitmarsh, at Jamaica, has 360 of what he calls *creolized native* eggs, in constant feed, which go through the whole course to the cocoon in 24 days. The eggs hatch in 10 days after being laid. He has received the silk report, and made such improvement as to save, in all, nine-tenths of the usual labor. The silk cause at Jamaica occasions great interest in England for its prosperity and success."

D. STEBBINS.

Northampton, Mass., *July*, 1844.

We will now conclude this Chapter with Dr. Bowring's admirable illustration, of the mutual dependence of the arts upon each other:—

“Let us fancy that some thousand years ago, a mortal, wandering through an oriental wood, saw a worm falling from a fruit-bearing tree—that he found this little creature had reached the end of one of its stages of existence, and was laboriously engaged in shrouding itself in an unknown substance, like a fine thread of gold, out of which it constructed its tomb; that, attracted by the circumstance, he found this shroud to consist of a thread hundreds of yards long, which a very little attention enabled him to detach; he found he could strengthen the threads by uniting them together, and they could be applied to various purposes of usefulness; he thought of winding off the thread; the reel lends him the first assistance, but he could not make the reel without the co-operation of a knife, or some such instrument with a sharp edge. Thus the aid of art—of the produce of art—is already called in. With this rude instrument he makes a machine which enables him to reel off the thread coffin of the curious animal. In process of time, he finds that this fine filament can be applied to the making of garments—garments alike useful and ornamental. Now trace the progress of things by which, from the narrow sphere of his observation and experiment, his success spreads through the districts he inhabits, and from them to other lands, and becomes an object of importance to communicate with the whole family of man. By and by the cocoon, or its produce, finds its way to foreign countries, probably more enlightened than his own, again to be operated on by a higher intelligence and more practised skill. This associates the thread of the silk-worm with a ship, with ship-building, and all its marvellous combinations.—Some wandering merchant probably conveyed the raw material to Persia; some adventurous mariner to Greece or Italy, or other regions where it gave a new impulse to science and to thought. But consider for a moment, before the ship was launched upon the water, how many elements were necessary for its production; think of how multitudinous and various the materials which that ship required for its construction, before the products of that remote country are brought to their ultimate markets for manufacture. I refer to this particular topic, because it is associated with the prosperity of the districts in which we are, and I wished to carry back your thoughts to the germ whence that prosperity sprang.”—BOWRING’S *Lecture at the Poplar Institution*.

CHAPTER IX.

THE SPIDER.

ATTEMPTS TO PROCURE SILKEN FILAMENTS FROM SPIDERS.

Structures of spiders—Spiders not properly insects, and why—Apparatus for spinning—Extraordinary number of spinnerules—Great number of filaments composing one thread—Reaumur and Leeuwenhoek's laughable estimates—Attachment of the thread against a wall or stick—Shooting of the lines of spiders—1. Opinions of Redi, Swammerdam, and Kirby—2. Lister, Kirby, and White—3. La Pluche and Bingley—4. D'Isjonval, Murray, and Bowman—5. Experiments of Mr. Blackwall—His account of the ascent of gossamer—6. Experiments by Rennie—Thread supposed to go off double—Subsequent experiments—Nests, Webs, and Nets of Spiders—Elastic satin nest of a spider—Evelyn's account of hunting spiders—Labyrinthic spider's nest—Erroneous account of the House Spider—Geometric Spiders—attempts to procure silken filaments from Spiders' bags—Experiments of M. Bon—Silken material—Manner of its preparations—M. Bon's enthusiasm—His spider establishment—Spider-silk not poisonous—Its usefulness in healing wounds—Investigation of M. Bon's establishment by M. Reaumur—His objections—Swift's satire against speculators and projectors—Ewbank's interesting observations on the ingenuity of spiders—Mason-spiders—Ingenious door with a hinge—Nest from the West Indies with spring hinge—Raft-building Spider—Diving Water-Spider—Rev. Mr. Kirby's beautiful description of it—Observations of M. Clerck—Cleanliness of Spiders—Structure of their claws—Fanciful account of them patting their webs—Proceedings of a spider in a steamboat—Addison—His suggestions on the compilation of a "History of Insects."

OF spiders there are many species; most of them extend their labors no further than merely to make a web to ensnare and detain their food. But others are known to go beyond this, and spin a bag in the form of a cocoon, for the protection of their eggs, nearly similar to that of the silk-worm.*

Modern naturalists do not rank spiders among insects, because they have no antennæ, and no division between the head

* Don Luis Nee observed on certain trees growing in Chilpancingo, Tixtala in South America, ovate nests of caterpillars, eight inches long, which the inhabitants manufacture into stockings and handkerchiefs.—Annals of Botany, 2d, p 104.

and shoulders. They breathe by leaf-shaped gills, situated under the belly, instead of spiracles in the sides; and have a heart connected with these. But as spiders are popularly considered insects, it will sufficiently suit our purpose to introduce them here as such.

Spiders are usually classed according to their difference of color, whether black, brown, yellow, &c., or sometimes by the number and arrangement of their eyes: of these organs some possess no fewer than ten, others eight, and others again six*.

Some species of spiders are known to possess the power of not merely forming a web, but also of spinning, for the protection of their eggs, a bag somewhat similar in form and substance to the cocoon of the silk-worm. The apparatus by which they construct their ingenious fabrics, is much more complicated than that which is common to the various species of caterpillars. Caterpillars have only two reservoirs for the materials of their silk; but the spider spins minute fibres from fine papillæ, or small nipples placed in the hinder part of its body. These papillæ serve the office of so many wire-drawing machines, from which the silken threadlets are ejected. Spiders, according to the dissections of M. Treviranus, have four principal vessels, two larger and two smaller, with a number of minute ones at their base. Several small tubes branch towards the reservoirs, for carrying to them, no doubt, a supply of the secreted material. Swammerdam describes them as twisted into many coils of an agate color†. We do not find them coiled, but nearly straight, and of a deep yellow color. From these, when broken, threads can be drawn out like those spun by the spider, though we cannot draw them so fine by many degrees.

From these little flasks or bags of gum, situated near the apex of the abdomen, and not at the mouth as in caterpillars, a tube originates, and terminates in the external spinnerets, which may be seen by the naked eye in the form of five little teats surrounded by a small circle, as represented in Fig. 8.

* Porter's "Treatise on the Silk Manufacture," p. 168.

† Hill's Swammerdam, part i. p. 23.

Plate IV.; this figure shows the garden spider (*Epeira diadema*) suspended by a thread proceeding from its spinneret.

We have seen that the thread of the silk-worm is composed of two filaments united, but the spider's thread would appear, from the first view of its five spinnerets, to be quintuple, and in some species which have six teats, so many times more. It is not safe, however, in our interpretations of nature to proceed upon conjecture, however plausible, nor to take anything for granted which we have not actually seen; since our inferences in such cases are almost certain to be erroneous. If Aristotle, for example, had ever looked narrowly at a spider when spinning, he could not have fancied, as he does, that the materials which it uses are nothing but wool stripped from its body. On looking, then, with a strong magnifying glass, at the teat-shaped spinnerets of a spider, we perceive them studded with regular rows of minute bristle-like points, about a thousand to each teat, making in all from five to six thousand. These are minute tubes which we may appropriately term *spinnerules*, as each is connected with the internal reservoirs, and emits a thread of inconceivable fineness. Fig. 9. represents this wonderful apparatus as it appears in the microscope.

We do not recollect that naturalists have ventured to assign any cause for this very remarkable multiplicity of the spinnerules of spiders, so different from the simple spinneret of caterpillars. To us it appears an admirable provision for their mode of life. Caterpillars neither require such strong materials, nor that their thread should dry as quickly. It is well known in our manufactures, particularly in rope-spinning, that in cords of equal thickness, those which are composed of many smaller ones united are stronger than those spun at once. In the instance of the spider's thread, this principle must hold still more strikingly, inasmuch as it is composed of fluid materials that require to be dried rapidly, and this drying must be greatly facilitated by exposing so many to the air separately before their union, which is effected at about the tenth of an inch from the spinnerets. In Fig. 10. Plate IV. each of the threads shown is represented to contain one hundred minute threads, the whole forming only one of the spider's common threads.

In the figure the threads are, of course, greatly magnified, so that, for the small space represented, the lines are shown as parallel. The threadlets, or filaments as they come from the papillæ, are too fine to be counted with any degree of accuracy, but it is evident that very many are sent forth from each of the larger papillæ. This fact tends to explain the power possessed by the spider of producing threads having different degrees of tenuity. By applying more or less of these papillæ against the place whence it begins its web, the spider joins into one thread the almost imperceptible individual filaments which it draws from its body; the size of this thread being dependent on the number of nipples employed, and regulated by that instinct which teaches the creature to make choice of the degree of exility most appropriate to the work wherein it is about to engage.

Reaumur relates that he has often counted as many as seventy or eighty fibres through a microscope, and perceived that there were yet infinitely more than he could reckon; so that he believed himself to be far within the limit of truth in computing that the tip of *each* of the five papillæ furnished 1000 separate fibres: thus supposing that one slender filament of a spider's web is made up of 5000 fibres!

Leeuwenhoek, in one of his extraordinary microscopical observations on a young spider, not bigger than a grain of sand, upon enumerating the threadlets in one of its threads, calculated that it would require *four millions* of them to be as thick as a hair of his head!

Another important advantage derived by the spider from the multiplicity of its threadlets is, that the thread affords a much more secure attachment to a wall, a branch of a tree, or any other object, than if it were simple; for, upon pressing the spinneret against the object, as spiders always do when they fix a thread, the spinnerules are extended over an area of some diameter, from every hair's breadth of which a strand, as ropemakers term it, is extended to compound the main cord. Fig. 11. Plate IV. exhibits, magnified, this ingenious contrivance. Those who may be curious to examine it, will see it best when

the line is attached to any black object, for the threads, being whitish, are, in otherwise, not so easily perceived.

SHOOTING OF THE LINES.—It has long been considered a curious though difficult investigation, to determine in what manner spiders, seeing that they are destitute of wings, transport themselves from tree to tree, across brooks, and frequently through the air itself, without any apparant starting point. On looking into the authors who have treated upon this subject, it is surprising how little there is to be met with that is new, even in the most recent. Their conclusions, or rather their conjectural opinions, are, however, worthy of notice; *for by unlearning error, we the more firmly establish truth.*

1. One of the earliest notions upon this subject is that of Blaucanus, the commentator on Aristotle, which is partly adopted by Redi, by Henricus Regius of Utrecht, by Swammerdam*, by Lehmann, as well as by Kirby and Spence†. “The spider’s thread,” says Swammerdam, “is generally made up of two or more parts, and after descending by such a thread, it ascends by one only, and is thus enabled to waft itself from one height or tree to another, even across running waters; the thread it leaves loose behind it being driven about by the wind, and so fixed to some other body.” “I placed,” says Kirby, “the large garden spider (*Epeira diadema*) upon a stick about a foot long, set upright in a vessel containing water. . . . It let itself drop, not by a single thread, but by *two*, each distant from the other about the twelfth of an inch, guided, as usual, by one of its hind feet, and that one apparently smaller than the other. When it had suffered itself to descend nearly to the surface of the water, it stopped short, and by some means, which I could not distinctly see, broke off, close to the spinners, the smallest thread, which still adhering by the other end to the top of the stick, floated in the air, and was so light as to be carried about by the slightest breath. On approaching a pencil to the loose end of this line, it did not adhere from mere contact. I, therefore, twisted it once or twice round the pencil, and then drew it tight. The spider, which had previously climbed

* Swammerdam, part i. p. 24.

† Intr. vol. i. p. 415.

to the top of the stick, immediately pulled at it with one of its feet, and finding it sufficiently tense, crept along it, strengthening it as it proceeded by another thread, and thus reached the pencil."

1. "We have repeatedly witnessed this occurrence," says Mr. Rennie, "in the fields, and when spiders were placed for experiment, as Kirby has described; but we very much doubt that the thread broken is ever intended as a bridge cable, or that it would have been so used in that instance, had it not been artificially fixed and again accidentally found by the spider. According to our observations, a spider never for an instant, abandons, the thread which she dispatches in quest of an attachment, but uniformly keeps trying it with her feet, in order to ascertain its success. We are, therefore, persuaded, that when a thread is broken in the manner above described, it is because it has been spun too weak, and spiders may often be seen breaking such threads in the process of netting their webs."

The plan, besides, as explained by these distinguished writers, would more frequently prove abortive than successful, from the cut thread not being sufficiently long. They admit, indeed, that spiders' lines are often found "a yard or two long, fastened to twigs of grass not a foot in height. . . . Here, therefore, some other process must have been used*."

2. The celebrated English naturalist, Dr. Lister, whose treatise upon the native spiders of that country, has been the basis of every subsequent work on the subject, maintains that "some spiders shoot out their threads in the same manner that porcupines do their quills†; that whereas the quills of the latter are entirely separated from their bodies, when thus shot out, the threads of the former remain fixed to their anus, as the sun's rays to its body‡." A French periodical writer goes a little farther, and says, that spiders have the power of shooting out threads, *and directing them at pleasure towards a determined point*, judging of the distance and position of the ob-

* Kirby and Spence, vol. i. Intr. p. 416.

† Porcupines do not shoot out their quills, as was once generally believed.

‡ Lister, Hist. Animalia Angliæ, 4to. p. 7.

ject by some sense of which we are ignorant*. Kirby also says, that he once observed a small garden spider (*Aranea reticulata*) "standing midway on a long perpendicular fixed thread, and an appearance caught" his "eye, of what seemed to be the emission of threads." "I," therefore, he adds, "moved my arm in the direction in which they apparently proceeded, and, as I had suspected, a floating thread attached itself to my coat, along which the spider crept. As this was connected with the spinners of the spider, it could not have been formed" by breaking a "secondary thread†." Again, in speaking of the gossamer-spider, he says, "it first extends its thigh, shank, and foot, into a right line, and then, elevating its abdomen till it becomes vertical, *shoots its thread* into the air, and flies off from its station‡."

Another distinguished naturalist, Mr. White of Selborne, in speaking of the gossamer-spider, says, "Every day in fine weather in autumn do I see these spiders shooting out their webs, and mounting aloft: they will go off from the finger, if you take them into your hand. Last summer, one alighted on my book as I was reading in the parlor; ran to the top of the page, and *shooting out a web*, took its departure from thence. But what I most wondered at, was, that it went off with considerable velocity in a place where no air was stirring; and I am sure I did not assist it with my breath§."

"Having so often witnessed," says Mr. Rennie, "the thread set afloat in the air by spiders, we can readily conceive the way in which those eminent naturalists were led to suppose it to be ejected by some animal force acting like a syringe; but as the statement can be completely disproved by experiment, we shall only at present ask, in the words of Swammerdam—'how can it be possible that a thread so fine and slender should be shot out with force enough to divide and pass through the air?—is it not rather probable that the air would stop its progress, and so entangle it and fit it to perplex the spider's operations||?'"

* Phil. Mag. ii. p. 275.

† Vol. i. Intr. p. 417.

‡ Ibid. ii. p. 339.

§ Nat. Hist. of Selborne, vol. i. p. 327. || Book of Nature, part i. p. 25.

The opinion, indeed, is equally improbable with another suggested by Dr. Lister, that the spider can retract her thread within the abdomen, after it has been emitted*. De Geert† very justly joins Swammerdam in rejecting both of these fancies, which, in our own earlier observations upon spiders, certainly struck us as plausible and true. There can be no doubt, indeed, that the animal has a voluntary power of permitting the material to escape, or stopping it at pleasure, but this is not projectile.

3. "There are many people," says the Abbé de la Pluche, "who believe that the spider flies when they see her pass from branch to branch, and even from one high tree to another; but she transports herself in this manner; and places herself upon the end of a branch, or some projecting body, and there fastens her thread; after which, with her two hind feet, she squeezes her dugs (*spinnerets*), and presses out one or more threads of two or three ells in length, which she leaves to float in the air till it be fixed to some particular place‡." Without pretending to have observed this, Swammerdam says, "I can easily comprehend how spiders, without giving themselves any motion, may, by only compressing their spinnerets, force out a thread, which being driven by the wind, may serve to waft them from place to place§." Others, proceeding upon a similar notion, give a rather different account of the matter. "The spider," says Bingley, "fixes one end of a thread to the place where she stands, and then with her hind paws *draws out* several other threads from the nipples, which, being lengthened out and driven by the wind to some neighboring tree or other object, are by their natural clamminess fixed to it||."

Observation gives some plausibility to the latter opinion, as the spider always actively uses her legs, though not to draw out the thread, but ascertain whether it has caught upon any object. The notion of her pressing the spinneret with her feet

* Hist. Anim. Anglæ, 4to.

† Mémoires, vol. vii. p. 189

‡ Spectacle de la Nature, vol. i.

§ Book of Nature, pt. i. p. 25.

|| Animal Biography, vol. iii. p. 475, 3d edition.

must be a mere fancy ; at least it is not countenanced by anything which we have observed.

4. An opinion much more recondite is mentioned, if it was not started, by M. D'Isjonval, that the floating of the spider's thread is electrical. "Frogs, cats, and other animals," he says, "are affected by natural electricity, and feel the change of weather ; but no other animal more than myself and spiders." In wet and windy weather he accordingly found that they spun very short lines, "*but when a spider spins a long thread, there is a certainty of fine weather for at least ten or twelve days afterwards**." A periodical writer, who signs himself Carolanf, fancies that in darting out her thread the spider emits a stream of air, or some subtle electric fluid, by which she guides it as if by magic.

A living writer (Mr. John Murray) whose learning and skill in conducting experiments give no little weight to his opinions, has carried these views considerably farther. "The aeronautic spider," he says, "can propel its thread both horizontally and vertically, and at all relative angles, *in motionless air* and in an *atmosphere agitated by winds* ; nay more, the aerial traveller can even dart its thread, to use a nautical phrase, in the 'wind's eye.' My opinion and observations are based on many hundred experiments. . . . The entire phenomena are electrical. When a thread is propelled in a vertical plane, it remains perpendicular to the horizontal plane always upright, and when others are projected at angles more or less inclined, their direction is invariably preserved ; the threads never intermingle, and when a pencil of threads is propelled, it ever presents the appearance of a divergent brush. These are electrical phenomena, and cannot be explained but on electrical principles."

"In clear, fine weather, the air is invariably positive ; and it is precisely in such weather that the aeronautic spider makes its ascent most easily and rapidly, whether it be in summer or winter." "When the air is weakly positive, the ascent of the

* Brez, Flore des Insectophiles. Notes, Supp. p. 134.

† Thomson's Ann. of Philosophy, vol. iii. p. 306.

spider will be difficult, and its altitude extremely limited, and the threads propelled will be but little elevated above the horizontal plane. When negative electricity prevails, as in cloudy weather, or on the approach of rain, and the index of De Saussure's hygrometer rapidly advancing towards humidity, the spider is unable to ascend*."

Mr. Murray tells us, that "when a stick of excited sealing-wax is brought near the thread of suspension, it is evidently repelled; consequently, the electricity of the thread is of a negative character," while "an excited glass tube brought near, seemed to attract the thread, and with it the aëronautic spider†." His friend, Mr. Bowman, further describes the aërial spider as "shooting out four or five, often six or eight, extremely fine webs several yards long, which waved in the breeze, diverging from each other like a pencil of rays." One of them "had two distinct and widely diverging fasciculi of webs," and "a line uniting them would have been at right angles to the direction of the breeze‡."

"Such is the chief evidence in support of the electrical theory," says Mr. Rennie; "but though we have tried these experiments, we have not succeeded in verifying any one of them. The following statements of Mr. Blackwall come nearer our own observations.

5. 'Having procured a small branched twig,' says Mr. Blackwall, 'I fixed it upright in an earthen vessel containing water, its base being immersed in the liquid, and upon it I placed several of the spiders which produce gossamer. Whenever the insects thus circumstanced were exposed to a current of air, either naturally or artificially produced, they directly turned the thorax towards the quarter whence it came, even when it was so slight as scarcely to be perceptible, and elevating the abdomen, they emitted from their spinners a small portion of glutinous matter, which was instantly carried out in a line, consisting of four finer ones, with a velocity equal, or nearly

* Loudon's Mag. of Nat. Hist., vol. i. p. 322.

† Experim. Researches in Nat. Hist., p. 136

‡ Mag. Nat. Hist. vol. i. p. 324.

so, to that with which the air moved, as was apparent from observations made on the motion of detached lines similarly exposed. The spiders, in the next place, carefully ascertained whether their lines had become firmly attached to any object or not, by pulling at them with the front pair of legs; and if the result was satisfactory, after tightening them sufficiently, they made them pass to the twig; then discharging from their spinners, which they applied to the spot where they stood, a little more of their liquid gum, and committing themselves to these bridges of their own constructing, they passed over them in safety, drawing a second line after them, as a security in case the first gave way, and so effected their escape.

‘Such was invariably the result when spiders were placed where the air was liable to be sensibly agitated: I resolved, therefore, to put a bell-glass over them; and in this situation they remained seventeen days, evidently unable to produce a single line by which they could quit the branch they occupied, without encountering the water at its base; though, on the removal of the glass, they regained their liberty with as much celerity as in the instances already recorded.

‘This experiment, which, from want of due precaution, has misled so many distinguished naturalists, I have tried with several geometric spiders, and always with the same success*.’”

Mr. Blackwall, from subsequent experiments, says he is “confident in affirming, that in motionless air, spiders have not the power of darting their threads even through the space of half an inch†.” The following details are given in confirmation of this opinion. Mr. Blackwall observed, the 1st of Oct., 1826, a little before noon, with the sun shining brightly, no wind stirring; and the thermometer in the shade ranging from 55°.5 to 64°, a profusion of shining lines crossing each other at every angle, forming a confused net-work, covering the fields and hedges, and thickly coating his feet and ankles, as he walked across a pasture. He was more struck with the phenomenon because on the previous day a strong gale of wind had blown from the south, and as gossamer is only seen in calm

* Linn. Trans., vol. xv. p. 456.

† Mag. Nat. Hist., vol. ii. p. 397.

weather, it must have been all produced within a very short time.

“What more particularly arrested my attention,” says Mr. Blackwall, “*was the ascent of an amazing quantity of webs of an irregular, complicated structure, resembling ravelled silk of the finest quality, and clearest white ; they were of various shapes and dimensions, some of the largest measuring upwards of a yard in length, and several inches in breadth in the widest part ; while others were almost as broad as long, presenting an area of a few square inches only.*”

“These webs, it was quickly perceived, were not formed in the air, as is generally believed, *but at the earth's surface.* The lines of which they were composed, being brought into contact by the mechanical action of gentle airs, adhered together, till, by continual additions, they were accumulated into flakes or masses of considerable magnitude, on which the ascending current, occasioned by the rarefaction of the air contiguous to the heated ground, acted with so much force as to separate them from the objects to which they were attached, raising them in the atmosphere to a perpendicular height of at least several hundred feet. I collected a number of these webs about mid-day, as they rose ; and again in the afternoon, when the upward current had ceased, and they were falling ; but scarcely one in twenty contained a spider : though, on minute inspection, I found small winged insects, chiefly *aphides*, entangled in most of them.

“From contemplating this unusual display of gossamer, my thoughts were naturally directed to the animals which produced it, and the countless myriads in which they swarmed almost created as much surprise as the singular occupation that engrossed them. Apparently actuated by the same impulse, all were intent upon traversing the regions of air ; *accordingly, after gaining the summits of various objects, as blades of grass, stubble, rails, gates, &c., by the slow and laborious process of climbing, they raised themselves still higher by strengthening their limbs ; and elevating the abdomen, by bringing it from the usual horizontal position into one al-*

most perpendicular, they emitted from their spinning apparatus a small quantity of the glutinous secretion with which they construct their webs. This viscous substance being drawn out by the ascending current of rarefied air into fine lines several feet in length, was carried upward, until the spiders, feeling themselves acted upon with sufficient force in that direction, quitted their hold of the objects on which they stood, and commenced their journey by mounting aloft.

“Whenever the lines became inadequate to the purpose for which they were intended, by adhering to any fixed body, they were immediately detached from the spinners and so converted into terrestrial gossamer, by means of the last pair of legs, and the proceedings just described were repeated; which plainly proves that these operations result from a strong desire felt by the insects to effect an ascent*.” Mr. Blackwall has recently read a paper (still unpublished) in the Linnæan Society, confirmatory of his opinions.

6. “Without going into the particulars,” says Mr. Rennie, “of what agrees or disagrees in the above experiments with our own observations, we shall give a brief account of what we have actually seen in our researches. So far as we have determined, then, all the various species of spiders, how different soever the form of their webs may be, proceed in the circumstance of shooting their lines precisely alike; but those which we have found the most manageable in experimenting, are the small gossamer spider (*Aranea obtextrix*, BECHSTEIN), known by its shining blackish-brown body and reddish-brown semi-transparent legs; but particularly the long-bodied spider (*Tetragnathia extensa*, LATR.), which varies in color from green to brownish or grey—but has always a black line along the belly, with a silvery white or yellowish one on each side. The latter is chiefly recommended by being a very industrious and persevering spinner, while its movements are easily seen, from the long cylindrical form of its body and the length of its legs.

“We placed the above two species with five or six others, including the garden, the domestic, and the labyrinthic spiders,

* Linn. Trans., vol. xv. p. 453.

in empty wine-glasses, set in tea-saucers filled with water, to prevent their escape. When they discovered, by repeated descents from the brims of the glasses, that they were thus surrounded by a wet ditch, they all set themselves to the task of throwing their silken bridges across. For this purpose they first endeavored to ascertain in what direction the wind blew, or rather (as the experiment was made in our study) which way any current of air set,—by elevating their arms *as we have seen sailors do in a dead calm*. But, as it may prove more interesting to keep to one individual, we shall first watch the proceedings of the gossamer spider.

“Finding no current of air on any quarter of the brim of the glass, it seemed to give up all hopes of constructing its bridge of escape, and placed itself in the attitude of repose; *but no sooner did we produce a stream of air, by blowing gently towards its position, than, fixing a thread to the glass, and laying hold of it with one of its feet, by way of security, it placed its body in a vertical position, with its spinnerets extended outwards; and immediately we had the pleasure of seeing a thread streaming out from them several feet in length, on which the little aëronaut sprung up into the air*. We were convinced, from what we thus observed, that it was the double or bend of the thread which was blown into the air; and we assigned as a reason for her previously attaching and drawing out a thread from the glass, the wish to give the wind a *point d'appui*—something upon which it might have a *purchase*, as a mechanic would say of a lever. The bend of the thread, then, on this view of the matter, would be carried out by the wind,—would form the point of impulsion,—and, of course, the escape bridge would be an ordinary line doubled.”

Such is the opinion of Mr. Rennie, which is strongly corroborated by what has been said by M. Latreille—than whom no higher authority could be given. “When the animal,” says he, “desires to cross a brook, she fixes to a tree or some other object one of the ends of her first threads, in order that the wind or a current of air may carry the other beyond the obstacle* ;”

* — “L’un des bouts de ces premiers fils, afin que le vent ou un courant

and as one end is always attached to the spinnerets, he must mean that the double of the thread flies off. In his previous publications, however, Latreille had contented himself with copying the statement of Dr. Lister. "In order to ascertain the fact," says Mr. Rennie, "and put an end to all doubts, we watched, with great care and minuteness, the proceedings of the long-bodied spider above mentioned, by producing a stream of air in the same manner, as it perambulated the brim of the glass. It immediately, as the other had done, attached a thread and raised its body perpendicularly, like a tumbler standing on his hands with his head downwards; but we looked in vain for this thread bending, as we had at first supposed, and going off double. Instead of this it remained tight, while another thread, or what appeared to be so, streamed off from the spinners, similar to smoke issuing through a pin-hole, sometimes in a line, and sometimes at a considerable angle, with the first, according to the current of the air,—the first thread, extended from the glass to the spinnerets, remaining all the while tight drawn in a right line. It further appeared to us, that the first thread proceeded from the pair of spinnerets nearest the head, while the floating thread came from the outer pair,—though it is possible in such minute objects we may have been deceived. That the first was continuous with the second, without any perceptible joining, we ascertained in numerous instances, by catching the floating line and pulling it tight, in which case the spider glides along without attaching another line to the glass; but if she have to coil up the floating line to lighten it, as usually happens, she gathers it into a packet and glues the two ends tight together. Her body, while the floating line streamed out, remained quite motionless, but we distinctly saw the spinnerets not only projected, as is always done when a spider spins, but moved in the same way as an infant moves its lips when sucking. We cannot doubt, therefore, that this motion is intended to emit (if eject or project be deemed words too strong), the liquid material of the thread; at the same time,

d'air pousse l'autre extrémité de l'un d'eux au de là de l'obstacle."—Dict. Classique d'Hist. Nat., vol. i. p. 510.

we are quite certain that it cannot throw out a single inch of thread *without the aid of a current of air*. A long-bodied spider will thus throw out in succession as many threads as we please, by simply blowing towards it ; but not one where there is no current, as under a bell-glass, where it may be kept till it die, without being able to construct a bridge over water of an inch long. We never observed more than one floating thread produced at the same time ; though other observers mention several.

“ The probable commencement, we think, of the floating line, is by the emission of little globules of the glutinous material to the points of the spinnerules—perhaps it may be dropped from them, if not ejected, and the globules being carried off by the current of air, drawn out into a thread. But we give this as only a conjecture, for we could not bring a glass of sufficient power to bear upon the spinnerules at the commencement of the floating line.

“ In subsequent experiments we found, that it was not indispensable for the spider to rest upon a solid body when producing a line, as she can do so while she is suspended in the air by another line. When the current of air also is strong, she will sometimes commit herself to it by swinging from the end of the line. We have even remarked this when there was scarcely a breath of air.

“ We tried another experiment. We pressed pretty firmly upon the base of the spinnerets, so as not to injure the spider, blowing obliquely over them ; but no floating line appeared. We then touched them with a pencil and drew out several lines an inch or two in length, upon which we blew in order to extend them, but in this also we were unsuccessful, as they did not lengthen more than a quarter of an inch. We next traced out the reservoirs of a garden-spider (*Epeira diadema*), and immediately taking a drop of the matter from one of them on the point of a fine needle, we directed upon it a strong current of air, and succeeded in blowing out a thick yellow line, as we might have done with gum-water, of about an inch and a half long.

“ When we observed our long-bodied spider eager to throw a

line by raising up its body, we brought within three inches of its spinnerets an excited stick of sealing-wax, of which it took no notice, nor did any thread extend to it, not even when brought almost to touch the spinnerets. We experienced the same want of success with an excited glass rod; and indeed had not anticipated any other result, as we have never observed that either these attract or repel the floating threads, as Mr. Murray has seen them do; nor have we ever noticed the end of a floating thread separated into its component threadlets and diverging like a brush, as he and Mr. Bowman describe (See Fig. 11.). It may be proper to mention that Mr. Murray, in conformity with his theory, explains the shooting of lines in a current of air by the electric state produced by motion in consequence of the mutual friction of the gaseous particles. But this view of the matter does not seem to affect our statements."

NESTS, WEBS, AND NETS OF SPIDERS.—“The neatest,” says Mr. Rennie, “though the smallest spider’s nest which we have seen, was constructed in the chink of a garden-post, which we had cut out the previous summer in getting at the cells of a carpenter-bee. The architect was one of the larger hunting-spiders, erroneously said by some naturalists to be incapable of spinning. The nest in question was about two inches high, composed of a very close satin-like texture. There were two parallel chambers placed perpendicularly, in which position also the inhabitant reposed there during the day, going, as we presume, only abroad to prey during the night. But the most remarkable circumstance was, that the openings (two above and two below) were so elastic, that they shut closely together. We observed this spider for several months, but at last it disappeared, and we took the nest out under the notion that it might contain eggs; but found none, and therefore concluded that it was only used as a day retreat.” The account which Evelyn has given of these hunting spiders is so interesting that we must transcribe it.

“Of all sorts of insects,” says he, “none have afforded me more divertisement than the *venatores* (hunters), which are a sort of *lupi* (wolves) that have their dens in rugged

walls and crevices of our houses ; a small brown and delicately-spotted kind of spiders, whose hinder legs are longer than the rest. Such I did frequently observe at Rome, which, espying a fly at three or four yards distance, upon the balcony where I stood, would not make directly to her, *but crawl under the rail, till being arrived to the antipodes, it would steal up, seldom missing its aim ; but if it chanced to want anything of being perfectly opposite, would, at first peep, immediately slide down again,—till taking better notice, it would come the next time exactly upon the fly's back : but if this happened not to be within a competent leap, then would this insect move so softly, as the very shadow of the gnomon seemed not to be more imperceptible, unless the fly moved ; and then would the spider move also in the same proportion, keeping that just time with her motion, as if the same soul had animated both these little bodies ; and whether it were forwards, backwards, or to either side, without at all turning her body, like a well-managed horse : but if the capricious fly took wing and pitched upon another place behind our huntress, then would the spider whirl its body so nimbly about, as nothing could be imagined more swift : by which means she always kept the head towards her prey, though, to appearance, as immoveable as if it had been a nail driven into the wood, till by that indiscernible progress (being arrived within the sphere of her reach) she made a fatal leap, swift as lightning, upon the fly, catching him in the pole, where she never quitted hold till her belly was full, and then carried the remainder home."*

One feels a little sceptical, however, when he adds, "I have beheld them *instructing their young ones how to hunt*, which they would sometimes discipline for not well observing ; but when any of the old ones did (as sometimes) miss a leap, *they would run out of the field and hide themselves in their cran-nies, as ashamed, and haply not to be seen abroad for four or five hours after ;* for so long have I watched the nature of this strange insect, the contemplation of whose so wonderful sagacity and address has amazed me ; nor do I find in any chase whatsoever more cunning and stratagem observed. I

have found some of these spiders in my garden, when the weather, towards spring, was very hot, but they are not so eager in hunting as in Italy*.”

We have only to add to this lively narrative, that the hunting-spider, when he leaps, takes good care to provide against accidental falls by always swinging himself from a good strong cable of silk, as Swammerdam correctly states†, and which anybody may recognise, as one of the small hunters (*Salticus scenicus*), known by its back striped with black and white like a zebra.

Mr. Weston, the editor of “Bloomfield’s Remains,” falls into a very singular mistake about hunting-spiders, imagining them to be web-weaving ones which have exhausted their materials, and are therefore compelled to hunt. In proof of this he gives an instance which came under his own observation‡ !

“As a contrast,” says Mr. Rennie, “to the little elastic satin nest of the hunter, we may mention the largest with which we are acquainted,—that of the labyrinthic spider (*Agelena labyrinthica*, WALCKENAER). Our readers must often have seen this nest spread out like a broad sheet in hedges, furze, and other low bushes, and sometimes on the ground. The middle of this sheet, which is of a close texture, is swung like a sailor’s hammock, by *silken* ropes extended all around to the higher branches; but the whole curves upwards and backwards, sloping down to a long funnel-shaped gallery which is nearly horizontal at the entrance, but soon winds obliquely till it becomes quite perpendicular. This curved gallery is about a quarter of an inch in diameter, is much more closely woven than the sheet part of the web, and sometimes descends into a hole in the ground, though oftener into a group of crowded twigs, or a tuft of grass. Here the spider dwells secure, frequently resting with her legs extended from the entrance of the gallery, ready to spring out upon whatever insect may fall into her sheet net. She herself can only be caught by getting behind her and forcing her out into the web; but though we

* Evelyn’s Travels in Italy.

† Book of Nature, part i. p. 24.

‡ Bloomfield’s Remains, vol. ii. p. 64, *note*.

have often endeavored to make her construct a nest under our eye, we have been as unsuccessful as in similar experiments with the common house spider (*Aranea domestica*).

“The house spider’s proceedings were long ago described by Homberg, and the account has been copied, as usual, by almost every subsequent writer. Goldsmith has, indeed, given some strange mis-statements from his own observations, and Bingley has added the original remark, that, after fixing its first thread, creeping along the wall, and joining it as it proceeds, it ‘*darts itself to the opposite side*, where the other end is to be fastened*!’ Homberg’s spider took the more circuitous route of travelling to the opposite wall, carrying in one of its claws the end of the thread previously fixed, lest it should stick in the wrong place. This we believe to be the correct statement, for as the web is always horizontal, it would seldom answer to commit a floating thread to the wind, as is done by other species. Homberg’s spider, after stretching as many lines by way of *warp* as it deemed sufficient between the two walls of the corner which it had chosen, proceeded to cross this in the way our weavers do in adding the *woof*, with this difference, that the spider’s threads were only laid on, and not interlaced†. The domestic spiders, however, in these modern days, must have forgot this mode of weaving, for none of their webs will be found thus regularly constructed!”

The geometric, or net-working spiders (See Fig. 12. Plate IV.) are as well known as any of the preceding; almost every bush and tree in our gardens and hedge-rows having one or more of their nests stretched out in a vertical position between adjacent branches. The common garden spider (*Epeira diadema*), and the long-bodied spider (*Tetragnatha extensa*), are the best known of this order.

“The chief care of a spider of this sort,” says Mr. Rennie, “is, to form a cable of sufficient strength to bear the net she means to hang upon it; and after throwing out a floating line as above described, when it catches properly, she doubles and

* Animal Biography, iii. 470, 471.

† Mem. de l’Acad. des Sciences, pour 1707, p. 339.

redoubles it with additional threads. On trying its strength she is not contented with the test of pulling it with her legs, but drops herself down several feet from various points of it, as we have often seen, swinging and bobbing with the whole weight of her body. She proceeds in a similar manner with the rest of the frame of her wheel-shaped net; and it may be remarked that some of the ends of these lines are not simple, but in form of a Y, giving her the additional security of two attachments instead of one."

In constructing the body of the nest, the most remarkable circumstance is the using of her limbs as a measure, to regulate the distances of her *radii* or wheel-spokes (See Fig. 12. Plate IV., which represents the geometric net of the "*Epeira diadema*"), and the circular meshes interwoven into them. These are consequently always proportional to the size of the spider. She often takes up her station in the centre, but not always, though it is so said by inaccurate writers; but she as frequently lurks in a little chamber constructed under a leaf or other shelter at the corner of her web, ready to dart down upon whatever prey may be entangled in her net. The centre of the net is said also to be composed of more viscid materials than its suspensory lines,—a circumstance alleged to be proved by the former appearing under the microscope studded with globules of gum*. "We have not been able," says Mr. Rennie, "to verify this distinction, having seen the suspensory lines as often studded in this manner as those in the centre."

At the commencement of the last century a method was discovered in France by Monsieur Bon, of procuring silk from spiders' bags, and its use was attempted in the manufacture of several articles. Mr. Bon has, however, noticed only *two* kinds of silk-making spiders, and these he has distinguished from each other as having either long or short legs, the last variety producing the finest quality of raw silk. According to this ingenious observer, the silk formed by these insects is equally beautiful, strong, and glossy with that formed by the silk-worm. When first formed, the color of these spiders' bags is gray, but,

* Kirby and Spence, Intr. i. 419.

by exposure to the air, they soon acquire a blackish hue. Other spider bags might probably be found of different colors, and affording silk of better quality, but their scarcity would render any experiment with them difficult of accomplishment; for which reason M. Bon confined his attention to the bags of the common sort of the short-legged kind.

These always form their bags in some place sheltered from the wind and rain, such as the hollow trunks of trees, the corners of windows or vaults, or under the eaves of houses. A quantity of the bags was collected from which a new kind of silk was made, said to be in no respect inferior to the produce of the silk-worm. It took readily all kinds of dyes, and might have been wrought into any description of silken fabric. Mr. Bon had stockings and gloves made from it, some of which he presented to the Royal Academy of Paris, and others he transmitted to the Royal Society of London.

This silk was prepared in the following manner:—Twelve or thirteen ounces of the bags were beaten with a stick, until they became entirely freed from dust. They were next washed in warm water, which was continually changed, until it no longer became clouded or discolored by the bags under process. After this they were steeped in a large quantity of water wherein soap, saltpetre, and gum-arabic had been dissolved. The whole was then gently boiled during three hours, after which the bags were rinsed in clear warm water to discharge the soap. They were finally set out to dry, previous to the operation of carding, which was then performed with cards differing from those usually employed with silk, being much finer. By these means silk of a peculiar ash color was obtained, which was spun without difficulty. Mr. Bon affirmed that the thread was both stronger and finer than common silk, and that therefore fabrics similar to those made with the latter material might be manufactured from this, there being no reason for doubting that it would stand any trials of the loom, after having undergone those of the stocking frame.

The only obstacle, therefore, which appeared to prevent the establishing of any considerable manufacture from these spider bags was the difficulty of obtaining them in sufficient abund-

ance. Mr. Bon fancied that this objection could soon be overcome, and that the art of domesticating and rearing spiders, as practised with silk-worms, was to be attained. Carried away by the enthusiasm of one who, having made a discovery, pursues it with ardor undismayed by difficulties, he met every objection by comparisons, which perhaps were not wholly and strictly founded on fact. Contrasted with the spider, and to favor his arguments, the silk-worm in his hands made a very despicable figure. He affirmed that the female spider produces 600 or 700 eggs; while of the 100, to which number he limited the silk-worm, not more than one-half were reared to produce balls. That the spiders hatched spontaneously, without any care, in the months of August and September; that the old spiders dying soon after they have laid their eggs, the young ones live for ten or twelve months without food, and continue in their bags without growing, until the hot weather, by putting their viscid juices in motion, induces them to come forth, spin, and run about in search of food.

Mr. Bon's spider establishment, was managed in the following manner:—having ordered all the short-legged spiders which could be collected by persons employed for the purpose, to be brought to him, he inclosed them in paper coffins and pots; these were covered with papers, which, as well as the coffins, were pricked over their surface with pin-holes to admit air to the prisoners. The insects were duly fed with flies, and after some time it was found on inspection that the greater part of them had formed their bags. This advocate for the rearing of spiders contended that spiders' bags afforded much more silk in proportion to their weight than those of the silk-worm; in proof of which he observed, that thirteen ounces yield nearly four ounces of pure silk, two ounces of which were sufficient to make a pair of stockings; whereas stockings made of common silk were said by him to weigh seven or eight ounces.

It was objected by some of Mr. Bon's contemporaries, that spiders were venomous; and this is so far true that a bite from some of the species is very painful, producing as much swelling as the smart sting of a nettle. Mr. Bon, however, asserted that

he was several times bitten, without experiencing any inconvenience ; if so, he was more fortunate or less sensitive than any of the spider-tamers with whom we have been acquainted. It was further asserted, that this venom extended itself to the silk which the spider produced ; but this assertion was utterly absurd, as any one who has ever applied a cobweb to stop the bleeding from a cut ought to have known. Mr. Bon declared with perfect truth, that the silk, so far from being pernicious, was useful in staunching and healing wounds, its natural gluten acting as a kind of balsam.

The honest enthusiasm of the projector, and the singularity of a regular establishment being formed for rearing and working spiders, excited a considerable share of public attention. It was, indeed, an age of strange speculations, for nearly at the same time a German gentleman broached a scheme for turning tame squirrels and mice to account in spinning ; and companies were formed in England, with large nominal capitals to carry out schemes still more preposterous. So important did Mr. Bon's project appear to the French Academy, that they deputed the eminent naturalist, M. Reaumur, to investigate the merits of this new silk-filament.

After a long and patient examination M. Reaumur stated the following objections to Mr. Bon's plan for raising spider-silk, which have ever since been regarded as insurmountable.

1. The natural fierceness of spiders renders them unfit to be bred together. On distributing four or five thousand of these insects into cells or companies of from fifty to one or two hundred, it was found that the larger spiders quickly *killed and ate the smaller*, so that in a short space of time the cells were depopulated, scarcely more than one or two being found in each cell.

2. The silk of the spider is inferior to that of the silk-worm both in lustre and strength ; and produces less material in proportion, than can be made available for the purposes of the manufacture. The filament of the spider's-bag can support a weight of only thirty-six grains, while that of the silk-worm will sustain a weight of one hundred and fifty grains. Thus four or five threads of the spider must be brought together to

equal one thread of the silk-worm, and as it is impossible that these should be applied so accurately over each other as not to leave little vacant spaces between them, the light is not equally reflected, and the lustre of the material is consequently inferior to that in which a solid thread is used.

3. A great disadvantage of the spider's silk is, that it cannot be wound off the ball like that of the silk-worm, but must necessarily be carded. By this latter process, its evenness, which contributes so materially to its lustre, is destroyed.

The ferociousness and pugnacity of the spiders are not exaggerated; they fight like furies. Their voracity, too, is almost incredible, and it is very questionable whether the mere collection of flies sufficient to feed a large number of the spiders would not involve an amount of expense fatal to the project as a lucrative undertaking. The strength of the spiders' filament is, if anything, overstated by Reaumur. Deficiency of lustre arising from the carding of the filaments is common to the spider-fabric and to spun silk; this objection would, perhaps, not be of very great weight but for the decisive calculation by which Reaumur showed the comparative amount of production between the spider and the silk-worm.

The largest cocoons weigh four, and the smaller three grains each; spider-bags do not weigh above one grain each; and, after being cleared of their dust, have lost two-thirds of this weight; therefore the *work of twelve spiders* equals that of *only one silk-worm*; and a pound of spider-silk would require for its production 27,648 insects. But as the bags are wholly the work of the females, who spin them as a deposit for their eggs, it follows that 55,296 spiders must be reared to yield one pound of silk: yet this will be obtained only from the best spiders; those large ones ordinarily seen in gardens, &c., yielding not more than a twelfth part of the silk of the others. The work of 280 of these would therefore not yield more silk than the produce of one industrious silk-worm, and 663,552 of them would furnish only one pound of silk!

Although Reaumur's report completely extinguished Mr. Bon's project in France, it was revived in England two or three times in the early part of the last century. Swift has

not neglected to make it a portion of his unrivalled satire against speculators and projectors, in his account of Gulliver's visit to the Academy of Lagado :

“ I went into another room, says he, where the walls and ceilings were all hung round with cobwebs, except a narrow passage for the artist to go in and out. At my entrance he called out to me not to disturb his webs. He lamented the fatal mistake the world had been so long in, of using silk-worms, while we had such plenty of domestic insects, who infinitely excelled the former, because they understood how to weave as well as spin. And he proposed further, that, by employing spiders, the charge of dyeing silk should be wholly saved ; whereof I was fully convinced, when he showed me a vast number of flies most beautifully colored, wherewith he fed his spiders, assuring us that the webs would take a tincture from them, and as he had them of all hues, he hoped to suit every body's fancy, as soon as he could find proper food for the flies, of certain gums, oils, and other glutinous matter to give a strength and consistency to the threads.”

THE INGENUITY OF SPIDERS.—Mr. Thomas Ewbank of New York, in a letter to the Editor of the Journal of the Franklin Institute, bearing date September 20th 1842, gives us the following interesting description of the ingenuity of the Spider.

“ The resources of the lower animals have often excited admiration, and though no comprehensive and systematic series of observations have yet been made upon them(?), the time is, I believe, not distant when the task will be undertaken—perhaps within the next century. But whenever and by whomsoever accomplished, the mechanism of animals will then form the subject of one of the most interesting and *useful* volumes in the archives of man.

“ Among insects, spiders have repeatedly been observed to modify and change their contrivances for *ensnaring their prey*. Those that live in fields and gardens often fabricate their nets or webs vertically. This sometimes occurs in locations where there is no object sufficiently near to which the lower edge or extremity of the web can properly be braced ; and unless this be done, light puffs or breezes of wind are apt to blow it into an entangled mass. Instead of being spread out, like the sail of a ship, to the wind, it would become clewed over the upper line, or edge, like a sail when furled up. Now how would a human engineer act under similar circumstances ? But

ere the reader begins to reflect(!), he should bear in mind that it would not do to brace the web by running rigging from it to some *fixed* or immovable object below—by no means;—for were this done, it could not yield to impulses of wind; the rigging would be snapped by the first blast, and the whole structure probably destroyed.

“ Whatever contrivances human sagacity might suggest, they could hardly excel those which these despised engineers sometimes adopt. Having formed a web, under circumstances similar to those to which we have referred, a spider has been known to descend from it to the ground by means of a thread spun for the purpose, and after selecting a minute pebble, or piece of stone, has coiled the end of the thread round it. Having done this, the ingenious artist ascended, and fixing himself on the lower part of the web, hoisted up the pebble until it swung several inches clear of the ground. The cord to which the weight was suspended was then secured by additional ones, running from it to different parts of the web, which thus acquired the requisite tension, and was allowed, at the same time, to yield to sudden puffs of wind without danger of being rent asunder.

“ A similar instance came under my notice a few days ago. A large spider had constructed his web, in nearly a vertical position, about six feet from the ground, in a corner of my yard. The upper edge was formed by a strong thread, secured at one end to a vine leaf, and the other to a clothes line. One part of the lower edge was attached to a Penyan sun-flower, and another to a trellis fence, four or five feet distant. Between these there was no object nearer than the ground, to which an additional brace line could be carried; but two threads, a foot asunder, descended from this part of the web, and, eight or ten inches below it, were united at a point. From this point, a single line, four or five inches long, was suspended, and to its lower extremity was the weight, a *living one*, viz. a worm, *three inches long*, and *one-eighth of an inch thick*. The cord was fastened around the middle of the victim's body, and as no object was within reach, all its writhings and efforts to escape were fruitless. Its weight answered the same purpose as a piece of inanimate matter, while its sufferings seemed not in the least to

disturb the unconcerned murderer, who lay waiting for his prey above.

“Whether the owner of the web found it a more easy task to capture this unlucky worm and raise it, than to elevate a stone of the same weight, may be a question(?). Perhaps in seeking for the latter, the former fell in his way, and was seized as the first suitable object that came to hand—like the human tyrant, (Domitian) who, to show his skill in archery, planted his arrows in the heads of men or cattle, in the absence of other targets. It may be, however, that a piece of stone, earth, or wood, of a suitable weight, was not in the vicinity of the web.

“To observe the effect of this weight, I separated, with a pair of scissors, the thread by which it was suspended, and instantly the web sunk to half its previous dimensions—the lower part became loose, and with the slightest current kept shaking like a sail shivering in the wind. A fresh weight was not supplied by the next morning; but instead of it two long brace lines extended from the lower part of the web to two vine tendrils, a considerable distance off. These I cut away to see what device would be next adopted, but on going to examine it the following day, I found the clothes line removed, and with it all relics of the insect’s labors had disappeared.”

MASON-SPIDERS.—A no less wonderful structure is composed by a sort of spiders, natives of the tropics and the south of Europe, which have been justly called mason-spiders by M. Latreille. One of these (*Mygale nidulans*, WALCKN.), found in the West Indies, “digs a hole in the earth obliquely downwards, about three inches in length, and one in diameter. This cavity she lines with a tough thick web, which, when taken out, resembles a leathern purse; but what is most curious, this house has a door with hinges, like the operculum of some sea-shells, and herself and family, who tenant this nest, open and shut the door whenever they pass and repass. This history was told me,” says Darwin, “and the nest, with its door, shown me by the late Dr. Butt, of Bath, who was some years physician in Jamaica*.”

* Darwin’s Zoonomia, i. 253; 8vo. ed.

“The nest of a mason-spider, similar to this,” says Mr. Rennie, “has been obligingly put into our hands by Mr. Riddle of Blackheath. It came from the West Indies, and is probably that of Latreille’s clay-kneader (*Mygale cratiens*), and one of the smallest of the genus. We have since seen a pair of these spiders in possession of Mr. William Mello, of Blackheath. The nest is composed of very hard argillaceous clay, deeply tinged with brown oxide of iron. It is in form of a tube, about one inch in diameter, between six and seven inches long, and slightly bent towards the lower extremity—appearing to have been mined into the clay rather than built. The interior of the tube is lined *with a uniform tapestry of silken web, of an orange-white color*, with a texture intermediate between India paper and very fine glove leather. But the most wonderful part of this nest is its entrance, which we look upon as the perfection of insect architecture. A circular door, about the size of a crown piece, slightly concave on the outside and convex within, is formed of more than a dozen layers of the same web which lines the interior, closely laid upon one another, and shaped so that the inner layers are the broadest, the outer being gradually less in diameter, except towards the hinge, which is about an inch long; and in consequence of all the layers being united there, and prolonged into the tube, it becomes the thickest and strongest part of the structure. The elasticity of the materials, also, gives to this hinge the remarkable peculiarity of acting like a spring, and shutting the door of the nest spontaneously. It is, besides, made to fit so accurately to the aperture, which is composed of similar concentric layers of web, that it is almost impossible to distinguish the joining by the most careful inspection. To gratify curiosity, the door has been opened and shut hundreds of times, without in the least destroying the power of the spring. When the door is shut, it resembles some of the lichens (*Lecidea*), or the leathery fungi, such as *Polyporus versicolor* (MICHELI), or, nearer still, the upper valve of a young oyster-shell. The door of the nest, the only part seen above ground, being of a blackish-brown color, it must be very difficult to discover.”

Another mason-spider (*Mygale cæmeataria*, LATR.), found

in the south of France, usually selects for her nest a place bare of grass, sloping in such a manner as to carry off the water, and of a firm soil, without rocks or small stones. She digs a gallery a foot or two in depth, and of a diameter (equal throughout) sufficient to admit of her easily passing. She lines this *with a tapestry of silk glued to the walls*. The door, which is circular, is constructed of many layers of earth kneaded, and bound together with *silk*. Externally, it is flat and rough, corresponding to the earth around the entrance, for the purpose, no doubt, of concealment: on the inside it is convex, *and tapestried thickly with a web of fine silk*. The threads of this door-tapestry are prolonged, and strongly attached to the upper side of the entrance, forming an excellent hinge, which, when pushed open by the spider, shuts again by its own weight, without the aid of spring hinges. When the spider is at home, and her door forcibly opened by an intruder, she pulls it strongly inwards, and even where half-opened often snatches it out of the hand; but when she is foiled in this, she retreats to the bottom of her den, as her last resource*. The nest of this spider (the mason spider) is represented in Plate IV. Fig. 14., and shows the nest shut. Fig. 15., represents it open. Fig. 16. the spider (*Mygale cœmentaria*). Fig. 17. the eyes magnified. Figures 18 and 19 parts of the foot and claw magnified. Rossi ascertained that the female of an allied species (*Mygale sauvagesii*, Latr.), found in Corsica, lived in one of these nests, with a numerous posterity. He destroyed one of the doors to observe whether a new one would be made, which it was; but it was fixed immoveably, without a hinge; the spider, no doubt, fortifying herself in this manner till she thought she might re-open it without dangert.

“The Rev. Revett Shepherd has often noticed, in the fen ditches of Norfolk, a very large spider (the species not yet determined) which actually forms a *raft* for the purpose of obtaining its prey with more facility. Keeping its station upon a

* Mem. Soc. d'Hist. Nat. de Paris, An. vii.

† Mém. Soc. d'Hist. Nat. de Paris, An. vii. p. 125, and Latreille, Hist. Nat. Génér. viii. p. 163.

ball of weeds about three inches in diameter, probably held together by slight silken cords, it is wafted along the surface of the water upon this floating island, which it quits the moment it sees a drowning insect. The booty thus seized it devours at leisure upon its raft, under which it retires when alarmed by any danger*." In the spring of 1830, Mr. Rennie found a spider on some reeds in the Croydon Canal, which agreed in appearance with Mr. Shepherd's.

Among our native spiders there are several, which, not contented with a web like the rest of their congeners, take advantage of other materials to construct cells where, "*hushed in grim repose,*" they "expect their insect prey." The most simple of those spider cells is constructed by a longish-bodied spider (*Aranea holosericea*, LINN.), which is a little larger than the common hunting spider. It rolls up a leaf of the lilac or poplar, precisely in the same manner as is done by the leaf-rolling caterpillars, upon whose cells it sometimes seizes to save itself trouble, having first expelled, or perhaps devoured, the rightful owner. The spider, however, is not satisfied with the tapestry of the caterpillar, *but always weaves a fresh set of her own*, more close and substantial.

Another spider, common in woods and copses (*Epeira quadrata?*) weaves together a great number of leaves to form a dwelling for herself, and in front of it she spreads her toils for entrapping the unwary insects which stray thither. These, as soon as caught, are dragged into her den, and stored up for a time of scarcity. Here also her eggs are deposited and hatched in safety. When the cold weather approaches, and the leaves of her edifice wither, she abandons it for the more secure shelter of a hollow tree, where she soon dies; but the continuation of the species depends upon eggs, deposited in the nest before winter, and remaining to be hatched with the warmth of the ensuing summer.

The spider's den of united leaves, however, which has just been described, is not always useless when withered and deserted; for the dormouse usually selects it as a ready-made

* Kirby and Spence, Intr. i. 425.

roof for its nest of dried grass. That those old spiders' dens are not accidentally chosen by the mouse, appears from the fact, that out of about a dozen mouse-nests of this sort found during winter in a copse between Lewisham and Bromley, Kent (England), every second or third one was furnished with such a roof.

THE WATER SPIDER.—We extract the following exquisitely beautiful and interesting fact in nature, *connected with diving operations*, from the Rev. Mr. Kirby's Bridgewater Treatise:—

“The Water Spider is one of the most remarkable upon whom that office (diving) is developed by her Creator. To this end, her instinct instructs her to fabricate a kind of *diving-bell* in the bosom of that element. She usually selects still waters for this purpose. Her house is an *oval cocoon*, filled with air, and lined with *silk*, from which threads issue in every direction, and are fastened to the surrounding plants; in this cocoon, which is open below, she watches for her prey, and even appears to pass the winter, when she closes the opening. It is most commonly, yet not always, entirely under water; but its inhabitant has filled it with air for her respiration, which enables her to live in it. She conveys the air to it in the following manner: she usually swims upon her back, when her abdomen is enveloped in a bubble of air, and appears like a globe of quicksilver*; with this she enters her cocoon, and displacing an

* Her singular economy was first, we believe, described by Clerck (Aranei Suecici, Stockholm, 1757.), L. M. de Lignac (Mem. des Araign. Aquat., 12mo. Paris, 1799.), and De Geer.

“The shining appearance,” says Clerck, “proceeds either from an inflated globule surrounding the abdomen, or from the space between the body and the water. The spider, when wishing to inhale the air, rises to the surface, with its body still submersed, and only the part containing the spinneret rising just to the surface, when it briskly opens and moves its four teats. A thick coat of hair keeps the water from approaching or wetting the abdomen. It comes up for air about four times an hour or oftener, though I have good reason to suppose it can continue without it for several days together.

“I found in the middle of May one male and ten females, which I put into a glass filled with water, where they lived together very quietly for eight days. I put some duck-weed (*Lemna*) into the glass to afford them shelter, and the fe-

equal mass of water, again ascends for a second lading, till she has sufficiently filled her house with it, so as to expel all the water.

“The males construct similar habitations by the same manœuvres. How these little animals can envelope their abdomens with an air-bubble, and retain it till they enter their cells, is still one of Nature’s mysteries that have not been explained.

“We, however, cannot help admiring, and adoring, the wisdom, power, and goodness manifested in this singular provision, enabling an animal that breathes the atmospheric air, to fill her house with it under water, and which has instructed her in a secret art, *by which she can clothe part of her body with air as a garment*, and which she can put off when it answers her purpose.

“This is a kind of attraction and repulsion which mocks all our inquiries.”

Thus it appears, that by the successive descents of the little water-spider under the impulsion of its instinct, produce effects

males began to stretch diagonal threads in a confused manner from it to the sides of the glass about half way down. Each of the females afterwards fixed a close bag to the edge of the glass, from which the water was expelled by the air from the spinneret, and thus a cell was formed capable of containing the whole animal. Here they remained quietly, with their abdomens in their cells, and their bodies still plunged in the water; and in a short time brimstone-colored bags of eggs appeared in each cell, filling it about a fourth part. On the 7th of July several young ones swam out from one of the bags. All this time the old ones had nothing to eat, *and yet they never attacked one another*, as other spiders would have been apt to do (Clerck, *Aranei Suecici*, cap. viii.).”

“These spiders,” says De Geer, “spin in the water a cell of strong, *closely woven, white silk* in the form of half the shell of a pigeon’s egg, or like a diving bell. This is sometimes left partly above water, but at others is entirely submersed, and is always attached to the objects near it by a great number of irregular threads. It is closed all round, but has a large opening below, which, however, I found closed on the 15th of December, and the spider living quietly within, with her head downwards. I made a rent in this cell, and expelled the air, upon which the spider came out; yet though she appeared to have been laid up for three months in her winter quarters, she greedily seized upon an insect and sucked it. I also found that the male as well as the female constructs a similar subaqueous cell, and during summer no less than in winter (De Geer, *Mem. des Insectes*, vii. 312.).” “We have recently kept one of these spiders,” says Mr. Rennie, “for several months in a glass of water, where it built a cell half under water, in which it laid its eggs.”

in its subaqueous pavilion equivalent to those produced in the diving-bell, or diving helmet, by the successive strokes of the condensing air-pump of scientific man!

In the language of the book of Psalms, this insect "LAY-ETH THE BEAMS OF" her "CHAMBERS IN THE WATERS," and there secures her subaqueous chambers in the manner described.

CLEANLINESS OF SPIDERS.—"When we look at the viscid material," says Mr. Rennie, "with which spiders construct their lines and webs, and at the rough, hairy covering (with a few exceptions) of their bodies, we might conclude, that they would be always stuck over with fragments of the minute fibres which they produce. This, indeed, must often happen, did they not take careful precautions to avoid it; for we have observed that they seldom, if ever, leave a thread to float at random, except when they wish to form a bridge. When a spider drops along a line, for instance, in order to ascertain the strength of her web, or the nature of the place below her, she invariably, when she re-ascends, coils it up into a little ball, and throws it away. Her claws are admirably adapted for this purpose, as well as for walking along the lines, as may be readily seen by a magnifying glass. Fig. 13. Plate IV. shows the triple-clawed foot of a spider, magnified, the others being toothed like a comb, for gliding along the lines. This structure, however, unfits it to walk, as flies can do, upon any upright polished surface like glass; although the contrary* is erroneously asserted by the Abbé de la Pluche. Before she can do so, she is obliged to construct a ladder of ropes, as Mr. Blackwall remarks†, by elevating her spinneret as high as she can, and laying down a step upon which she stands to form a second; and so on, as any one may try by placing a spider at the bottom of a very clean wine glass.

"The hairs of the legs, however, are always catching bits of web and particles of dust; but these are not suffered to remain long. Most people may have remarked that the house-fly is ever and anon brushing its feet upon one another to rub off the

* Spectacle de la Nature, i. 58.

† Linn. Trans. vol. xv.

dust, though we have not seen it remarked in authors that spiders are equally assiduous in keeping themselves clean. They have, besides, a very efficient instrument in their mandibles or jaws, which, like their claws, are furnished with teeth; and a spider which appears to a careless observer as resting idly, in nine cases out of ten will be found *slowly combing her legs with her mandibles, beginning as high as possible on the thigh, and passing down to the claws.* The flue which she thus combs off is regularly tossed away.

“With respect to the house-spider (*A. domestica*), we are told in books, that ‘she from time to time clears away the dust from her web, and sweeps the whole by giving it a shake with her paw, so nicely proportioning the force of her blow, that she never breaks any thing*.’ That spiders may be seen shaking their webs in this manner, we readily admit; though it is not, we imagine, to clear them of dust, but to ascertain whether they are sufficiently sound and strong.

“We recently witnessed a more laborious process of cleaning a web than merely shaking it. On coming down the Maine by the steam-boat from Frankfort, in August 1829, we observed the geometric-net of a conic spider (*Epeira conica*, WALCK.) on the framework of the deck, and as it was covered with flakes of soot from the smoke of the engine, we were surprised to see a spider at work on it; for, in order to be useful, this sort of net must be clean. Upon observing it a little closely, however, we perceived that she was not constructing a net, but dressing up an old one; though not, we must think, to save trouble, so much as an expenditure of material. Some of the lines she dexterously stripped of the flakes of soot adhering to them; but in the greater number, finding that she could not get them sufficiently clean, she broke them quite off, bundled them up, and tossed them over. We counted five of these packets of rubbish which she thus threw away, though there must have been many more, as it was some time before we discovered the manœuvre, the packets being so small as not to be readily perceived, except when placed between the eye and the

* Spectacle de la Nature, i. p. 61.

light. When she had cleared off all the sooted lines, she began to replace them in the usual way; but the arrival of the boat at Mentz put an end to our observations." Bloomfield, the poet, having observed the disappearance of these bits of ravelled web, says that he observed a garden spider moisten the pellets before swallowing them! Dr. Lister, as we have already seen, thought the spider retracted the threads within the abdomen.

"I could wish," says Addison, in 'The Spectator,' "our Royal Society would compile a body of natural history, the best that could be gathered together from books and observations. If the several writers among them took each his particular species, and gave us a distinct account of its original, birth, and education; its policies, hostilities, and alliances; with the frame and texture of its inward and outward parts,—and particularly those which distinguish it from all other animals,—with their aptitudes for the state of being in which Providence has placed them; it would be one of the best services their studies could do mankind, and not a little redound to the glory of the All-wise Creator."—'Spectator,' No. iii.

Although we do not consider Addison as a naturalist, in any of the usual meanings of the term, yet it would be no easy task, even for those who have devoted their undivided attention to the subject, to improve upon the admirable plan of study here laid down. It is, moreover, so especially applicable to the investigation of insects, that it may be more or less put in practice by any person who chooses, in whatever station or circumstances he happens to be placed. Nay, we will go farther; for since it agrees with experience and many recorded instances that individuals have been enabled to investigate and elucidate particular facts, who were quite unacquainted with systematic natural history, we hold it to be undeniable, that *any person of moderate penetration, though altogether unacquainted with what is called "Natural History,"* who will take the trouble to observe particular facts and endeavor to trace them to their causes, has every chance to be successful in adding to his own knowledge, and frequently in making discoveries of what was previously unknown. It is related of M. Pélissan, while a prisoner in the Bastille, that he tamed a spider by means of music. This in conjunction with Evelyn's observations on hunting-spiders is strong proof of our position, and show that though books are often of high value to guide us in our observations, they are by no means indispensable to the study of nature, inasmuch as the varied scene of creation itself forms an inexhaustible book, which "even he who runneth may read."

"It will be of the utmost importance, in the study here recommended, to bear in mind that an insect can never be found in any situation, nor make any movement, without some motive, originating in the instinct imparted to it by Providence. This principle alone, when it is made the basis of inquiry into such motives or instincts, will be found productive of many interesting discoveries, which, without it, might never be made. With this, indeed, exclusively in view, during an excursion, and with a little attention and perseverance, every walk—nay, every step—may lead to delightful and interesting knowledge."—"INSECT ARCHITECTURE," p. 219.

CHAPTER X.

FIBRES OR SILKEN MATERIAL OF THE PINNA.

The Pinna—Description of—Delicacy of its threads—Reaumur's observations—Mode of forming the filament or thread—Power of continually producing new threads—Experiments to ascertain this fact—The Pinna and its Cancer Friend—Nature of their alliance—Beautiful phenomenon—Aristotle and Pliny's account—The Greek poet Oppianus's lines on the Pinna, and its Cancer friend—Manner of procuring the Pinna—Poli's description—Specimens of the Pinna in the British Museum—Pearls found in the Pinna—Pliny and Athenæus's account—Manner of preparing the fibres of the Pinna for weaving—Scarceness of this material—No proof that the ancients were acquainted with the art of knitting—Tertullian the first ancient writer who makes mention of the manufacture of cloth from the fibres of the Pinna—Procopius mentions a chlamys made of the fibres of the Pinna, and a silken tunic adorned with sprigs or feathers of gold—Boots of red leather worn only by Emperors—Golden fleece of the Pinna—St. Basil's account—Fibres of the Pinna not manufactured into cloth at Tarentum in ancient times, but in India—Diving for the Pinna at Colchi—Arrian's account.

IN the preceding chapter we have confined our remarks, principally, to the various attempts made to obtain a silken or filamentous material from the spider, and although those efforts have not been crowned with that degree of success which would render a speculation of the kind worthy of our attention in a pecuniary point of view, yet, it must be conceded, that the subject is scarcely the less interesting; and Mr. Bon, the gentleman who first undertook the training of spiders, has at least given us matter for further interesting speculation. It is now about 104 years since Mr. Bon commenced his experiments.

In this chapter, we shall proceed to describe the Pinna of the ancients, and upon which human ingenuity has been more successfully exercised in seeking, many feet below the surface of the Ocean, for the slender filaments, the produce of an animal in almost a vegetative state of existence.

The Pinna is a bivalve* shell-fish, which, when full grown, is 18 inches long, and 6 wide at its broad end. It is found near the shores of South Italy, Sicily, Corsica, and Sardinia; also in the Bay of Smyrna, and in the Indian Ocean. It does not fasten itself to rocks in the same position as the muscle, but sticks its sharp end into the mud or sand, while the rest of the shell is at liberty to open in the water. In common with the muscle, it has the power of spinning a viscid matter from its body, conformably with that of the spider and caterpillar. Although the pinna is vastly larger than the muscle, its shell being sometimes found two feet long, the threads which it produces are more delicate and slender than those of the muscle, being in fineness and beauty scarcely inferior to the single filament of the comparatively minute silk-worm. Threads so delicately thin, as may readily be imagined, do not singly possess much strength; but the little power of each is made up by the aggregate of the almost infinite number which each fish puts forth to secure itself in a fixed situation, and preserve it against the rolling of the waves. The threads are, however, similar in their nature to those of the muscle, differing only in their superior fineness and greater length. These fish have, therefore, been distinguished by some naturalists, the one as the silk-worm, the other as caterpillar of the sea.

It has been from a very remote period well known, that muscles have the power of affixing themselves either to rocks or the shells of one another, in a very firm manner; yet their method of effecting this was not understood until explained by the accurate observations of M. Reaumur, the *first* naturalist who ascertained that if, by any accident, the animals were torn from their hold, they possessed the power of substituting other threads for those which had been broken or injured. It was found by him, that if muscles, detached from each other, were placed in any kind of vessel and then plunged into the sea, they contrived in a very short time to fasten themselves both to the vessel's side and one another's shells: in this process, the ex-

* An animal having two valves, or a shell consisting of two parts which open and shut.

tremity of each thread seemed to perform the office of a hand in seizing upon the body to which it would attach itself.

The threads issue from the shell at that part where it naturally opens, and in affixing themselves to any substance, form numerous minute cables, by which the fish steadies itself in the water. Each animal is provided with an organ, which it is difficult to designate by any name, since it performs the office of so many members, and is the only indicator of the existence of vital powers in the creature. It is by turns a tongue, an arm, and sometimes a leg. Its shape resembles that of a tongue, and is, therefore, most frequently called by that name. Whenever the fish requires to change its place, this member serves to drag its body forward, together with its cumbrous habitation: in performing a journey, the extremity of this organ, which may then be styled a leg, is fixed to some solid body, and being then contracted in length, the whole fish is necessarily drawn towards the spot where it intends to station itself; and by a repetition of these movements, the animal arrives at its destination. It is not often that the organ is put to this use, as the pinna is but little addicted to locomotion: some naturalists indeed affirm that it is always stable. The purpose to which the tongue is most frequently applied, is that of spinning the threads. Although this body is flat, and in form similar to a tongue through the greater part of its length, it becomes cylindrical about the base or root, where it is much smaller than in any other part: at this lower end are several ligatures of a muscular nature, which keep the tongue firmly fixed against the middle of the shell; four of these cords are very apparent, and serve to move the tongue in any direction according to the wants of the fish. Through the entire length of this member there runs a slit, which pierces so deeply into its surface, as almost to divide it into two longitudinal sections; this performs the office of a canal for the liquor of which the threads are formed, and serves to mould them into their proper form: the canal appears externally like a small crack, being almost covered by the flesh from either side, but internally it is much wider, and surrounded by circular fibres. The channel thus formed extends regularly from the tip to the base of the tongue, where it par-

takes of the form of the member and becomes cylindrical, producing there a tube or pipe in which the canal terminates. The viscid substance is moulded in this tube into the shape of a cord, similar to the threads produced from it, though much thicker, and from which all the minute fibres issue and disperse. The internal surface of the tube, wherein the large cord is formed, is furnished with glands for the secretion of the peculiar substance employed in its production, and which is always in great abundance in this animal as well as in muscles.

Reaumur observed, "that although the workmanship of the land and sea animals when completed is alike, the manner of its production is very different. Spiders, caterpillars, &c., form threads of any required length, by making the viscous liquor of which the filament is formed pass through fine perforations in the organ appointed for spinning. But the way in which muscles form their thread is widely opposite; as the former resembles the work of the wire-drawer*, so does the latter that of the founder who casts metals in a mould." The canal of the organ destined for the muscle's spinning is the mould in which its thread is cast, and gives to it its determinate length.

Reaumur learned the manner of the muscle performing the operation of swimming by actually placing some of these fish under his constant inspection. He kept them in his apartment in a vessel filled with sea water, and distinctly saw them open their shells and put forth their tongues. They extended and contracted this organ several times, obtruding it in every direction, as if seeking the fittest place whereon to fix their threads. After repeated trials of this kind, the tongue of one was observed to remain for some time on the spot chosen, and being then drawn back with great quickness, a thread was very

* This remark of M. Reaumur confirms the observations of M. H. Straus, quoted in Chapter VII. that the thread of the silk-worm is not produced by a simple emission of liquid matter through the orifices of the spinner, or that it acquires solidity at once from the drying influence of the air. Indeed, silk cannot be produced in this manner, but is *secreted in the form of silk in silk vessels*, and the spinning apparatus, so called, only unwinds it. Mr. Straus's observations on this head admit of no argument. The discovery reduces all that has been heretofore written upon the subject to the character of old lumber.

easily discerned, fastened to the place : this operation was again resumed, until all the threads were in sufficient number : one fibre being produced at each movement of the tongue.

The old threads were found to differ materially from those newly spun, the latter being whiter, more glossy, and transparent than the former, and it was thence discovered that it was not the office of the tongue to transfer the old threads one by one to the new spots where they were fixed, which course M. Reaumur had thought was pursued. The old threads once severed from the spot to which they had been originally fixed were seen to be useless, and that every fibre employed by the fish to secure itself in a new position was produced at the time required ; and, in short, that nature had endowed some fish, as well as land insects, with the power of spinning threads, as their natural wants and instincts demanded. This fact was incontrovertibly established by cutting away, as close to the body as they could with safety be separated, the old threads, which were always replaced by others in a space of time as short as was employed by other muscles not so deprived.

“The pinna and its cancer friend” have on more than one occasion been made subjects for poetry. There is doubtless some foundation for the fact of the mutual alliance between these aquatic friends which has been thus celebrated ; yet some slight coloring may have been borrowed from the regions of fancy wherewith to adorn the verse, and even the prose history of their attachment may be exposed to a similar objection.

The scuttle-fish, a native of the same seas with the pinna, is its deadly foe, and would quickly destroy it, were it not for its faithful ally. In common with all the same species, the pinna is destitute of the organs of sight, and could not, therefore, unassisted, be aware of the vicinity of its dangerous enemy. A small animal of the crab kind, itself deprived of a covering, but extremely quick-sighted, takes refuge in the shell of the pinna, whose strong calcareous valves affords a shelter to her guest, *while he makes a return for this protection by going forth in search of prey.* At these intervals the pinna opens her valves to afford him egress and ingress : if the watchful scuttle-fish now approach, the crab returns instanter with notice of the

danger to her hostess ; who, timely warned, shuts her door and keeps out the enemy. When the crab has, unmolested, succeeded in loading itself with provisions, *it gives a signal by a gentle noise at the opening of the shell*, and when admitted, the two friends feast together on the fruit of its industry. It would appear an arduous, nay, a task almost impossible for the defenceless and diminutive crab, not merely to elude its enemies and return home, but likewise obtain a supply of provender sufficient to satisfy the wants of its larger companion. The following different account of the nature of this alliance is more credible :—

Whenever the pinna ventures to open its shell, it is immediately exposed to the attacks of various of the smaller kinds of fish, which, meeting with no resistance to their first assaults, acquire boldness and venture in. The vigilant guard, by a gentle bite, gives notice of this to his companion, who, upon such a hint, closes her shell, and having thus shut them in makes a prey of those who had come to prey upon her : when thus supplied with food, she never fails to share her booty with so useful an ally.

We are told that the sagacious observer, Dr. Hasselquist, in his voyage, (about the middle of the last century,) to Palestine, which he undertook for objects connected with the study of natural history, beheld this curious phenomenon, which, although well known to the ancients, had escaped the attention of the moderns.

It is related by Aristotle* that the pinna keeps a guard to watch for her, which grows to her mouth, and serves as her caterer : this he calls pinnophylax, and describes as a little fish with claws like a crab. Pliny observes†, that the smallest species of crab is called the pinnatores, and being from its diminutive size liable to injury, has the prudence to conceal itself in the shells of oysters. In another place he describes the pinna as of the genus of shell-fish, with the further particulars that it is found in muddy waters, always erect, and never without a companion, called by some pinnatores, by others pinnophylax ;

* Hist. lib. v. c. 15.

† Lib. ix. 51. 66.

this being sometimes a small squill, and at others a crab, which remains with the pinna for the sake of food.

The description of the pinna by the Greek poet Oppianus, who flourished in the second century, has been thus given in English verse:—

The pinna and the crab together dwell,
For mutual succor in one common shell;
They both to gain a livelihood combine,
That takes the prey, when this has given the sign;
From hence this crab, above his fellows famed,
By ancient Greeks was Pinnotores named.

It is said that the pinna fastens itself so strongly to the rocks, that the men employed in fishing for it are obliged to use considerable force to break the tuft of threads by which it is secured fifteen, twenty, and sometimes even thirty feet below the surface of the sea.

It is fished up in the Gulf of Tarentum by the *Pernonico*, which consists of two semicircular bars of iron fastened together at the ends, at one of which is a wooden pole, at the other a ring and cord. The fishermen conduct their boat over the place, where the pinna is seen through the clear water, let down the *Pernonico*, and, having loosened the pinna by embracing it with the iron bars and twisting it round, draw it up to the boat. The pinna is also obtained by diving. Poli, in his splendid work on the Sicilian Testacea (*Parma*, 1795, *folio*,) gives beautiful representations of the several species and especially of the *Pinna Nobilis**. The following description of submarine scenery and operations, is so vivid and pleasing that we quote it at length.

Pinnis hujusmodi abundant præ cæteris litus Trinacriæ, sinus Tarentinus, oraque maritima Crateris Neapolitani, potissimum ultra Promontorium Pausilypi. Equidem persummâ adficimur animi jucunditate, quoties illarum piscationis recordamur, quam vere jam inchoato inibi facere iterum iterumque consuevimus. Est ad Insulam Nisitæ, quâ illa ad septentrionem vergit, respicitque contra Pausilypi Promontorium, amœnissimi maris plaga, quoddam maris ocium. Ibi inter ingentes, pulcherrimosque marinarum stirpium saltus, quibus plaga illa undique virescit, oculosque animumque recreat, Pinnarum greges sponte gignuntur; quæ

* The figure (Fig. 7.) of the *Pinna Nobilis*, Plate III., is reduced from Plate XXXIV. in vol. ii.

mari tranquillo, umbrisque ab insulæ summitate cadentibus, ab iis qui cymbis insistunt, ad triginta fermè pedum altitudinem, subrectæ, inque fundo arenoso defixæ perspicuè cerni possunt. Urinatores igitur, sese mari submergentes, illis arripiendis destinantur. Quoniam vero, ne reiteratis quidem ictibus, ab arenâ, ubi consitæ sunt, educi queunt; arena etenim, et pondere suo et altissimâ aquarum mole sibi incumbente fortiter stipata, urinatorum conatibus validè resistit; hi maris fundum nacti, ibique veluti in solo sedentes, arenam Pinnæ circumjectam manibus averrunt, Pinnamque deinceps ambabus manibus comprehensam divellere conantur. Et si diutius, quam par est, spiritum cohibere nequeunt, ad summa æquorum ascendunt, suberibusque aquæ innatantibus inibi de industriâ positissimis innituntur, donec tandem aëris haustu recreati, maris fundum iterum petant, operamque penitus absolvant. v. ii. p. 230, 231.

This species of Pinna is especially abundant on the shores of Sicily, in the Gulf of Taranto, and in the Bay of Naples, particularly beyond the Cape of Posilipo. It always fills my mind with the greatest delight to recollect the manner of fishing for it, in which I have often taken a part at that spot in the commencement of spring. On the northern shore of the Isle of Nisida opposite Posilipo, is a most agreeable expanse of water, where the sea appears to be ever at rest. Here, amidst those vast and most beautiful submarine forests, with which the coast is decorated in every direction so as at once to charm the mind and refresh the eye, the Pinna grows spontaneously in large groups, and in calm water, when the shadows fall from the summit of the island, is clearly seen by persons in boats growing nearly upright and fixed in the sandy bottom at the depth of about thirty feet. There are divers, whose business it is to bring it up. But, since it cannot be loosened even by repeated blows, (for the sand firmly resists the attempts of the diver, being supported by its own weight and by the superincumbent water,) in these circumstances he sits down at the bottom of the sea, brushes away with his fingers the earth which encompasses the shell, and then endeavors to pull it up by seizing it with both hands. If he is thus likely to be detained at the bottom for a longer time than he can hold his breath, he ascends to the surface, supports himself upon corks, which are in readiness for him, and, when he has sufficiently recovered himself by breathing, he again dives to the bottom to complete his task.

The specimens of Pinna in the British Museum show not only the tuft, but also the pearls and the mother of pearl. Poli found in one specimen of the Pinna Nobilis no less than twenty pearls, of which he has given figures in his splendid work. Pliny (l. ix. c. 35.) mentions the practice of diving for the Pinna in the Mediterranean Sea in order to obtain pearls from it: and Athenæus (l. iii. p. 93 Casaub.) has preserved extracts from two historical writers, one of whom accompanied Alexander on his Indian expedition, and who informs us, that the Pinna was procured in the Indian seas, by diving and for the sake of the pearls.

The Italians call the fibres *Lana Pesce* or *Lana Penna*, i. e. *Fish Wool*, or *Pinna Wool*. It is not equally good in all places. When the bottom of the sea is sandy, the shell with its bunch of fibres may be easily extracted, and they are silky and of a fine color. But in rushy and muddy bottoms so fast do they stick as to be generally broken in drawing up, and are of a blackish color without gloss.

The *Lana Penna* is twice washed in tepid water, once in soap and water, and again in tepid water, then spread on a table to dry: while yet moist, it is rubbed and separated with the hand, and again spread on the table. When quite dry, it is drawn through a wide comb of bone, and then through a narrow one. That which is destined for very fine works is also drawn through iron combs, called *scarde* (*cards*). It is then spun with a distaff and spindle.

As it is impossible to procure much of this material of a good quality, the manufacture is very limited, and the articles produced, stockings and gloves, are expensive. They are esteemed excellent preservatives against cold and damp, are soft and very warm, and the finest of a brown cinnamon, or glossy gold color. The manufacture is chiefly carried on at Taranto, the ancient *Tarentum**.

The *Lana Penna*, having been spun, is now almost universally knit. But, as it does not appear that the ancients were acquainted with this process prior to the second century; whatever garments they made of this material must have been woven.

The first proof we possess of its use among them is in Tertullian, who lived in the second century (*De Pallio*, iii. p. 115, *Rigaltii*). Speaking of the materials for weaving, he says,

Nec fuit satis tunicam pangere et serere, ni etiam piscari vestitum contigisset nam et de mari vellera, quo mucosæ lanusitatis plautiores conchæ comant.

Nor was it enough to comb and to sow the materials for a tunic. It was ne-

* Riedesel's Travels through Sicily and Græcia Magna, translated by J. R. Forster, London, 1773, p. 178-180. De Salis, Travels in the Kingdom of Naples. Keppel Craven, Tour through the Southern Provinces of the Kingdom of Naples, p. 185. D'Argenville, Lithol. et Conchologie, p. 183, and Plate 25.

cessary also to fish for one's dress. For fleeces are obtained from the sea, where shells of extraordinary size are furnished with tufts of mossy hair*. (See Fig. 7, Plate II.)

Procopius informs us (*De Edif. lib. iii. c. 1.*), that Armenia was governed by five hereditary satraps, who received their *insignia* from the Roman Emperor. Among these was a Chlamys made of the fibres of the Pinna. (Χλαμὺς ἡ ἐξ ἐρίων πιποιημένη, οὐχ οἷα τῶν προβατίων ἐκπέφυκεν, ἀλλ' ἐκ θαλάσσης συνειλεγμένων πίννουσ τὰ ζῶα καλεῖν νενομίκασι, ἐν οἷς ἡ τῶν ἐρίων ἔκφυσις γίνεται.) This chlamys was fastened with a fibula of gold, in which a precious stone was set, and three hyacinths were suspended from it by golden chains (χρυσᾶϊς τε καὶ χαλαραῖς ἀλύσειν.) The chlamys was accompanied by a silken tunic, adorned with sprigs or "*feathers*" of gold. It is thus described :

Χιτῶν ἐκ μετᾶξης, ἐγκυλλωπίσμασι χρυσοῖς πανταχόθεν ὠρατάμενος, ἣ δὴ νενομίκασι πλούμια καλεῖν.

With the chlamys and tunic were worn boots of red leather, such as only the emperors of Rome and Persia were allowed to wear.

St. Basil mentions with admiration "the golden fleece" of the Pinna, which no artificial dye could imitate. Πόθεν τὸ χρυσοῦν ἔριον αἱ πίνναι τρέφουσι, ὅπερ οὐδεὶς τῶν ἀνθοβάφων ἐμιμήσατο.—*Hexæm. vii.*

Whether the tuft of the Pinna was used for weaving before the time of the authors, who have now been cited, seems doubtful. As the Pinna is frequently mentioned by earlier writers, both Greek and Latin†, but without any reference to the use of its tuft, it may be regarded as probable, that this kind of cloth was not invented before the time of Tertullian.

It is a no less curious question, Whence did the ancients obtain the fibres of the Pinna, and where was the manufacture of them carried on?

* In this passage *piscari* is rather fancifully opposed to *pangere* and *serere*. The former of these two terms (*pangere*) refers to tunics of wool, which was *pacta* or *pexa*; the latter to tunics of cotton and flax, which were *sata*. The epithet *plautiores*, (etymologically allied to *latiores*, and to *πλαυτός*,) well describes the large size and expanded form of the Pinna.

† The passages are collected in Stephani Thesaurus L. Græcæ, ed. Valpy, p. 7579.

It has been commonly said at *Tarentum*, but apparently for no other reason than that the Pinna is obtained and the manufacture principally carried on at *Taranto* in modern times. By referring to the authorities above quoted, it will be seen that none of them makes any allusion to *Tarentum*. Consequently we have no direct evidence, that this was the seat of the ancient manufacture. On the contrary, we have testimony, that fine cloths of this substance were made in *India*, and thence imported into Greece and other countries.

The author of the *Periplus of the Erythrean Sea*, a document of an age at least as late as the time of *Tertullian*, states that the business of diving for the wool of the Pinna was prosecuted near the city called *Colchi* in the south of India. Different species of Pinna with tufts of fine silk are now no less abundant in the Indian than the Mediterranean Sea. The *Periplus of the Erythrean Sea* presents a sufficient proof, that this beautiful substance was spun and woven by the Indians, whereas we can only suppose from analogy that the manufacture was carried on in ancient times by the *Tarentines*.

CHAPTER XI

FIBRES, OR SILKEN MATERIAL OF THE PINE-APPLE.

Fibres of the Pine Apple—Facility of dyeing—Manner of preparing the fibres for weaving—Easy cultivation of the plant—Thrives where no other plant will live—Mr. Frederick Burt Zincke's patent process of manufacturing cloth from the fibres of this plant—Its comparative want of strength—Silken material procured from the Papyfera—Spun and woven into cloth—Cloth of this description manufactured generally by the Otaheiteans, and other inhabitants of the South Sea Islands—Great strength (supposed) of ropes made from the fibres of the aloe—Exaggerated statements.

THIS plant, which has hitherto been valued solely as ministering to the luxuries of the table, has lately had a new interest attached to it from the discovery of a fibre contained in its leaves, possessing such valuable properties, that it will, in all probability, soon form a new and important article of commerce.

The fibres of the pine-apple plant are disposed in fasciculi, each apparent fibre being an assemblage of fibres adhering together, of such exceeding delicacy, as only to measure from $\frac{1}{5000}$ th to $\frac{1}{7000}$ th part of an inch in diameter; viewed under the microscope, they bear considerable resemblance to silk, from their glossy, even, and smooth texture. They appear altogether destitute of joints, or other irregularities, and are remarkably transparent, particularly when viewed in water: they are very elastic, of considerable strength, and readily receive the most delicate dyes. This last fact appears singular, when we bear in mind the resistance, if we may be allowed the expression, which flax offers to dyes. With much trouble, and by long processes, flax will receive a few dark dingy colors: all light and brilliant ones it wholly resists; they do not enter the fibre, but merely dry upon it externally, and afterwards easily peel, or rub off,—in short, it may be said to be *painted*, and not dyed.

The preparation of the pine-fibre is exceedingly simple. If

a leaf of this plant be examined, it will be found to consist of an assemblage of fibres running parallel from one extremity of the leaf to the other, embedded in the soft pabulum. All the process necessary is to pass the leaf under a "tilt hammer," the rapid action of which, in a few seconds, completely crushes it, without in the slightest degree injuring the fibre, which remains in a large skein, and then requires to be rinsed out in soft water, to cleanse it from impurities, and be afterwards dried in the shade. So simple and rapid is the process, that a leaf, in a quarter of an hour after being cut from the plant, may be in a state fit for the purposes of the manufacturer, as a glossy, white fibre, with its strength unimpaired by any process of maceration, which, by inducing partial putrefaction, not only materially injures the strength of flax, but also renders it of a dingy color.

The pine-plant abounds both in the East and West Indies, and may be easily propagated from the crown; offsets from round the base of the fruit, which often amount to upwards of twenty in number; and from the young plants which spring from the parent stem; its cultivation requires but little care or expense, and is of such hardy growth, as to be almost independent of those casualties of weather, which often prove so detrimental to more delicate crops—it is one of those plants which Nature has scattered so profusely through tropical regions, whose leaves are thick and fleshy, to contain a large supply of nourishment, and covered by a thick, glazed cuticle; admitting of so little evaporation, that many of them will thrive upon a barren rock, where no other plant would live. Also from the large portion of oxalic acid which the leaves contain, no animal will touch them, and are, therefore, exempt from the trespasses of cattle, &c. Indeed no greater proof of the hardness of the plant can be given, than the fact, that in many places where lands have been under tillage,—afterwards abandoned, and allowed to return to a state of nature, the pine-apple plant exhibits the only trace of former cultivation; every other cultivated plant has died away before the encroachments of the surrounding wood, while they alone remained increasing from year to year, and spread into large beds.

Mr. Frederick Burt Zincke obtained a patent in England, bearing date December 9, 1836, for the following mode of preparing the filaments of this plant, the "*Bromelia ananas*." We give the patentee's own description (with slight emendations), as received from the patent office, London, and which is as follows.

"I (the said Frederick Burt Zincke) do hereby declare that the nature of my said invention consists—Firstly, in preparing or manufacturing the leaf of the plant, commonly called the pine-apple, by bruising, beating, washing, and drying the same, in such manner as to separate the long fibrous parts from the cuticle pabulum, and other matter comprising the said leaf. Secondly, in the application of the fibrous substance, so prepared to various manufactures and purposes, for which silk, flax, cotton, hemp, wool, and other fibrous materials are now used. And further, I describe the manner in which my said invention is to be performed by the following statement: For the purpose of preparing the fibre, I cut the leaves from the pine-apple plant, at any period from the time of their obtaining their full growth, till the ripening of the fruit, for I find that if the leaves are taken before they are full grown, the fibre is less strong, and if suffered to remain on the plant, after the ripening of the fruit, the fibre becomes harsh, and is more difficult to divest of the extraneous matter. The small thorns having been trimmed from the edge of the leaves, with a sharp knife, the leaves should be crushed, so as to disengage the fibre from the other matter composing the leaf, for which purpose the employment of a mallet upon a block of wood, will fully answer the intended purpose. This process of crushing is to be continued until the fibre appears in an assemblage of long silky filaments, with more or less of the pulpy and other matter of the leaf adhering to them; to cleanse them from which they are to be well rinsed in soft water, *immediately after having been crushed* or beaten, and then the water should forthwith be squeezed out of them, by drawing them between the edges of two pieces of wood, placed parallel to each other, so as to admit of the fibres being drawn out rather lightly between them, for if the green matter is allowed to dry on the fibre, it of course

becomes more difficult to cleanse. The washing must be carefully performed, so as to prevent the fibre from becoming tangled or knotted. The operation of washing or rinsing must be repeated until the fibre be thoroughly cleansed. If it be found difficult to clean the fibre from the extraneous matter, in consequence of not collecting the leaves from the plant sufficiently early, or from any other cause, the operation will be facilitated by boiling the fibre, after it has been beaten, and partially purified in a solution of soap in soft water. For this purpose the fibre must be regularly disposed in any suitable vessel, so as to prevent its becoming tangled, with sufficient water to cover it, in which soap has been dissolved, in the proportion of about 5 lbs. to 50 lbs. of fibre, a light weight being then placed upon it, to keep the fibre beneath the surface of the liquor; the whole is then to be boiled for the space of three or four hours, and after boiling, to be well rinsed out in soft water, and squeezed as before directed. The fibre having been cleansed by these processes, is to be *gradually dried in the shade*, and occasionally shaken out, so as to prevent the too close adhesion of the filament in drying, which would otherwise take place. The fibre may be obtained free from the extraneous matter of the leaf by other modes; but I prefer that which I have above described. As to the second part of my said invention, it is only necessary to observe that from the *superiority of this fibre in several respects over those now in common use* (?), it is adapted to a vast number of purposes, in which fibrous materials are now employed; it is of a glossy white color, it receives dyes with facility, it possesses great strength, and is divisible to an exceeding degree of fineness, for upon examination each filament that appears a single fibre, is, in fact, a bundle of very delicate fibres, adhering more or less strongly together. These qualities render it applicable to the manufacture of *shawls, drills, damask-linens, plushes, carpets, rugs, lace, bonnets, paper*; as a material for *rope, twine, or thread*, and a variety of other purposes to which silk, cotton, flax hemp, wool, and other fibrous materials are now applied. As a material for spinning in the ordinary method in which flax is now spun through hot water, this fibre requires to undergo the process generally in use for

bleaching flax. I find the period at which the bleaching can be most conveniently performed, is when the fibre is in the state called technically "a roving;" for the coarser yarns the first stages of the bleaching process will be sufficient, but this operation must be carried further, in proportion to the fineness of the yarn intended to be spun. The effect of the bleaching upon the fibre is, to disengage part of the adhesive matter, which connects the fine filaments together, and render the yarn susceptible of longation, between the receiving and delivering rollers in spinning, after it has passed through the hot water; I therefore claim as my invention, the preparing and manufacturing into the fibres hereinbefore particularly described; the leaf of the plant commonly called the pine-apple, by any mode or modes of preparation, and also the application of the said fibres, when prepared and manufactured, to the several purposes hereinbefore also particularly specified, the same being to the best of my knowledge (information, remembrance, and belief), now and not heretofore practised."

M. de la Rouverie affirms, that he procured a beautiful vegetable silk from the Papyfera or paper mulberry; cutting the bark while the tree was in sap, beating it with mallets, and steeping it in water; he obtained a thread from the fibres, almost equal to silk in quality; and this was woven into a cloth the texture of which appeared as if formed of that material. The finest sort of cloth among the inhabitants of Otaheite, and other of the South Sea Islands, is made of the bark of this tree.

According to M. Chevremont, Engineer of Mines, "ropes made of aloes have *four times the resistance* of those of hemp of the same diameter, and made by the same process(?). The fibres of the aloe contain a resinous substance which protects the ropes from the action of moisture: even at sea, and renders the tarring of them unnecessary. They are lighter than hemp-ropes, and lose nothing of their strength by being wet(?). When plunged into water, they are shortened only two per cent., so that they become less rigid than ropes made of hemp(?)."

There appears to be a good deal of exaggeration in regard

to the great superiority of the fibres of these plants over cotton, flax, &c. This is particularly the case in regard to Mr. Zincke, for although he succeeded in producing some very beautiful specimens of fabric, in conformity with the foregoing specification, yet, the manufacture does not appear to make much progress, chiefly on account of the *inferiority in point of strength of the cloth*, more especially when bleached.

CHAPTER XII.

MALLOWS.

CULTIVATION AND USE OF THE MALLOW AMONG THE ANCIENTS.—

TESTIMONY OF LATIN, GREEK, AND ATTIC WRITERS.

The earliest mention of Mallows is to be found in Job xxx. 4.—Varieties of the Mallow—Cultivation and use of the Mallow—Testimony of ancient authors—Papias and Isidore's mention of Mallow cloth—Mallow cloth common in the days of Charlemagne—Mallow shawls—Mallow cloths mentioned in the Periplus as exported from India to Barygaza (Baroch)—Calidāsa the Indian dramatist, who lived in the first century B. C.—His testimony—Wallich's (the Indian botanist) account—Mantles of woven bark, mentioned in the Sacontāla of Calidāsa—Valcālas or Mantles of woven bark, mentioned in the Ramayana, a noted poem of ancient India—Sheets made from trees—Ctesias's testimony—Strabo's account—Testimony of Statius Cæcilius and Plautus, who lived 169 B. C. and 184 B. C.—Plautus's laughable enumeration of the analogy of trades—Beauty of garments of Amorgos mentioned by Eupolis—Clearchus's testimony—Plato mentions linen shifts—Amorgine garments first manufactured at Athens in the time of Aristophanes.

THE earliest mention of mallows is that given in the book of Job, in the following words. "For want and famine they were solitary: fleeing into the wilderness in former time desolate and waste. Who cut up *mallows* by the bushes, and *juniper-roots* for their meat."—Job xxx. 4.

We find in ancient authors of a more modern date, distinct mention of three species of malvaceous plants, which are still common in the South of Europe. These are, the Common Mallow, *Malva Silvestris*, Linn.; the Marsh Mallow, *Althæa Officinalis*, Linn.; and the Hempleaved Mallow, *Althæa Cannabina*, Linn.

The Common Mallow is called by the Latin writers *Malva*. by the Greek Μαλάχη, or Μολόχη.

This plant was used for food from the earliest times. Hesiod represents living on Mallows and asphodel as the sign of moderation, contentment, and simplicity of manners.

Νήπιοι, οὐδ' ἴσασιν ὅσω πλέον ἤμισυ παντός,
 Οὐδ' ὄσον ἐν μαλάχῃ τε καὶ ἀσφοδέλω μεγ' ὄνειρα.—*Op. et Dies*, 41.

Fools! not to know how much more the half is than the whole, and how much benefit there is in mallows and asphodel.

A dish of these vegetables was probably the cheapest of all kinds of food; they grew wild in the meadow and by the way-side, and were gathered and dressed without any labor or trouble.

Various authors however mention the cultivation of the Common Mallow in gardens. See Virgil, *Moretum*, 73. Pliny, *Hist. Nat.* l. xix. c. 22 and 31. Isidori *Orig.* l. xvii. c. 10. Papiæ *Vocabular.* v. *Malva. Geoponica*, xii. l. Palladius, iii. 24. xi. ll.

Dioscorides (*l.* ii. c. III.) calls it the Garden Mallow. Aristophanes (*Plutus* 544.) mentions eating the shoots of mallows instead of bread, intending by this to represent a vile and destitute kind of living. Plutarch (*Septem Sapientum Convivium*) says, "The mallow is good for food, and the Anthericus is sweet." According to Le Clerc ὁ ἀνθήρικος (*Anthericus*) means the scapus of the asphodel: if he is right, this plant was eaten as we now eat asparagus. It is also remarkable that on this supposition Plutarch mentions the same two plants, which are also mentioned together by Hesiod.

According to Theophrastus (*Hist. Plant.* vii. 7. 2.) the mallow was not eaten raw, as in a salad, but required to be cooked. Cicero (*Epist. ad Fam.* vii. 26.) mentions the highly-seasoned vegetables at a dinner given by his friend Lentulus. Having been made ill by them, he says, that he, "who easily abstained from oysters and lampreys, had been deceived by beet and mallows." Probably the leaves of the mallow were on this occasion boiled, chopped, and seasoned, much in the same way as spinach is now prepared in France.

Moschus in the following well-known lines refers to the common mallow together with other culinary vegetables:

Ἄλ, αἶ, ταὶ μαλάχαι μὲν, ἐπὶν κατὰ κᾶπον ὄλωνται,
 Ἡδὲ τὰ χλωρὰ σέλινα, τό τ' εὐθαλὲς οὖλον ἄνηθον,
 Ὑστερον αὖ ζῶοντι, καὶ εἰς ἔτος ἄλλο φύοντι.

Mallows, alas! die down, and parsley, and flourishing fennel;
 Then they spring up afresh, and live next year in the garden.

This is accurately true of the common mallow, the root of which is perennial, so that the stems grow up and die down again every year. Accordingly Theophrastus brings it as an example of a plant *with annual stems**.

Horace in two passages signifies his partiality to mallows, calling them "*leves,*" *light to digest.*

Let olives be my food, endive, and mallows light.

Od. l. i. 31. v. 16.

Mallows, salubrious to a frame o'er-filled.

Epod. 2. 57.

Martial recommends this vegetable on account of its laxative effect :

Utere lactucis, et mollibus utere malvis. (iii. 47.)

Exoneratarus ventrem mihi villica malvas

Attulit, et varias, quas habet hortus, opes. (x. 48.)

Diphilus of Siphnos (*as quoted by Athenæus, l. ii. p. 58. E. Casaub.*), after enumerating the medical virtues of the Common Mallow, says, that "the wild was better than the cultivated kind."

Without quoting other classical authorities, the ancient practice may be illustrated by the observations of modern travellers, who mention that the Common Mallow is still an article of consumption in the same parts of the world.

Biddulph, who visited Syria about the year 1600, says, he "saw near Aleppo many poor people gathering mallows, and three-leaved grass, and asked them what they did with it, and they answered, that it was all their food, and that they boiled it, and did eat it." (*Collection of Voyages and Travels from the Library of the E. of Oxford, p. 807.*)

Dr. Sibthorp states, that the *Malva Silvestris* grows wild in Cyprus, and is called *Μολχα*. He also says, "The wild mallow is very common about Athens: the leaves are boiled and eaten as a pot-herb, and an ingredient in the Dolma." (*Memoirs relating to European and Asiatic Turkey, edited by Walpole, p. 245.*) Dr. Holland mentions both *Malva Silves-*

* Hist. Plant. l. vii. c. 8. p. 142. Heinsii. 240. Schneider.

tris and *Althæa Officinalis* among the officinal plants, which he found in Cephalonia. (*Travels in Greece*, p. 543, 4to.).

The *Althæa Officinalis*, or Marsh Mallow, is called by the Greek authors ἄλθαϊα, by the Latin, Hibiscus. Theophrastus says, that it went also under the name of wild mallow*. Whilst the Common Mallow, though highly esteemed for its medicinal virtues, was principally regarded as a substantial article of food; the Marsh Mallow, on the contrary, seems to have been rarely used except as an article of the *Materia Medica*†; and, as its peculiar properties were likely to be more matured in the wild than cultivated state, it does not appear to have been grown in gardens‡. Theophrastus describes it by comparing it with the Common Mallow, and mentions its application, both internally and externally, as a medicine§. Dioscorides (*l. iii. c. 139.*) gives similar details. Besides mentioning the proper name of the plant in Greek and in Latin, he calls it, “a kind of wild mallow.” Palladius (*l. xi. p. 184. Bip.*) explains “*Hibiscus*” to be the same as “*Althæa*.” See also Pliny, *l. xx. c. 14. ed. Bip.* Virgil alludes to the use of it as fodder for goats, and as a material for *weaving baskets*||.

The Hemp-leaved Mallow, *Althæa Cannabina*, is once mentioned by Dioscorides (*lib. iii. c. 141.*). Giving an account of hemp, he distinguishes between the cultivated and the wild. He says of the wild hemp, that the Romans called it *Cannabis Terminalis*¶. After mentioning the medical properties of the plant, Dioscorides says, that its bark was useful for making ropes. The truth of this observation will be apparent to every botanist. The plants belonging to the natural order *Malva-*

* Hist. Plant. l. ix. cap. 15. p. 188. Heinsii.

† Calpurnius (*Eclog. iv. 32.*) mentions the “*Hibiscus*” as used for food, but only by persons in a state of great destitution.

‡ At a later period, however, we find the *Althæa Officinalis* under the name of “*Ibischa Mis-malva*” in a catalogue of the plants, which Charlemagne selected for cultivation in the gardens attached to his villas. See Sprengel, *Hist. Rei Herb. i. 220.*

§ Hist. Plant. l. ix. cap. 19, p. 192. ed. Heinsii.

|| *Eclog. ii. 30. and x. 71.* See Servius, Heyne, and J. H. Voss., *ad loc.*

¶ Meaning literally Hedge-hemp.

ceæ are all remarkable for the abundance of strong and beautiful fibres in their bark*.

But of the European species there is none superior in the fineness, the strength, the whiteness, and lustre of its fibres, to the Common Mallow, the *Malva Silvestris*. We have seen that the *ancients* were familiarly acquainted with this plant; that it was commonly cultivated in their gardens; and that they gathered it, when growing wild, to be taken as food or medicine. In these circumstances they could scarcely fail to observe the aptitude of its bark for being spun into thread. More especially in places where they had no other native supply of fibrous materials; in Attica, for example, which probably produced neither hemp nor flax, it seems in the highest degree probable, that the fitness of the mallow to supply materials for weaving would not be overlooked.

In producing the evidence, which establishes this as a positive fact, we shall begin with the latest testimonies and proceed in a reverse order upward to the most ancient. According to this plan, the first authority is that of Papias, who wrote his Vocabulary about the year 1050. He gives the following explanations :

Malbella vestis quæ ex malvarum stamine conficitur, quam alii molocinam vocant.

Molocina vestis quæ albo stamine sit : quam alii malbellam vocant.

These passages clearly describe a kind of cloth made of the white fibres of the common mallow. *Malbella*, the same with *Malvella*, is a Latin adjective, in the form of a diminutive, from *Malva* : *Molocina*, the same with *Μολόχινη*, is a Greek adjective from *Μολόχην*, and signifies *made of mallow*.

Papias, who seems in compiling his dictionary to have made great use of Isidore, perhaps derived these explanations in part from the following passage of the latter author :

* We have the following testimony respecting the actual fabrication of mallow-cloth in modern times :

“ Nous avons vu à Madrid, chez le savant pharmacien D. Casimir Ortéga, de ces tissus, qui nous ont semblé fort remarquables. Ils étaient faits avec l'écorce des *Althéas officinalis* et *cannabina*, et avec celle du *Malva sylvestris*.” Fée, Flore de Virgile, Paris 1822, p. 66.

Melocinia (vestis est), quæ malvarum stamine conficitur, quam alii *molocinam*, alii *malvellam* vocant. *Isid. Hisp. Orig.* xix. 22.

The cloth called *Melocinea* is made of the thread of mallows, and is called by some *Molocina*, by others *Malvella*.

The passages of Papias cannot be taken as a proof, that mallow-cloth was woven in his day. But that it was in fashion as late as the age of Charlemagne appears from the following line, which is quoted by Du Cange (*Glossar. Med. et Inf. Lat. v. Melocineus*) from a poem in praise of that monarch, attributed to Alcuin :

Tecta melocineo fulgescit femina amictu.
Wrapt in a mallow shawl the lady shines.

The word "*fulgescit*" aptly describes the lustre of the material under consideration. From the Periplus of the Erythrean Sea* we learn, that *cloths made of mallow*, were among the articles of export from India, being brought from Ozene (Ugain) and Tagara in the interior of the country to the sea-port of Barygaza (Baroch). P. 146. 169, 170, 171.

The genus *Hibiscus*, Linn. is very abundant in India. The bark of a certain species of this genus, especially of *H. Tiliaceus* and *H. Cannabinus*, is now very extensively employed for making *cordage*, and might unquestionably have been used for making cloth†.

H. Tiliaceus is also represented in Rheede's Hort. Malabaricus (vol. i. fig. 30.). It grows about 15 feet high.

Dr. Wallich (Cat. of Indian Woods, p. 18.) mentions two other species as used for making cordage from the bark.

The late Mr. John Hare, who lived in India a long time, says, that a coarse kind of cloth, used for making sacks, &c., is now woven from *Hibiscus* bark.

As a further evidence, that the *Molochina* mentioned in the Periplus were made from the bark of the *Hibiscus*, we may

* P. 146. 169, 170, 171. Arriani Op. ed. Blancardi, tom. ii.

† Cavanilles, Tab. 52, fig. 1, represents *H. Cannabinus*, the leaf of which is like that of hemp. Tab. 55, fig. 1, represents *H. Tiliaceus*, in the description of which we read "*cortice in funes ductili;*" and Cavanilles says, the inhabitants of the South Sea Islands (*Australium insularum*) use in their ships and boats ropes made from the bark.

refer to that admirable specimen of Eastern taste and ingenuity, the Sacontāla of the great Indian dramatist Calidāsa. Several passages of this poem make mention of the *Valcāla*, which the Sanscrit Lexicons, themselves of great antiquity, explain as meaning either bark, or a vesture made from it. We learn from Dr. Wallich, a celebrated Indian botanist, that many kinds of Hibiscus had this quality in an eminent degree, and, as their bark was in common use for making all kinds of cordage, it might undoubtedly be employed for weaving.

The Sacontāla is of a date as ancient as the Periplus. Professor Von Bohlen (*Das alte Indien*, vol. ii. p. 477.) asserts, that the author Calidāsa certainly flourished as early as the first century B. C. Sir William Jones makes him older by several centuries. (*Works*, vol. vi. p. 206.) The place also agrees as well as the time. The Hibiscus Tiliaceus, according to Sir J. E. Smith, is "one of the most common trees in every part of the East Indies, thriving in all sorts of situations and soils, and cultivated for the sake of its shade even more than the beauty of its flowers, in towns and villages and by roadsides. A coarse cordage," he adds, "is made of the bark; the wood is light and white, useful for small cabinet-work; the mucilage of the whole plant is applied to some medical purposes." The Molochina, mentioned in the Periplus, were brought from Ozene and Tagara, and may have come from still further North. The hermitage, described in the drama, was at the foot of the Himalaya Mountains, and near the river Malina, and, according to the representations given by the poet, the Valcālas (translated by Sir W. Jones "*mantles of woven bark*," and by Chézy, "*vêtemens d'écorce*"), were worn both by the hermits and by the beautiful Sacontāla, while she was their inmate*.

"Valcālas" are mentioned in precisely the same manner in the Ramayana, one of the most noted of the heroic poems of ancient India. They are represented as coarse garments worn by ascetics.

* Translation of the Sacontāla, Sir W. Jones's *Works*, vol. vi. pp. 217. 225. 289. Original, ed. Chézy, Paris, 1830, p. 7, l. 10.; p. 9, l. 10; p. 24, l. 7.; p. 131, l. 14. Chézy's translation, pp. 10. 27. 142. 143. See also Heeren, *Ideen*, i. 2. p. 648.

If the explanation now given be admitted as applicable to the *Molochina* of the *Periplus*, it may throw light upon some other passages of ancient authors.

Ctesias, in his *Indica**, mentions "*sheets made from trees.*"

Strabo's account of the webs, which he calls *Serica*, an account derived from the writings of Nearchus, admiral of Alexander the Great, represents those webs as made from fibres, *which were scraped from the bark of trees.* This would apply exactly to the supposed use of the *Hibiscus* for making cloth. The bark must have been first stripped from the tree, and the fibres then scraped from the *inside of the bark.*

To the same source we may, we think, trace the idea of *Arethas* (*in Apoc. c. 57.*), that the *Byssus*, *Rev. xix. 8.*, was "*the bark of an Indian tree made into flax.*"

Although the date of the following inscription, found at Rome, is uncertain, it may be conveniently brought in here. It is published by Muratori, *Novus Thesaurus Vet. Inscriptionum*, tom. ii. p. 939.

P. AVCTIVS P. L. LYSANDER.
VESTIARIVS. TENVIARIVS.
MOLOCHINARIVS. VOT. SOL.

Muratori in his Note says, that "*Vestiarius Tenuiarius*" was the man who made thin garments, and "*Molochinarius*" the man who made such garments of a mallow color.

The authors, next in regard to antiquity, who make mention of *Molochina*, are the writers of the Latin Comedy, *Staius Cæcilius*, who died 169 B. C., and *Plautus*, who died 184 B. C.

Nonius Marcellus (*l. xvi.*) quotes the following line from the *Pausimachus* of the former dramatist:

Carbasina, molochina, ampelina.†

The passage of *Plautus* is in the *Aulularia* (*Act iii. Scene v. l. 40.*), where we have a ludicrous enumeration, extending

* *Cap. 22. Fragmenta*, ed. Bähr. p. 253. 326.

† See *C. C. Staii Fragmenta*, a Leonhardo Spengel, *Monachii* 1829, p. 35 *Staius* chiefly copied *Menander* (*Gellius*, ii. c. 16.); but it is not certain that *Menander* wrote any play called *Pausimachus*.

through more than ten lines, of all the persons concerned in the manufacture or sale of garments.

Solearii astant, astant molochinariii.

All the lexicographers and commentators explain *Molochinarius* to be one who dyes cloth of the color of the mallow. *Lanarius* was a woollen-draper; *Coactiliarius*, a dealer in felts, a hatter; *Lintearius* a linen-draper; and *Sericarius* a silk-mercator. According to the same analogy, *Molochinarius* would mean a dealer in *Molochina*, i. e. in all kinds of cloth made from mallows.

The class of writers, which will now be produced as affording testimony respecting the use of the mallow for weaving, are Greek authors, and who instead of the common Greek terms employ the Attic term *Ἀμοργός* and its derivatives.

Ἀμοργός has been explained by some of the lexicographers to be a kind of flax (See Julius Pollux, L. vii. § 74.). Perhaps by this explanation nothing more was intended than that it was a plant, the fibres of which were used to spin and weave into cloth. It is highly probable that it was the *Malva Silvestris* or *Common Mallow*, and that it was called *Ἀμοργός*.

According to the Attic lexicons of Pausanias (*apud Eustath. l. c.*) and of Mœris, *Ἀμοργός* was an Attic term. We now find traces of it in seven Attic writers, four or five of whom wrote comedy. These are Aristophanes, Cratinus, Antiphanes, Eupolis, Clearchus, Æschines, and Plato.

I. We shall take first Aristophanes, whose comedy called *Lysistrata* is frequently quoted by Pausanias and Cratinus, and being still extant throws considerable light upon the subject. It was represented in the year 412. B. C. *Lysistrata* says (*l. 150*),

Κἄν τοῖς χιτῶνιοισι τοῖς ἀμόργωις
Γυμναὶ παριοῖμεν,

“And if we should present ourselves naked in shifts of *amor-gos*,” showing that these shifts were transparent. Accordingly Mœris says, that the *ἀμόργων* was *λεπτὸν ὕφασμα*, “a thin web.” Bisetius in his Greek commentary on this play, after quoting the explanations of Stephanus Byzantinus, Suidas, Eustathius,

and the *Etymologicum Magnum*, judiciously concludes as follows: "From all these it is manifest, that ἀμόργιοι χιτῶνες, whether they took their name from a place, from their color, or from the raw material, were a kind of valuable robe, worn by the rich, fashionable, and luxurious women."

A subsequent passage of the *Lysistrata* (v. 736–741) still further illustrates this subject. A woman laments, that she has left at home her ἀμοργίς *without being peeled* (ἄλοπον), and she goes to *peel it* (ἀποδείρειν). The mallow no less than flax and hemp, would require the bark to be stript off, and doubtless the best time for stripping it is as soon as the plant is gathered.

II. Cratinus died about 420 B. C. The following line, from his comedy called Μαλθακοί, represents a person spinning Ἀμοργός.

Ἀμοργὸν ἔνδον βρυτίην νήθειν τινα.

Cratina Fragmenta, a Runkel, p. 29.

III. Julius Pollux, speaking of garments made of Ἀμοργός (L. vii. c. 13.) quotes the *Medea* of Antiphanes thus; Ἦν χιτῶν ἀμόργιος. This author was contemporary with Aristophanes.

IV. Eupolis wrote about the same time, and his authority may be added to the rest as proving that garments of Amorgos were admired by luxurious persons at Athens*.

V. Clearchus of Soli† mentions the use of a cover of Amorgos for inclosing a splendid purple blanket. This application of it is agreeable to the foregoing evidence, showing that the *amorgine webs were transparent*. The silky translucence of the lace-like web of mallow would have a very beautiful effect over the fine purple of the downy blanket.

VI. Æschines in an oration against Timarchus, the object of which is to hold up to contempt the extravagancies of this Athenian spendthrift, in his enumeration of them, he mentions (p. 118, ed. Reiskii.) that Timarchus took to his house "a woman skilled in making cloths of Amorgos."

* See Harpocration, p. 29. ed. Blancardi. 1683. 4to. Also Pher. et Eupolidis *Fragmenta, a Runkel, p. 150.*

† Ap. Athenæum, L. vi. p. 255, Casaub. Clearchus probably wrote about 100 years later than the before-mentioned authors, but the circumstances related by him may have occurred about the time when those authors flourished, and even at Athens.

VII. Plato in the 13th Epistle, addressed to Dionysius, tyrant of Syracuse, which, if not genuine, is at least ancient, proposes to give to the three daughters of Cebes three long shifts, not the valuable shifts made of Amorgos, but the linen shifts of Sicily.

The mention of amorgine garments by the writers, who have now been cited, seems to prove, that the fashion of making and wearing them first came in among the Greeks at Athens in the time of Aristophanes, who lived, as the reader will have observed, in the fifth century before Christ. From them the fashion may have extended itself into Sicily and Italy, which will account, if *Amorgina* were the same with *Molochina*, for the striking agreement in this respect between the writers of Greek and of Latin Comedy. In subsequent ages the manufacture seems so have declined, probably in consequence of the abundance of silk and other rich and beautiful goods imported from Asia. But the mention of these stuffs in the writings of Isidore and Alcuin renders it probable, that they were brought again into use in the fifth and following centuries of the Christian era.

CHAPTER XIII.

SPARTUM, OR SPANISH BROOM.

CLOTH MANUFACTURED FROM BROOM BARK, NETTLE, AND BULBOUS PLANT.—TESTIMONY OF GREEK AND LATIN AUTHORS.

Authority for Spanish Broom—*Stipa Tenacissima*—Cloth made from Broom-bark—Albania—Italy—France—Mode of preparing the fibre for weaving—Pliny's account of *Spartum*—Bulbous plant—Its fibrous coats—Pliny's translation of Theophrastus—Socks and garments—Size of the bulb—Its genus or species not sufficiently defined—Remarks of various modern writers on this plant—Interesting communications of Dr. Daniel Stebbins, of Northampton, Mass. to Hon. H. L. Ellsworth.

PLINY says, that “in the part of Hispania Citerior about New Carthage whole mountains were covered with *Spartum*; that the natives made mattresses, shoes, *and coarse garments of it*, also fires and torches; and that its tender tops were eaten by animals*.” He also says, that it grows spontaneously where nothing else will grow, and that it is “the rush of a dry soil.”

The question now arises, what plant Pliny intended to describe. Clusius, who travelled in Spain chiefly with a view to botany, supposed Pliny's “*Spartum*” to be the tough grass, used in every part of Spain for making mats, baskets, &c., which Linnæus afterwards called *Stipa Tenacissima*†. It is not surprising, that the opinion of so eminent a botanist as Clusius has been generally adopted. It is, however, far more probable, that the plant, which Pliny intended to speak of, was the *Spartium Junceum*, *Linn.*, so familiarly known under the name of Spanish Broom.

In the first place, the name *Spartum* should be considered as decisive of the question, unless some sufficient reason can be

* L. xix. c. 2.

† Clusii Plant. Rar. Historia, L. vi. p. 219. 220.

shown for ascribing to it in this passage a sense different from that which it commonly bore. *Spartus* or *Spartum*, is admitted to be used by all authors, Greek and Latin, and even by Pliny himself in another passage*, to denote the Spanish Broom. We learn from Sibthorp, that the Spanish Broom is still called *Sparto* by the Greeks, and that it grows on dry sandy hills throughout the islands of the Archipelago and the continent of Greece. *Sparto* was indeed properly the Greek name of this shrub, the Latin name being *Genista*, and the use of the Greek name in Hispania Citerior may have been owing to the Grecian settlements on that coast, colonized from Marseilles.

Besides the passages of Latin authors referred to by Schneider and Billerbeck, and which it is unnecessary to repeat, the following from Isidore of Seville appears decisive respecting the acceptation of the term.

“*Spartus frutex virgosus sine foliis, ab asperitate vocatus; volumina enim funium, quæ ex eo fiunt, aspera sunt.*” *Originum* L. xvii. c. 9.

This is the definition of a learned and observant author, who lived in Spain, and who must have been familiar with the facts. “*Frutex virgosus sine foliis*” is a clear and striking description of the Spanish Broom, the leaves of which are so small as easily to escape observation†. The *Stipa Tenacissima*, on the other hand, is not a shrub with twigs, but a grass, which grows in tufts, the long leaves being as abundant and useful as the stems or straws. Clusius himself (*l. c.*) in laying down the distinction between the *Spartum* of the Greeks, which he supposed to be the Spanish Broom, and the *Spartum* of Pliny, which he supposed to be the *Stipa Tenacissima*, asserts that the former is a shrub (*frutex*), the latter a herb with grassy leaves (*herba graminacea folia proferens*). It is clear, therefore, that the inhabitants of Spain in the time of Isidore

* See L. xi. 8. where Pliny says, that bees obtain honey and wax from “*Spartum*,” and compare this with Aristotle, *Hist. Anim.* L. x. 40.

† Dioscorides also describes the Spanish Broom to be “a shrub bearing long twigs without leaves.” Isidore’s etymology, deducing *Spartus* from *Asper*, is manifestly absurd.

still used the term *Spartus* in its original acceptation, viz. to denote the *Spartium Junceum* of Linnæus.

When the *Stipa Tenacissima* was brought into use for making ropes and for other purposes, for which the Spanish Broom was employed, the name of the latter would naturally be extended to the former, and we may thus account for the fact that the *Stipa Tenacissima* is now universally known in Spain by the name *Esparto*. Indeed it is possible, that the employment of the *Stipa Tenacissima* for these purposes may have been as ancient as the time of Pliny; and his use of the word "*herba*" in describing it, as well as the locality which he assigns to it, the hilly country about Carthage, favors the common interpretation, and perhaps even authorizes the conclusion, that his account is the result of confounding the two plants together, so that he says of one supposed plant things, which were partly true of both, and partly applicable either to the Spanish Broom, or to the *Stipa Tenacissima* only. But, even if this be admitted, it is still possible that the plant, from whose fibres the "*pastorum vestis*" was manufactured, was not the grassy *Stipa*, but the shrub, the Spanish Broom.

In order to establish this point we now proceed to mention the evidence respecting the application of it to such uses. It has been employed for making cloth in Turkey, in Italy, and the South of France, but in circumstances, which were either specially favorable to the manufacture, or where flax could not be cultivated. It is manufactured into shirts in Albania according to Dr. Sibthorp*. Nearly a century ago, Pope Benedict XIV. brought a colony of Albanians to inhabit a barren and desolate portion of his territory on the sea-coast. Here they obtained a very fine, strong, durable thread from the Broom and the *Nettle*, and used it, when woven, in place of linen†. Trombelli, who relates this fact, also gives an account of the manufacture of broom-bark in the vicinity of Lucca, where the hills, called Monte Cascia, are covered with this plant‡. "Formerly," he

* Flora Græca, No. 671.

† Trombelli, Bononiensis Scient. atque Artium Instituti Commentarii, tom. vi. p. 118.

‡ Trombelli calls the plant *Genista*, and says it is the kind called by botanists

says, "the people derived no other advantage from the shrub than to feed sheep and goats with it, and to heat their stoves and furnaces. But their ingenuity and industry have now made it far more profitable. They steep the twigs for some days in the thermal waters of Bagno a Acqua near Lucca. *After this process the bark is easily stript off, and it is then combed and otherwise treated like flax.* It becomes finer than hemp could be made; it is easily *dyled* of *any* color, and may be used for garments of *any* kind*." In the vicinity of Pisa we find that the twigs of the Spanish Broom were in like manner soaked in the thermal waters, and that a coarse cloth was manufactured from the bark†.

But the manufacture has been carried to a far greater extent in the South of France. In the *Journal de Physique*, Tom. 30. 4to. An. 1787. p. 294., is a paper by *Broussonet Sur la culture et les usages économiques du Genêt d'Espagne*. A minute and highly curious account is here given of the mode of preparing the fibres, which is practised by the inhabitants of all the villages in the vicinity of Lodève in Bas Languedoc. The shrub abounds on the barren hills of that region, and all that the people do to favor its growth is to sow the seed in the driest places, where scarce any other plant can vegetate. After being cut, the twigs are dried in the sun, then beaten, macerated in water, and treated in the same way as flax or hemp (See Zincke's process, Chapter XI.). The coarser thread is used to make bags for holding the legumes, corn, &c.; the finer for making *sheets, napkins, and shirts*. The peasants in this district use *no other kind of linen*, not being acquainted with the culture either of flax or hemp. The ground is too dry and unproductive to suit these plants. The linen made

"*Genista juncea flore luteo.*" This is the *Spartium Junceum* of Linnæus. See Ray, *Catal. Stirp. Europ. and Scopoli, Flora Carniolica*, 1772, tom. i. No. 870.

* *Bononiensis Scientiarum atque Artium Instituti Commentarii*, tom. iv. Bonon. 1757, p. 349-351. A similar account of the manufacture of the "*Teladi Ginestia*" at Bagno a Acqua is given by Mr. John Strange, who says he had sent an account of it to the Society for encouraging Arts, Manufactures, and Commerce. *Lettera sopra l'Origine della carta naturale di Cortona*, Pisa 1764. p. 79.

† *Mem. de l'Académie des Sciences*, Paris 1763.

of the Spanish Broom is as supple as that made from hemp ; it might be even as beautiful as real linen, if more pains were taken with it. It becomes whiter, the oftener it is washed. It is rarely sold, each family making it for its own use. The stalks, after the rind has been separated from them, are tied in small bundles, and sold for lighting fires.

Let us now see how far Pliny's account of the Spartum agrees with these representations of the mode of manufacturing Broom-bark. The Spartum, of which he speaks, is "*the rush of a dry soil*," a description far more applicable to the young twigs of the Spanish Broom than to the grassy stems of the *Stipa Tenacissima*, or indeed to any other plant. His Spartum was used for making fires and for giving light (*hinc ignes facesque*), purposes for which the *Stipa Tenacissima* is not at all adapted, but to both of which the stems and twigs of the Spanish Broom are applied. The tender tops of Pliny's Spartum served as food for animals. According to Trombelli sheep and goats feed upon the Spanish Broom in Italy ; but we cannot find that this is the case with the *Stipa Tenacissima*. Pliny's Spartum, after being steeped in water, was beaten in order to be made useful (*Hoc autem tunditur, ut fiat utile*) ; and this process was quite necessary in preparing the twigs of Spanish Broom, whereas the *Stipa Tenacissima* is most commonly manufactured without going through any such process. Clusius indeed states (*l. c.*) that by macerating it in water like flax, and then drying and beating it, the Spaniards of Valencia make a kind of shoes, which they call *Alpergates*, also cords, and other finer articles ; but, at the same time, he says, that it is made into mats, baskets, ropes, and cables, merely by being dried, platted, and twisted, without any other operation. The same account is given by Townsend, who visited the country as late as 1787, and who further states, that "the esparto rush" had latterly "been spun into fine thread for the purpose of making cloth*." It seems, however, that this had only been done as an experiment, whereas the accounts which have been quoted show, that the manufacture of cloth

* Journey through Spain, vol. iii. p. 129, 130.

from broom-bark had been long established in Albania, Italy, and the South of France. In the latter district more especially, the entire dependence of the people on this material as a substitute for flax and hemp, and the primitive mode in which this domestic manufacture was carried on in a retired and mountainous region, seem to indicate the high antiquity of the practice. All the other authors, who mention the use of the *Stipa Tenacissima*, certainly give little countenance to the idea of its fitness to supply a thread for making cloth. Mr. Carter, adopting the common opinion that the *Spartum* of Pliny is the *Stipa Tenacissima*, observes, that "at present the meanest Spaniard would think clothing made from this grass very rough and uncomfortable*." We shall only quote one other authority, that of Löffling, the favorite pupil of Linnæus, who became botanist to the King of Spain, and whose *Iter Hispanicum* (*Stockholm*, 1758.) relates particularly to the plants of that country. He follows Clusius in supposing the *Spartum* of Pliny to be the *Stipa Tenacissima* of Linnæus. He mentions, that its stem is two or three feet high, with leaves so long, thin, tough, and convoluted, that they are admirably adapted for the purposes to which they are applied. He adds, "*Hispanis nominatur Esparto. Usus hujus frequentissimus per universam Hispaniam ad stercas ob pavimenta lateritia per hyemem: ad funes crassiores pro navibus ad que corbes et alia utensilia pro transportandis fructibus.*" (p. 119.)

Pliny's remark, that the *Spartum*, of which he speaks, could not be sown (*quæ non queat seri*), is not true of the Spanish Broom; but this is of little importance in the present inquiry, because it is coupled with the remark, that nothing else could be sown in the same situation (*nec aliud ibi seri aut nasci potest*); a remark, which is totally unfounded in fact. The Spanish Broom would unquestionably be propagated by its seed, which is very abundant.

From these facts, the reader will have no difficulty in forming his decision. Notwithstanding the respect due to the authority of Clusius, into which that of all the subsequent writers

* Carter's Journey, vol. ii. p. 414, 415.

seems to resolve itself, it appears to us that the evidence preponderates against the use of *Stipa Tenacissima* for making cloth in ancient times, and points to the conclusion, that the coarse garments, to which Pliny alludes, were fabricated from the fibrous rind of *Spartium Junceum*.

One of the most interesting facts in the geography of plants is the frequent substitution in one country, of a plant of a certain natural order for another of the same natural order in another country. The Indians have a plant, bearing a very close and striking resemblance to the *Spartium Junceum*, which they employ just as the natives of Bas Languedoc employ that plant. We refer to the *Crotalaria Juncea*, called by the natives Goni, Danapu, or Shanapu, and by us the Sun-plant, or Indian Hemp. From the bark are made all kinds of ropes, packing-cloths, sacks, nets, &c. In order to improve the fibre, the plants are sown as close as possible and thus draw up to the height of about ten feet. According to Dr. Francis Buchanan, the plant thrives best on a poor sandy soil, and requires to be abundantly watered. After being cut down it is spread out to the sun and dried. The seed is beaten out by striking the pods with a stick. After this the stems are tied up in large bundles, about twelve feet in circumference, and are preserved in stacks or under sheds. When wanted, the stems are macerated during six or eight days. They are known to be ready, when the bark separates easily from the pith. "The plant is then taken out of the water, and a man, taking it up by handfuls, beats them on the ground, and occasionally washes them until they be clean; and at the same time picks out with his hand the remainder of the pith, until nothing except the bark be left. This is then dried, and being taken up by handfuls, is beaten with a stick to separate and clean the fibres. The hemp is then completely ready, and is spun into thread on a spindle, both by the men and women. The men alone weave it, and perform this labor in the open air with a very rude loom." The fabric made from it is a coarse, but very strong sack-cloth.

"The fibres, when prepared," says Ironside, "are so similar

to hemp, that Europeans generally suppose them to be the produce of the same plant*.”

Theophrastus† (Hist. Pl. viii. 13.) gives the following account of a bulbous plant, called by him Βολβοδὲς ἐριόφορος, the root of which supplied materials for weaving:—“It grows in *bays*, and has the wool under the first coats of the bulb so as to be between the inner eatable part and the outer. Socks and other garments are woven from it. Hence this kind is woolly, and not hairy, like that in India.”

It is difficult to determine what plant is meant, though the description seems accurate and scientific. Billerbeck absurdly supposes it to be cotton-grass‡. By former botanists, men of great eminence, it was supposed to be *Scilla Hyacinthoides*. Sprengel objects, that this species does not grow in Greece§. Sir James Smith however (*article SCILLA* in *Rees's Cyclop.*) represents it as growing in Madeira, Portugal, and the Levant. If this account be true, Theophrastus may have been acquainted with it. In another article, Eriophorus, Sir J. Smith doubts whether either *Scilla Hyacinthoides* or any other bulb produces wool of such quality and in such quantity as to answer the description of Theophrastus. But, we learn from other well-

* Account of the culture and uses of the Son- or Sun-plant of Hindostan by Ironside, in the Phil. Trans., vol. lxiv.: Dr. F. Buchanan's Journey, vol. i. 226, 227, 291.; vol. ii. 227, 235.: Wissett on Hemp, passim.: Roxburgh's Flora Indica, vol. iii. p. 259-263.

The genus *Lupinus* (*the Lupin*), belonging to the same natural order as *Spartium* and *Crotalaria*, might probably afford materials of the same kind. Mr. Strange (*Lettera*, &c. p. 70.) mentions the filamentous substance of the *Lupin* as adapted for making paper.

† “Theophrastus relates, that there is a kind of bulb growing about the banks of rivers, and that between its outer rind and the part of it which is eaten there is a woolly substance, out of which they make certain kinds of socks and cloths. But in the copies which I have found, he neither mentions in what country this is done, nor anything else with greater exactness, except that the bulb is called *eriphoros*; nor does he make any mention at all of *spartum*, although he examined the whole subject with great care 390 years before my time, as I have observed in another place (*Viz.*, lib. xv. 1.), from which circumstance it appears, that *spartum* came into use since that time.”

‡ *Flora Classica*, p. 20.

§ German translation of Theophrastus, Notes, vol. ii. p. 283.

informed botanists, that various bulbs have under the outermost coats a copious tissue of tough fibres, *fully sufficient* to be employed in *weaving*. This is particularly the case with the genera *Amaryllis*, *Crinum*, and *Pancratium*, as well as *Scilla*. The fibrous coats serve as a protection to the interior and more vital parts of the bulb.

Hoffmansegg and Link, who travelled in Portugal, in the description of *Scilla Hyacinthoides*, say, "Bulbus tomento viscoso tectus*."

Sonnini says of the *Scilla Maritima*, "The Greeks of the Archipelago call it *Kourvara-skilla*, *kourvara* signifying properly 'a tuft of thread' (*peloton de fil*)." Does this refer to the fibres mentioned by Theophrastus? The *size* of this bulb, which is the common squill, used in pharmacy, seems to favor this supposition. It is often as large as a man's head‡. Hoffmansegg and Link§ say it grows abundantly on barren hills in Spain and Portugal; but add, "The name *maritima* is not quite proper: for the plant is seldom met with near the sea-shore, and sometimes very remote from it." On the other hand, it must have been so called, because it was reported by others to grow on the sea-shore; and Sir James Smith (*in Rees's Cyclopaedia*) expressly states, that it grows on "sandy shores." Redouté says the same.

From the account of *Pancratium* by Sir James Edward Smith (*in Rees's Cyclop.*), we learn that two species grow in Greece, viz. *P. Maritimum* and *Illyricum*.

The remarks now offered appear to prove, that there certainly may have been a bulb, such as Theophrastus describes, though we have not sufficient information to decide its genus and species. It may have been the *Scilla Maritima*.

It is to be observed, that he refers also to an Indian bulb, having similar properties. Perhaps he alluded to some plant of

* Annals of Botany, by König and Sims. Lond. 1805, vol. i. p. 101.

† Voyage en Grèce, tom. i. ch. 14. p. 295.

‡ "Bulbus ovatus, tunicatus, *crassitie ferè capitis humani*." Desfontaines' Flora Atlantica, tom. i. p. 297.

§ An. of Bot. vol. i. p. 101.

a kind similar to *Agave Vivipara*, the leaves of which are extensively used in India for making cordage*.

We cannot better conclude this part of the subject, than by giving the following interesting communication of Dr. Daniel Stebbins, of Northampton, Mass., to the Hon. H. L. Ellsworth, a gentleman who has, in our opinion, rendered most valuable services, not only to the people of the United States, but to the world at large, since his appointment to the office of Commissioner of Patents.

Northampton, Hampshire County, Mass.

“Dear Sir: The favorable notice of silk culture in document No. 109, from the Patent Office report of February, 1843, is my apology for presenting the enclosed samples of *paper*, made of mulberry foliage and bark. Unfortunately, the *external cuticle* of the bark had not been removed; producing the spots, but does not injure the paper for the use intended, which was for the purpose of depositing silk-worms’ eggs upon something dark; and this being *unbleached*, is considered adapted to the habits of the silk-worm, and is now in successful experiment.

“The four samples are all of one batch; the darkest, having more of the outside cuticle, was most buoyant, rose to the top and came off first.

“A quantity of genuine Canton foliage, which retains its verdure in greater perfection and later than any other mulberry, is gathered, dried, and sent to the mill for making paper, bleached, without spots, fit for cotton paper, as hoped; and, if successful, I shall take pleasure in sending you a sample, to be preserved with the enclosed.

“I began, some ten or twelve years since, to bring silk culture into notice among the members of the Hampshire Agricultural Society, believing that if we tried the right kind of trees, (such as used in China,) we could raise silk, yet could not afford to pay \$1 per tree, as then asked for *multicaulis*; not reflecting how easily they could be propagated by cuttings and layers. Under this view of the subject, I wrote to the Rev. E.

* Dr. F. Buchanan’s *Journey in Mysore*, &c. i. p. 36

C. Bridgman, missionary at Canton, China, a native of Hampshire county, with the request that he would procure and forward me some *mulberry seed* of the most approved kind for growing in China, for the use of members of the agricultural society. He promptly attended to the request; the seed was forwarded and sown in the spring of 1834 or 1835. It grew finely, and developed a splendid leaf.

“About two years since, while Dr. Parker, with a Chinaman, was here on a visit, on being shown the Canton foliage, it was readily recognized. As the trees had grown here very luxuriantly, and developed a larger leaf than in China, Dr. Parker suggested that our soil might be more congenial to the plant than even China, its native soil.

“Soon after receiving the seed from Canton, a friend sent me another parcel from the South of Asia, with high commendations, that if it would grow here, it would be of essential benefit to the United States for raising silk. It succeeded well, and is more hardy than the white mulberry, very productive in small branches, and a good-sized leaf. I named the latter *Asiatic Canton*. These two kinds are highly approved of for feeding silk-worms—the Canton for leaf-feeding, and the Asiatic for branch feeding. I have, however, almost every variety which was cultivated during the mulberry speculation—covering, altogether, some ten or twelve acres, besides a large number of young Canton and Asiatic seedlings, of this year’s sowing, from seed of my own raising, to enlarge the plantations.

“A few days since, the Rev. William Richards, of the Sandwich Islands, with the young prince, called on me. At a former visit, I had supplied him with Canton mulberry-seed, silk-worms’ eggs, and dry mulberry foliage to use in case the eggs should hatch on the passage; but this they did not do until his arrival home. About the same time, other eggs had been received there from China; but the cocoons raised from them were not *one quarter* as large as the American, and must have required some 10,000 to 12,000 to make a pound of silk, while in America 2,400 to 3,000 would make a pound.

“Mr. Titcomb, also a silk-grower in one of the islands, having the American and Chinese, crossed them: but the crossing

produced cocoons so small as to require from 5,000 to 6,000 to make a pound of silk, while not over 3,000 of the American would be required to do the same thing(!).

“Mr. Richards was shown several *pamphlets, newspapers, cap and writing paper*, supposed to have been made of mulberry bark. He said rags were *not* used in India*, China, or the islands, for making paper, but they always make it of some vegetable leaf; that the bark was too valuable for that, and was used to make *fabrics*. (See Chapters XI. and XII. of this Part. Also Appendix A.)

“We, as Americans, have the appropriate soil and climate for the Canton and Asiatic mulberry, with the pea-nut variety of worms, which, being managed with due care and attention, together with the skill, ingenuity, and perseverance of Americans—and, in addition, and could we have the aid of our country to encourage new beginners—we might hope to compete with any nation in the production of silk, their cheap labor and cheap living to the contrary notwithstanding. There is abundant evidence that worms fed exclusively on the Canton mulberry have been larger, and produced heavier cocoons, by one-third in size of worms and weight of cocoons, than by other

* Abdollatiph who visited Egypt A. D. 1200, informs us (Chapter iv. p. 188 of Silvestre de Sacy's French translation, p. 221 of Wahl's German translation.), “*that the cloth, rags, &c. found in the catacombs, and used to envelope the mummies, was made into garments, or sold to the scribes to make paper for shop-keepers.*” This cloth is proved to be linen (See Part IV. p. 365), and the passage of Abdollatiph may be considered as decisive proof, which however has never been produced as such, of the manufacture of linen paper as early as the year 1200. Professor Tychsen in his learned and curious dissertation on the use of paper from Papyrus (published in the *Commentationes Reg. Soc. Gottingensis Recentiores*, vol. iv. A. D. 1820), has brought abundant testimonies to prove that *Egypt supplied all Europe with this kind of paper until towards the end of the eleventh century*. The use of it was then abandoned, cotton paper being employed instead. The Arabs in consequence of their conquests in Bucharia, had learnt the art of making *cotton paper* about the year 704, and through them or the Saracens it was introduced into Europe in the *eleventh century*. Another fact should not be lost sight of, namely, “that most of the old MSS. in Arabic and other oriental languages are written on this sort of paper,” and that it was first introduced into Europe by the Saracens of Spain. (For further proof, see Appendix A. Also Part IV. already referred to.)

feed. I have supplied an order of the peanut variety of eggs, to go to Guatemala ; and Canton seed, of my own raising, to go to Rio ; and now have an order for a number of the genuine Canton mulberry trees, roots, or cuttings, to go to Lima, where the applicant went on business, a few years since, taking with him a few multicaules, at \$2 each—now multiplied to 50,000 ; who, without any practical knowledge of raising trees, reeling and manufacturing silk, or having seen a silk-worm or reel until he introduced them in 1843, has now presented me with beautiful samples of *floss cocoons, reeled and sewing silk*, done by ladies as a diversion, without any assistance, and very little instruction from him. The silk is of good quality. Samples had been sent by a mercantile house in Lima to England, for an opinion of the quality ; but no return had been received when he came away. He has come to this place with a native Spaniard, to obtain more perfect information in all the branches of reeling, twisting, coloring(!), &c. ; to procure machinery, with a view of enlarging operations, so that he might turn off twenty-five pounds per day of sewings, cords, braids, &c. He represents the climate and soil as adapted to the culture of silk, and could feed every month in the year ; that the necessaries of living are procured with but little labor ; that the laboring population are indolent, *the wealthy classes too proud to labor*. He feels confident of success, and that he can introduce habits of industry by silk culture, that would counteract their natural indolence ; and he will inform me of his success in due time, that may be more interesting than speculations upon what he intends doing. He has engaged several to perfect themselves in reeling, &c., to accompany him when he returns to Lima with his machinery. He has become so satisfied with the superiority of the genuine Canton mulberry, that he has engaged to take it on with him for propagation and use.

“I have letters from widely different locations, rendering favorable accounts of this year’s success in growing silk, and in corroboration of the prevalent opinion *that the silk cause will finally prevail*. I have several letters on this subject—one from a gentleman presiding over one of our most eminent liter-

ary institutions, under date of June, 1844. Discoursing about the culture of silk, he writes as follows :

“ ‘If this earnest waking up to a scientific and practical consideration of the subject be not soon crowned with signal success, it will not be for want of enterprize or skill in our countrymen, but merely from the high price of labor here, compared with the scanty wages given in other silk-growing countries. Even this consideration, though it may *retard* for a while the complete success of this department of productive industry, will not prevent its ultimate *triumph*.’

“Another gentleman, under date of August, 1844, writes from the far West, ‘that the soil and climate of the Western and South-western States are admirably suited to the growth of the mulberry and raising silk-worms,’ and that ‘eventually the two great staples of the Western and South-western States will be *silk* and *wool*.’ It is the opinion of competent skilful silk manufacturers, who have made critical experiments upon the *Pongee-silk* (so called) of foreign make, by tests which they consider satisfactory and decisive, that it is *only a vegetable production*, and that the material was never operated upon *by the silk-worm*(?). There can be no reasonable doubt about the ultimate success of silk-culture in some *future* years ; but to accelerate that desirable event, which may constitute an important American staple for revenue (which might not only enrich the Government, but reward the labor of personal enterprize), a bounty is deemed necessary to stimulate and encourage that portion of the agricultural population whose circumstances or health disqualifies them for the more laborious exercises of the fields, to commence operations upon a new and untried crop. Our extensive imports of raw and manufactured silks are encouraged by us as consumers, instead of being producers. We now contribute to support foreign enterprize and industry, to produce the article of silk, which we might, with proper encouragement, raise ourselves, not only for our own consumption, but for exportation.”

Very respectfully, yours, &c.

Henry L. Ellsworth, Esq.,
Commissioner of Patents.

DANIEL STEBBINS.

The amount of silk imported into the United States annually, nearly equals that of linen and woollen together, and is equal to one half of all other fabrics combined. Is it not then, an important consideration, that this expenditure be saved to the nation?

PART SECOND.

ORIGIN AND ANCIENT HISTORY OF THE SHEEP.

CHAPTER I.

SHEEP'S WOOL.

SHEEP-BREEDING AND PASTORAL LIFE OF THE ANCIENTS—ILLUSTRATIONS OF THE SCRIPTURES, ETC.

The Shepherd Boy—Sheep-breeding in Scythia and Persia—Mesopotamia and Syria—In Idumæa and Northern Arabia—In Palestine and Egypt—In Ethiopia and Libya—In Caucasus and Coraxi—The Coraxi identified with the modern Caratshai—In Asia Minor, Pisidia, Pamphylia, Samos, &c.—In Caria and Ionia—Milesian wool—Sheep-breeding in Thrace, Magnesia, Thessaly, Eubœa, and Bœotia—In Phocis, Attica, and Megaris—In Arcadia—Worship of Pan—Pan the god of the Arcadian Shepherds—Introduction of his worship into Attica—Extension of the worship of Pan—His dances with the nymphs—Pan not the Egyptian Mendes, but identical with Faunus—The philosophical explanation of Pan rejected—Moral, social, and political state of the Arcadians—Polybius on the cultivation of music by the Arcadians—Worship of Mercury in connection with sheep-breeding and the wool trade—Present state of Arcadia—Sheep-breeding in Macedonia and Epirus—Shepherds' dogs—Annual migration of Albanian shepherds.

THE SHEPHERD BOY.

The rain was pattering o'er the low thatch'd shed
That gave us shelter. There was a shepherd boy,
Stretching his lazy limbs on the rough straw,
In vacant happiness. A tatter'd sack
Cover'd his sturdy loins, while his rude legs
Were deck'd with uncouth patches of all hues,
Iris and jet, through which his sun-burnt skin
Peep'd forth in dainty contrast. He was a glory
For painter's eye; and his quaint draperies
Would harmonize with some fair sylvan scene,

Where arching groves, and flower-embroider'd banks,
 Verdant with thymy grass, tempted the sheep
 To scramble up their height, while he, reclin'd
 Upon the pillowing moss, lay listlessly
 Through the long summer's day. Not such as he,
 In plains of Thessaly, as poets feign,
 Went piping forth at the first gleam of morn,
 And in their bowering thickets dreamt of joy,
 And innocence, and love. Let the true lay
 Speak thus of the poor hind :—His indolent gaze
 Reck'd not of natural beauties ; his delights
 Were gross and sensual : not the glorious sun,
 Rising above his hills, and lighting up
 His woods and pastures with a joyous beam,
 To him was grandeur ; not the reposing sound
 Of tinkling flocks cropping the tender shoots,
 To him was music ; not the blossomy breeze
 That slumbers in the honey-dropping bean-flower,
 To him was fragrance : he went plodding on
 His long-accustomed path ; and when his cares
 Of daily duties were o'erpass'd, he ate,
 And laugh'd, and slept, with a most drowsy mind.
 Dweller in cities, scorn'st thou the shepherd boy,
 Who never look'd within to find the eye
 For Nature's glories ? Know, his slumbering spirit
 Struggled to pierce the fogs and deepening mists
 Of rustic ignorance ; but he was bound
 With a harsh galling chain, and so he went
 Grovelling along his dim instinctive way.
 Yet *thou* hadst other hopes and other thoughts,
 But the world spoil'd thee : then the mutable clouds,
 And doming skies, and glory-shedding sun,
 And tranquil stars that hung above thy head
 Like angels gazing on thy crowded path,
 To thee were worthless, and thy soul forsook
 The love of beauteous fields, and the blest lore
 That man may read in Nature's book of truth.
 Despise not, then, the lazy shepherd boy :
 For his account and thine shall be made up,
 And evil cherish'd and occasion lost
 May cast their load upon thee, while his spirit
 May bud and bloom in a more sunny sphere.

The inquiry into the origin and propagation of sheep, no less than of the silk-worm, may be justly regarded as a subject of the deepest interest. For the management and use of these

animals has, from the earliest dawn of human history, formed a striking feature in the condition of man. Of the materials employed by the ancients for making cloth, by far the most important was the wool of sheep. We are able to trace with great probability the process of sheep-breeding and of the use of wool for weaving. Among the bones of quadrupeds, found in ancient caves *throughout Europe*, we cannot find on consulting the works of Cuvier, Buckland, and De la Beche, that remains of sheep have ever been discovered. This fact affords some reason for presuming, that the sheep is not a native of Europe, but has been introduced there by man.

It appears to have been a general opinion among Zoologists, that the Argali, or *Ovis Ammon* of Linnæus, which inhabits in vast numbers the elevated regions of Central Asia, is the primitive stock of the whole race of domesticated sheep. Agreeably to this supposition we find, that from the earliest times the inhabitants of Tartary, Persia, Mesopotamia, Syria, Palestine, and the North of Arabia, have been addicted to pastoral employments. The tribes of wandering shepherds, which frequent those countries, are descended from progenitors, who led the same life thousands of years ago, and whose manners and habits are preserved to the present day with scarcely the slightest change.

As might be expected, we have little precise information respecting the Scythians, who inhabited the elevated plains of inner Asia. Some of their hordes are distinguished by Herodotus, Strabo, and others, under the name of *Nomadic* or *pastoral* Scythians; and that this denomination was understood to imply, that they tended sheep as well as larger cattle may be inferred from what Herodotus says of their use of felt (See Appendix B.). Strabo, moreover, says of a particular tribe of the Massagetæ, that they had "few sheep," which implies that the rest were rich in flocks; and of another tribe he says, "They do not till the ground, but derive their sustenance from sheep and fish, *after the manner of the Nomadic Scythians*.*" But a much more distinct account of the manners of this people

* Strabo, l. xi. cap. 8. p. 486. ed. Siebenkees.

is given us by Justin, who says, that they were accustomed to wander through uncultivated solitudes, always employed in tending herds and flocks (*armenta et pecora*). He, however, adds, that they were strangers to the use of woollen garments, being clothed in skins and furs*. Hence it appears, that they were too rude and ignorant to have acquired the arts of *spinning* and *weaving*.

If we may trust to the authority of Strabo, the Medes did not tend sheep; for he says of them, "They eat the flesh of wild animals; they do not bring up tame cattle‡." Nevertheless, their southern neighbors, the Persians, with whom they were united under one government, had sheep in abundance. These animals are strikingly represented in the bas-reliefs of Persepolis. In one of them, which represents a long procession sculptured on the wall of a splendid staircase, two rams, attended by keepers, are accompanied in the same train by horses, asses, camels, and oxen‡. Herodotus, in his account of the manners and institutions of the Persians (L. i. cap. 133.), mentions all these animals together in the following passage: "Of all days they are accustomed to observe most that on which each individual was born. On this day they set before their guests a more abundant feast than on any other. The wealthy provide an ox, a horse, a camel, and an ass, roasted whole in furnaces; and the poor provide the smaller cattle." By "*the smaller cattle*," this author always means sheep and goats.

The superior excellence of the rich plains of Mesopotamia for the pasture of sheep as well as oxen, is attested by Dionysius Periegetes§, and his account illustrates in an interesting manner the history of Jacob as contained in the book of Genesis,

* Justin, l. ii. cap. 2.

† Strabo, l. xi. cap 8. p. 567.

‡ See Ancient Universal History, vol. vi. plates 6. 8.

§ Οσαη δ' Εὐφράτην, &c. l. 992-996.

In English,

"As for the land, which lies between the Euphrates and the Tigris, called the land *Between the Rivers*, the herdsman would not contemn its pastures, nor he who tends flocks folded in the fields, and honors with his syrinx Pan who has horny hoofs."

the rapid multiplication of the flocks and herds showing how well the soil and climate were adapted to this pursuit, and how well the business of tending them was there understood from the earliest times. Seldom do we find in any ancient author so beautiful a picture as is presented to us, when Jacob arrives at Padan-aram, and sees the flocks of sheep and goats assembling from the neighboring pastures in the evening to be watered at the well. Rachel appears conducting the flock of her father Laban, which she tended, and Jacob rolls from the mouth of the well the stone, which was placed to preserve the water cool and fresh, and assists his relative and future bride in watering her sheep. (Gen. xxix. 1-10.) Also on Jacob's departure his remonstrance with Laban presents to us an animated representation of the duties and difficulties of the shepherd's life; "These twenty years have I been with thee; thy ewes and thy she-goats have not cast their young, and the rams of thy flock have I not eaten. That which was torn of beasts I brought not unto thee; I bare the loss of it: of my hand didst thou require it, whether stolen by day, or stolen by night. Thus I was; in the day the drought consumed me, and the frost by night; and my sleep departed from mine eyes." (Gen. xxxi. 38-40.)

From Ezekiel we learn, that Damascus supplied the Tyrians with wool*, and Jerome, who well knew the country, says in his comment on the passage, that this article was still produced there in his time (A. D. 378).† Aristotle, referring to the

* "Damascus was thy merchant in the multitude of the wares of thy making, for the multitude of all riches; in the wine of Helbon, and *white* wool. Dan also and Javan going to and fro occupied in thy fairs: *bright* iron, cassia, and calamus, were in thy market. Dedan was thy merchant in *precious clothes for chariots*. Arabia, and all the princes of Kedar, they occupied with thee in *lambs*, and *rams*, and *goats*: in these were they thy merchants. The merchants of Shebah and Raamah, they were thy merchants: they occupied in thy fairs with chief of all spices, and with all precious stones, and gold. Haran, and Canneh, and Eden, the merchants of Sheba, Asshur, and Chilmad, were thy merchants. These were thy merchants in all sorts of things, in *blue clothes*, and *broidered work*, and in *chests of rich apparel*, bound with cords, and made of cedar, among thy merchandise."—*Ezekiel* xxvii. 18-24.

† "Et lana præcipua, quod usque hodie cernimus."

sheep of Syria, mentions a variety with tails, which were a cubit broad* ; and Pliny in addition to this circumstance asserts generally the abundance of the Syrian wool†. Probably the part of Syria appropriated more especially to the breeding of sheep, was the eastern part, which bordered on Arabia, and was distinguished by the same natural features.

In no part of the ancient world does sheep-breeding appear to have been more cultivated than in that which we are now approaching. Here were the Moabites, among whom it was a *royal occupation*, and, as it appears, the chief source of the revenues of the sovereign : for it is said in 2 Kings iii. 4. "Mesha, king of Moab, was a *sheep-master*, and rendered unto the king of Israel an hundred thousand lambs and an hundred thousand rams with the wool." Here on occasion of a war, which the Reubenites, the Gadites, and the half-tribe of Manasseh, whose territory was to the east of Jordan, carried on against the Hagarites, they obtained as part of their booty 250,000 sheep. (I. Chron. v. 21.) Here was Idumæa, in a part of which Job is represented to have dwelt, being possessed of 7,000, and afterwards of 14,000 sheep (Job i. 3. xlii. 12.) : and we have a beautiful allusion to the pastoral habits of the same country in the language of consolation employed by the prophet Micah (ii. 12.) ; "I will surely assemble, O Jacob, all of thee ; I will surely gather the remnant of Israel ; I will put them together as the sheep of Bosrah, as the flock in the midst of their fold : they shall make great noise by reason of the multitude of men." Here also were the Midianites, whose flocks were so vast, that the sheep taken from them by Moses after his victory amounted to 675,000. (Num. xxxi. 32.) Jethro, the priest of Midian, was himself the owner of a numerous flock, tended by his seven daughters, whom Moses assisted in watering them, when the neighboring shepherds rudely attempted to drive them from the well. He afterwards married one of them, and was employed by the father as his shepherd ; and, having occasion according to the practice of

* Hist. Animalium, l. viii. cap. 28.

† Plinii Hist. Nat. l. viii. c. 75. ed. Bipont. See Appendix A.

the country to conduct the flock from the plains to pasture upon the mountains of Horeb, he was thence called to undertake his extraordinary mission for the deliverance of his nation. (Exod. ii. 15—iii. 1.)

The Arabs appear from the earliest times to the present day to have bestowed no less attention upon sheep than upon horses. Isaiah also records the excellence of the sheep of Arabia in the following terms addressed by the Almighty to his people (Ch. lx. 7): "All the flocks of Kedar shall be gathered together unto thee, the rams of Nebaioth shall minister unto thee: they shall come up with acceptance on mine altar, and I will glorify the house of my glory." The habits of the Nebatæi, or Arabs of Nebaioth, are depicted as follows by Diodorus Siculus: "They live in the open air, and call a land their country, which is destitute of habitations, and has neither rivers nor copious fountains, such as could satisfy an army of invaders. *Their law forbids them on pain of death either to sow corn, to plant fruit-trees, to use wine, or to build houses.* They submit to this law, because they think, that those who enjoy such conveniences may for the sake of them be readily compelled by the powerful to do what they command. Some of them rear camels, and others sheep, which they pasture in the wilderness*."

Various ancient authors mention that extraordinary variety of sheep among the Arabs, the tail of which grew to so great a size as to require to be supported on a wooden carriage, which was dragged after the wearer†.

We have no reason to believe, that the Phœnicians employed themselves in the breeding and pasture of sheep. The narrow strip of territory, which they occupied at the eastern extremity of the Mediterranean Sea, was in general too densely peopled to be adapted for this purpose. Their activity, intelligence,

* Diod. Sic. l. xix. 94. p. 722. ed. Steph.

Strabo (l. xvi. cap. 4. p. 460. ed. Siebenkees.), speaking apparently of another division of the Nebatæi, says they have large oxen, camels, and white sheep.

† The passages of ancient authors relating to this variety, with various confirmations from modern travellers, are quoted with his usual accuracy by Bochart, Hieroz. l. ii. cap. 45. p. 494-497. Ed. Leusden. Lug. Bat. 1692.

and enterprize were directed into other channels, and they supplied themselves from foreign countries with wool for their celebrated manufactures.

On the other hand, the Hebrews, who were the immediate neighbors of the Phœnicians, were altogether an agricultural and pastoral people. The history of the patriarchs, Abraham, Isaac, and Jacob, presents to us beautiful images of the kind of life, which still continues with little variation among the Bedouins, or wandering Nomads of Arabia. Not only was David *a shepherd boy*; but, when he had ascended the throne, he had numerous herds and flocks superintended by distinct officers. "And over the herds that fed in Sharon was Shitrai the Sharonite: and over the herds that were in the valleys was Shaphat the son of Adlai. Over the camels also was Obil the Ishmaelite: and over the asses was Jehdeiah the Meronothite: and over the flocks was Jaziz the Hagarite. All these were the rulers of the substance which was king David's." (I. Chron. xxvii. 29-31. The reader cannot fail to call to mind David's frequent allusions in the Psalms to those employments, which were no less familiar to his own mind than to the rest of his countrymen, and which supplied to them the most touching comparisons for the expression of their deepest religious convictions. The passage "The Lord is my shepherd: I shall not want. He maketh me to lie down in green pastures: he leadeth me beside the still waters. Yea though I walk through the valley of the shadow of death, I will fear no evil; for thou art with me; thy rod (or *crook*) and thy staff, they comfort me" (Psalm xxiii. 1, 2, 4.). "He shall feed (*i. e. tend*) his flock like a shepherd; he shall gather the lambs with his arm, and carry them in his bosom, and shall gently lead those that are with young" (Is. xl. ii.). "The pastures are *clothed* with flocks," an expression denoting the vast multitudes of sheep, which overspread the mountains and plains (Ps. lxxv. 13.). "Be thou diligent," says Solomon, "to know the state of thy flocks, and look well to thy herds. The lambs are for thy clothing, and the goats are the price of thy field; and thou shalt have goat's milk enough for thy food, for the food of thy household, and for the maintenance of thy maidens" (Prov.

xxvii. 23. 26, 27.). We would particularly refer the reader to the thirty-fourth chapter of Ezekiel, where the prophet, reprimanding the rulers of Israel under the character of shepherds, makes some allusion to every circumstance connected with the care of sheep and goats. Language very similar is employed by our Saviour in John x. where he speaks of himself as "*the good shepherd.*" The whole system and history of the sacrifices both before and after the giving of the Mosaic law, might be produced to prove the pastoral habits of this people from the earliest times. The districts of Bashan and Carmel, seem to have attained the highest reputation in respect to the breeding of sheep. Bashan, which lay to the east of the Jordan in the country adjoining that of the Hagarites and Moabites, already mentioned, and Carmel, the mountainous range near the Dead Sea in the south of Judea. In the latter district Nabal kept his flocks, and as he is said to have been "very great," and we are at the same time informed that "he had 3000 sheep and 1000 goats" (I. Sam. xxv. 2.), these numbers afford us a precise idea of the wealth of a considerable proprietor in this respect. That the "rams of the breed of Bashan," were particularly celebrated, we learn from Deut. xxxii. 14; and Ezekiel mentions with distinction (ch. xxxix. 18.) a sacrifice "of rams, of lambs, and of goats, of bullocks, all of them fatlings of Bashan."

It is impossible to conceive a more striking difference in manners and institutions, than that which must have presented itself to the traveller in very ancient times, when on crossing the Isthmus of Suez he passed from the deserts of Arabia and Idumæa to the richly cultivated and populous plains of Egypt. According to the statement already quoted from an ancient historian the wandering tribes of Nabaioth were forbidden by a positive law to till the ground or to construct settled habitations, and they lived on the produce of their flocks, which they continually led from place to place in pursuit of pasture adapted to the season of the year. The Egyptians, on the contrary, appear to have been originally under a prohibition of exactly the opposite kind, since they cultivated the ground with care, excelled most other nations in all the arts of life, and produced the most splendid

proofs of their architectural skill, but were not allowed to keep flocks of sheep and goats. That this was the case at the time, when Jacob took his family to sojourn in Egypt, is evident from their application to Pharaoh on arriving in the land of Goshen, which was on the eastern border of Egypt adjoining Palestine and Arabia, to be permitted to remain there on the ground, that from their youth they had been accustomed to tend flocks, whereas "every shepherd was an abomination to the Egyptians*."

It appears that the Nabatæan law was far more effectual towards the attainment of its object than the Egyptian. For, whereas the pastoral tribes of Arabia have retained their independence and their national peculiarities even to the present day; the Egyptians, on the other hand, became a prey to foreign invasion, and among other changes in their customs we have to notice the introduction of the management of sheep. Even as early as the time of Moses the practice had commenced; for in the account of the effects of the murrain in Exodus ix. 3, we find mention of sheep, and indeed it is remarkable, that the domestic animals there enumerated, viz. horses, asses, camels, oxen, and sheep, are exactly the same, which, as we have before shown, were bred by the ancient Persians†. Later historians afford distinct testimony to the same fact. Thus Diodorus Siculus says, that "upon the subsidence of the waters after the inundation of the Nile the flocks were admitted to pasture, and the produce of the soil was so abundant, that the sheep were not only shorn *twice*, but also brought forth young *twice* in the year." Herodotus also plainly supposes, that sheep and goats were bred in Egypt, when he contrasts the inhabitants of the Theban Nome, who worshipped Ammon, with the inhabitants of the Mendesian Nome, who worshipped Mendes. The former, he says, "all abstain from sheep, and sacrifice goats;" the latter "abstain from goats, which they hold in veneration, and sacrifice sheep." He, however, men-

* Gen. xlv. 28.—xlvii. 6. Compare Josephus, Ant. ii. 7. 5.

† It should be observed, that the Hebrew word translated *sheep* in Ex. ix. 3. included goats.

tions that the Thebans slew a ram once a year on occasion of a particular ceremony, which he describes (ii. 42. 46.). The testimony of Strabo and Plutarch, though differing in some particulars from that of Herodotus, is to the same general effect. Aristotle (*l. c.*) mentions, that the sheep of Egypt were larger than those of Greece.

But, although these passages show, that sheep were bred in Egypt, we think it evident that their number was very limited. Egyptian wool cannot have been of the least importance as an article of commerce. What was produced must also have been consumed in the country. For, although the chief material for the clothing of the Egyptians was linen, and they were forbidden to be buried in woollen or to use it in the temples, yet Herodotus (ii. 81.) states, that on ordinary occasions they wore a garment of white wool over their linen shirt. They also used wool for embroidering. According to Pliny* the Egyptian wool was coarse and of a short staple. Tertullian records a saying of the Egyptians, that Mercury invented the spinning of wool in their country†.

Strabo in an instructive manner contrasts the Ethiopians with the Egyptians. Having observed, that the boundary between the two nations was the smaller cataract above Syene and Elephantine, he says, that the Ethiopians led for the most part a pastoral life without resources, both on account of their intemperate climate and the poverty of their soil, and also because they were remote from the civilized world; whereas the Egyptians had always lived in a refined manner and under a regular government, settled in fixed habitations, and cultivating philosophy, agriculture, and the arts‡. Thus do we find the nomad life recurring immediately to the south of Egypt. Strabo further states, that the Ethiopian sheep were small, and instead of being woolly were hairy like goats, on which account the people wore skins instead of woollen cloth§. That these

* Hist. Nat. l. viii. 73. See Appendix A.

† De Pallio, c. 3.

‡ Strabo, l. xvii. c. 1. § 3. p. 476, 477. ed. Siebenkees.

§ Cap. 2. § 1. 3. p. 621. 626. Strabo's account is illustrated and confirmed by the traveller, Dr. Shaw, who describes a variety of sheep in the interior of Africa

sheep were held in some estimation by the Egyptians is, however, manifest from the fact, that in the splendid procession exhibited at Alexandria by Ptolemy Philadelphus, there were 130 sheep from Ethiopia, 300 from Arabia, and 20 from Eubœa*. Also, that the pastoral habits of the Ethiopians were known to the Romans may be inferred from the allusion, which Virgil makes to them in his Tenth Eclogue (l. 64–68.):

No toils of ours can change the cruel god,
 Though we should flee him through each new abode ;
 Whether we drink, where chilling Hebrus flows,
 And winter reigns amid Sithonian snows ;
 Or, where the elms beneath hot Cancer bend,
 Our Ethiopian sheep we fainting tend.

We find, that the people of Libya had attained to some distinction in the management of flocks. What Diodorus says of the Egyptian sheep is asserted by Aristotle of those of Libya, viz. that they produced young *twice* in the year†. That sheep-breeding had extended hither in very early times appears from a passage in the Odyssey, which, however, in consequence of the remoteness of the situation and the imperfect knowledge of geography in the time of the writer, is mixed with fable, inasmuch as it represents, that the ewes brought forth not only twice, but even *three* times in the year, and that the lambs were immediately provided with horns‡.

That happy clime ! where each revolving year
 The teeming ewes a triple offspring bear,
 And two fair crescents of translucent horn
 The brows of all their young increase adorn ;
 The shepherd swains, with sure abundance blest,
 On the fat flock and rural dainties feast ;
 Nor want of herbage makes the dairy fail,
 But every season fills the foaming pail.

Pope's Translation.

Pindar (*Pyth.* ix. 11.) distinguishes Libya by the epithet *πουμηλος*, "abounding in flocks." To the same district of Africa,

with "fleeces as coarse and hairy as those of the goat."—Travels in Barbary, part iii. chap. 2. § 1.

* Callixenus Rhodius, apud Athenæum, l. v. p. 201. ed. Casaub.

† Aristot. Problem. cap. x. sec. 46.

‡ Odyss. iv. 85–89.

Virgil alludes in the following passage of the *Georgics*, which is surpassed by few as a happy example of the art of the poet in describing the various modes of pastoral life.

Why should I sing of Libya's artless swains ;
 Her scatter'd cottages and trackless plains ?
 By day, by night, without a destined home,
 For many a month their flocks all lonely roam ;
 So vast th' unbounded solitude appears,
 While, with his flock, his all the shepherd bears,
 His arms, his household god, his homely shed,
 His Cretan darts, and dogs of Sparta bred.

Georg. iii. 339-345.—*Warton's Translation.*

It is to be observed, that, although the Libyan shepherd according to Virgil's description led a migratory life, conducting his sheep from place to place in search of pasture, yet the scale, upon which he carried on his operations, was widely different from that which has always characterized the nomadic tribes of Asia. The poet represents the Libyan shepherd as a solitary wanderer, bearing with him all his arms and implements, just as a Roman soldier (l. 346.) carried his military accoutrements. On the other hand, as we have seen, the Syrian or Arabian shepherd goes in a kind of state, with camels and horses to carry his wife and children, his tents, and the rest of his equipage ; and he is followed by thousands, instead of hundreds or perhaps scores, of sheep and goats.

Let us now pursue the progress of this employment in another direction, viz. towards the north-west, and across the Euxine Sea and the straits connected with it into Europe.

Near the eastern extremity of the Euxine Sea we meet with a very remarkable instance of the attention paid to the produce and manufacture of wool in a tribe called *the Coraxi*. Strabo alludes to the value of their fleeces in a passage which we shall produce in speaking of the wool of Spain, to which it more directly refers. At present we shall only consider the following evidence preserved by Joannes Tzetzes.

Τὸ παλαιὸν περὶ στρωμνῆς ἦν τῆ Μιλητῶ φήμη·
 Ἐρία τὰ Μιλησία καλλίστα γὰρ τῶν πάντων,
 Κἄν ὧσι τῶν Κοραξικῶν φέροντα δευτερεῖα*.

* Jo. Tzetzes, *Chiliad.* x. 348-350, in *Lectii Corp. Poetarum Græcorum.*

“Anciently Miletus was famed for carpets: for of all fleeces the Milesian were the most beautiful, although the Coraxic bore the second prize.”

Περὶ τῶν Μιλησιῶν ἔφαν παλλοὶ ἐρίων
 Περὶ ἐρίων Κοράξων ἐν πρωτῷ δὲ Ἰαμβῷ
 Ἰππῶνας οὐτως εἴρηκε, μέτρῳ χλωῶν Ἰάμβων,
 Κωραξικὸν μὲν ἠμφισμένη λῶπος.*

“Of the Milesian fleeces many have spoken: and to the Coraxic Hipponax has alluded in his Choliambic measure, where he mentions ‘a woman enveloped in a Coraxic shawl.’”

Hipponax, who is here cited by Tzetzes, was a satirical poet of Ephesus, and flourished about 540 B. C. In confirmation of his testimony it may be proved, that his countrymen and contemporaries had constant intercourse with a port in the vicinity of the Coraxi. We learn from Pliny (l. vi. cap. 5.)†, that the Coraxi were situated near Dioscurias, which, though deserted in his time, had been formerly so illustrious that 300 nations, *speaking different languages*, resorted to it. As we learn from other authorities, Dioscurias *was a colony of Miletus and one of its chief settlements*. Miletus also in the time of Hipponax had risen to the summit of its prosperity, and was the greatest commercial city in the world next to Tyre and Carthage‡. Its chief trade was towards the north and as far as the extremity of the Euxine Sea. Among the numerous Asiatic tribes, which were accustomed to bring their productions to Dioscurias and exchange them for Grecian merchandise, the Coraxi were, as we may conclude from the evidence now produced, a nation of superior enterprize and intelligence, who sent to the shores of the Ægean in the vessels of Miletus their fine wool, as well as the *carpets and shawls*, which they made from it.

If we had no more exact information than that which has been already cited, we might infer, that the Coraxi occupied part of the modern Circassia, a mountainous region admirably adapted to the breeding of sheep. The Circassians of the present day have numerous herds of cattle and vast flocks of sheep and goats. Their vallies are distinguished by beauty and fertility. A late traveller says, that from whatever country you

* Ib. 378–381.

† See Appendix A.

‡ Heeren, Handbuch, iii. 2. 2. p. 185. Mannert, Geographie, 6. 3. p. 253, &c.

enter Circassia, “*you are at once agreeably impressed with the decided improvement in the appearance of the population, the agriculture, and the beauty of their flocks and herds**.” With respect to Dioscurias, we are informed, that “the memory of its ancient name is still preserved in the present appellation of Iskouriah†.” Sir John Chardin, who visited it and calls it Isgaour, commends its safety in summer as a road for ships, but says that it is a complete desert, where he could obtain no provisions, the traders who anchor there being obliged to construct temporary huts and booths of the boughs of trees for their accommodation, whilst awaiting the arrival of the natives of Mingrelia and Caucasus‡.

But, besides the general inference that the Coraxi occupied part of the modern Circassia, we are able to determine their abode with still greater precision, and even obtain some insight into their distinctive characters as a nation.

At the south-eastern extremity of Chirkess, or Circassia, on the northern declivity of Mount Elborus, and about the sources of the Kuban, the ancient Hypanis, we find a mountain clan, consisting of rather more than 250 families, which appears to retain not only the manners and habits, but even the very name of the Coraxi. Julius von Klaproth, to whom we are principally indebted for our knowledge of them, calls them the Caratshai§. From him we learn the following particulars respecting their appearance, manners, and employments. They

* Travels in Circassia, &c. in 1835, by Edmund Spencer, Esq., vol. ii. p. 355. Julius von Klaproth, in the work quoted below, says, (p. 582.), that the wealth of the Circassians consists principally in their sheep, from whose wool the women make coarse cloth and felt. In the summer they drive their sheep into the mountains, but feed them under cover in winter, and at other times in the plains.

† Dr. Goodenough, in Journal of the Royal Geographical Society, vol. i. p. 110. See also Major Rennell’s Map of Western Asia.

‡ Chardin’s Travels, vol. i. p. 77. 108. of the English Translation. London, 1686.

§ Reise in den Caucasus, cap. 24. The author thus spells the name in German characters, *Ckaratschai*. Father Lamberti, a missionary from the Society of the Propaganda at Naples, who remained twenty years in that part of Asia in the seventeenth century, calls them “*i Caraccioli*,” in which name we observe the addition of an Italian termination. See his *Relazione della Colchide, hoggi delta Mengrelia, Napoli, 1654, cap. 28. p. 196.*

are among the most beautiful of the inhabitants of Caucasus, and more like the Georgians than the wandering Tartars of the Steppe. *They are well formed, and have fine features, which are set off by large black eyes and a white skin.* Their language resembles that of the Nogay-Tartars. They live in very neat houses, built of pine. Their children are *strictly and well* educated; and in general it may be said of them, that they are the most cultivated nation in Caucasus, surpassing all their neighbors in refinement of manners. They are very *industrious*, and subsist chiefly by agriculture. Their soil is productive, and, besides various kinds of grain, yields abundance of grass for pasture. The country around them is covered with woods, which abound with wild animals, such as bears, wolves, wild goats, hares, and wild cats, whose skins are much prized, and martins. *Their dress is chiefly made of woollen cloth, which they weave themselves from the produce of their flocks, and which is admired throughout the whole of Caucasus.* They sell their cloth, called by them *Shal**, their felt for carpeting, and their furs, partly to the Nogay-Tartars and Circassians, from whom they purchase articles of metal, and partly at *Souhom-Kalé, a Turkish fort on the Black Sea*, which contains shops and ware-houses, and carries on a considerable trade with the Western Caucasus. They receive here in return goods of *cotton and silk*, tobacco and tobacco-pipes, needles, thimbles, and otter-skins. While the men are employed out of doors, the women stay at home, make gold and silver thread, and sew the clothes of their fathers and brothers.

Such is the account given by a recent and most competent witness of the actual condition of this interesting nation, who, though now perhaps reduced in number, occupy probably after the lapse of 2500 years their original seat at the distance of from forty to eighty miles to the north-east of the same coast, to which they have always resorted for commercial purposes†.

* The origin of the English *shawl*.

† Souhom-Kalé is only twelve miles from *Iscuria*, a single promontory intervening between the bay and river of the former harbor and those of the latter. See Spencer's Travels, vol. i. p. 295-297, and his Map at p. 209.

We cannot survey the now deserted Iscuria without observing, what a mournful contrast the Euxine presents under the sway of both Russia and Turkey to the useful energy, which more than 2000 years ago promoted life and the arts of life, and brought into close and peaceful contact the most refined and the most uncultivated nations, under the direction of the Ionians of Miletus. The beauty, the bravery, the activity, and the independence of a highland clan still represent the skill and enterprize of the ancient Coraxi; but the commerce, which rewarded their industry, and extended their reputation through the civilized world, has sunk into insignificance.

Besides the above notices of the Coraxi in Strabo and Tzetzes we find little said concerning the breeding of sheep in this part of Asia. Aristotle, however, mentions the sheep of "Pontus near Scythia," and says that they were without horns*. The Melanchlæni also, who are mentioned by Herodotus in his account of the Scythian tribes, and who lived to the north of the Coraxi, were so called, because they wore black palls.

There can be no doubt, that the use and management of sheep were known from the earliest times throughout nearly the whole of Asia Minor, and that some nations in this region had attained to a superiority in the art before the settlement in it of the Grecian colonists.

The imagery of the Homeric poems (supposed to be written about 900 B. C.) affords abundant evidence of these facts. They continually mention shepherds, who had the care of sheep, as well as goat-herds, who managed goats. They speak of the folds, in which the flocks were secured at night to preserve them from the attacks of wild beasts. The dangers to which the flocks were exposed from both wolves and lions, are in accordance with similar expressions and incidents in the Scriptures of the Old Testament, arising from the existence of the same ravenous and destructive quadrupeds in Palestine. Also, the language both of the Scriptures and of the Homeric poems *is precisely the same*, in which the king, ruling his people is compared to the shepherd tending his flock, or to the

* Hist. Anim. viii. 28.

strong and large ram, which leads the sheep*. It is to be observed, that the geographical knowledge expressed in the Homeric poems extended as far as the promontory of Carambis on the south coast of the Euxine Sea, and included all Phrygia, Ionia, and the western half of Asia Minor.

The Greek mythology affords similar evidence. The well-known story of Paris, adjudging the golden apple, is founded on the pastoral scenes of Ida. Marsyas also was a shepherd on mount Ida†: the river Marsyas, famed for his contest with Apollo, was among the Phrygian mountains‡.

The historical evidence to which we now proceed, though referring to times much posterior to the mythological, is more exact as well as more entitled to absolute credit.

According to Strabo the branches of Mount Taurus in *Pisidia* were rich in pastures "for all kinds of cattle§." The chief town of this region was *Selge*, a very flourishing city, and hence Tertullian, in a passage, mentions "oves Selgicæ," Selgic sheep, among those of the greatest celebrity. The superior whiteness of the fleeces of *Pamphylia* is mentioned by Philostratus.

We have reason to believe, that the *Lydians* and *Carians* bestowed the greatest attention on sheep-breeding and on the woollen manufacture before the arrival of the Greek colonists among them. The new settlers adopted the employments of the ancient inhabitants, and made those employments subservient to a very extensive and lucrative trade. Pliny (viii. 73.

* See Bochart's *Hierozoïcon*, l. ii. cap. 44. De Gregum Pastoribus.

† Hyginus, Fab. 165.

‡ It appears not impossible, that, when Theocritus in *Idyll*. iii. 46, represents Adonis as "tending flocks upon the mountains," he may have referred to the mountains of Phrygia or of Ionia. For in another *Idyll*. (i. 105-110,) he seems to connect the love of Venus for Adonis with her love for Anchises, as if the scene of both were in the same region. Among the various accounts of Adonis, one makes him the offspring of Smyrna; and Cinyras, *the father of Adonis, is said to have founded the city of Smyrna in Ionia, calling it by that name after his daughter.* (Hyginus, Fab. 58 and 275.) This supposition accounts most satisfactorily for the production of the beautiful elegy on the death of Adonis by Bion, who was a native of Smyrna.

§ Lib. xii. c. 7, § 3.

ed. Bip.) mentions the wool of Laodicea (See Appendix A.) in Caria; and Strabo (xii. c. 7. p. 578. Casaub.) observes, that the country about this city and Colossæ, which was not far from it, produced sheep highly valued on account of the fineness and the color of their fleeces.

Aristophanes mentions a *pall*, made "of Phrygian fleeces*:" and Varro asserts, that in his time there were many flocks of wild sheep in Phrygia†.

The passages above quoted from Strabo and Joannes Tzetzes allude to the very great celebrity of the wool of *Miletus* and of the articles woven from it.

The passages, which will now be produced from both Greek and Latin authors of various ages, conspire to prove the distinguished excellence of the wool of Miletus, although in many of them the epithet *Milesian* may be employed only in a proverbial acceptation to denote wool of the finest quality. The animals, which yielded this wool, must have been bred in the interior of Ionia not far from Miletus.

Ctesias describes the softness of camels'-hair by comparing it to Milesian fleeces‡. A woman in Aristophanes (Lysist. 732.) says, she must go home to spread her Milesian fleeces on the couch, because the worms were gnawing them. In a fragment of a Greek comedy, called Procris, of a somewhat later age (ap. Athen. l. xii. p. 553), a favorite lap-dog is described, lying on Milesian fleeces;

Θύκοῦν ὑποστορεῖτε μαλακῶς τῷ κυνί
Κάτω μὲν ὑποβαλεῖτε τῶν Μιλησίων
Ἐρίων.

Therefore make a soft bed for the dog: throw down for him Milesian fleeces.

The Sybarites wore *shawls* of Milesian wool§. Palæphatus explains the fable of the Hesperides by saying, that their father Hesperus was a Milesian, and that they had beautiful sheep, such as those which were still kept at Miletus||. Eustathius says, the "*Milesian carpets*¶" had become proverbial. Virgil

* Aves, 492.

† De Re Rusticâ, ii. 1.

‡ Ctesias fragmenta, a Bähr, p. 224.

§ Timæus apud Athenæum, xii. p. 519. B.

|| De Incred. § 19.

¶ In Dionysium, v. 823.

represents the nymphs of Cyrene spinning Milesian fleeces, dyed of a deep *sea-green* color :

The nymphs, around her placed, their spindles ply,
And draw Milesian wool, of glassy dye.

Georg. iv. 334.

He also alludes to the high price of Milesian fleeces in the following passage :

Let rich Miletus vaunt her fleecy pride,
And weigh with gold her robes in purple dyed.

Georg. iii. 306.—*Sotheby's Translation.*

The comment of Servius on the latter passage is as follows :

Milesian fleeces, most valuable wools; for Miletus is a city of Asia, where the best wools are dyed.

The ancient Greek version of Ezekiel (xxvii. 18.) enumerates Milesian fleeces among the articles of Tyrian importation.

Columella (vii. 2.) and Pliny (viii. 48.) assert the celebrity of the flocks of Miletus in former times, although in their time they were surpassed by the sheep of some other countries.

In soft Milesian wool as fine as possible.—Hippocrates, vol. i. p. 689. ed. *Fœsii.*

Ye are hairs of sheep, although Miletus may boast of you, and Italy be in high repute, and though the hairs be guarded under skins.—Clemens Alexandrinus, *Pæd.* ii. 30.

Lying on Milesian carpets.—Aristoph. *Ranæ*, l. 548.

Nor do I speak of the sheep of Miletus and Selge and Altinum, nor of those, for which Tarentum and Bætica are famous, and which are colored by nature.—Tertullian de *Pallio*, 3.

If, from the beginning the Milesians were occupied in *shearing sheep*, the Seres in *spinning the produce of trees*, the Tyrians in *dyeing*, the Phrygians in *embroidering*, and the Babylonians in *weaving*.—Tertullian de *Habitu Muliebri.*

We may now notice Samos, as being near the Ionic coast. Athenæus (xii. p. 540. D.) cites two ancient authors who assert that, when Polycrates was introducing into Samos the most excellent of the different breeds of animals, he chose the dogs of Laconia and Molossis, the goats of Scyros and Naxos, and the sheep of Miletus and Attica.

Respecting the breeding of sheep in *Samos* it may be proper to quote the remark of Ælian (*Hist. Anim.* xii. 40.), that the

Samians gave some religious honor to this animal, because a consecrated utensil of gold, which had been stolen from one of their temples, was discovered by a sheep.

It appears probable, that the shepherd life was established in Thrace as early as in any part of Europe; for in the Homeric poems it is called "the mother of flocks" (Il. v. 222.). In a much later age the sheep of Thrace are mentioned by Nicander (Nicand. Ther. 50.). We learn from Plato (De Legibus, l. vii. p. 36. ed. Bekker) that in Thrace the flocks were entrusted to the care of the women, who were there compelled like slaves to work out of doors.

Aristotle speaks of the sheep of Magnesia, and says that they brought forth young twice a year*.

A little further south we find sheep from the earliest times in Thessaly near the river Amphrysus. Here was Iton, which Homer also calls "the mother of flocks†." It was celebrated for a temple of Minerva, who was called from it *Itonis*, or *Itonia‡*, and whose worship was transferred from hence to Bœotia.

That Eubœa was famous for sheep we know from the testimony of two different authors cited by Athenæus. That of Callixenus Rhodius has been already produced; and that of Hermippus occurs in his metrical enumeration of the most excellent and characteristic productions of different countries§.

Bœotia appears from very early times to have been rich in flocks. The tragic history of Œdipus supposes, that his father Laius, the king of Thebes, had flocks on Mount Cithæron. According to Sophocles (Œd. Tyr. 1026–1140.) Œdipus was delivered to one of the royal shepherds to be there exposed, and this shepherd through pity committed him to another, and thus saved his life||. Seneca in his free version of Sophocles (Œd. Act. iv. v. 815–850.) has added a circumstance, as it appears, from the

* Problem. cap. x. sec. 46.

† Il. B. 696.

‡ Strabo, l. ix. c. 2. § 29. p. 458; and c. 5. § 14. p. 614. ed. Siebenkees. Apollonius Rhodius, Argon. i. 551; and Schol. ad locum. Alcæi Reliquiæ, a Mathitiæ, No. 54.

§ Athen. Deip. l. i. p. 27. D.

|| This transaction is represented in Plate VIII. Fig. 5.

practice established in other cases. He says, that the shepherd of Laius, whom he calls *Phorbas*, had many others under him. But, although it may be doubted whether the flocks of Laius were so numerous as to require a head shepherd placed over many others, we learn that his possessions of this description excited contest and warfare among his descendants. Their countryman, Hesiod, represents them fighting at the gates of Thebes "for the flocks of *Ædipus*" (*Op. et Dies*, 163.), an expression, which must at least be understood to imply, that sheep constituted a principal part of the king's wealth.

Among the Elgin marbles in the British Museum we have an interesting inscription relating to a contract made between the city of Orchomenos in Bœotia and Eubulus of Elatea in Phocis, according to which *Eubulus* was to have for four years the right of pasturage for 4 cows, 200 mares, 20 sheep, and 1000 goats. In the opinion of Professors Böckh* and Otfried Müller† this inscription may be referred to the time of the Peloponnesian war. The supposed effect of the waters of the Melas and Cephisos on the fleeces of sheep is a testimony of a much later date, but proves that sheep, both black and white, were bred in that country‡. Varro (*De Re Rust.* ii. 2.) mentions the practice of covering sheep with skins in order to improve and preserve their fleeces. The Attic sheep, thus clothed with skins, are mentioned by Demosthenes under the name of "soft sheep§." The hilly part of Attica was of course particularly adapted for sheep as well as goats; and accordingly a letter of Alciphron (iii. 41.) describes flocks of them at Decelia near Mount Parnes about fifteen miles to the north of Athens. The fame of the Attic wool is also alluded to by Plutarch (*De au-*

* *Corpus Inscip. Græcar.*, vol. i. p. 740.

† Orchomenos, p. 471.

‡ Vitruvius, viii. 3. p. 218. ed. Schneider. See also Dodwell's *Tour*, vol. i. p. 242. It was imagined that the water of the Melas rendered the wool black, and that of the Cephisos white.

Dr. Sibthorp, in crossing the plain of Bœotia near Platæa in November A. D. 1794, says, "Flocks of sheep, whose fleeces were of remarkable blackness, were feeding in the plain; the breed was considerably superior in beauty and size to that of Attica."—Walpole's *Memoirs on Eur. and As. Turkey*, p. 65.

§ *Contra Everg. et Mnesid.* p. 1155. ed. Reiske.

diendo, p. 73. ed. Steph.), and by the Roman poet Laberius, who died in the year 43 B. C.

No matter whether in soft Attic wool,
Or in rough goats'-hair you be clothed*.

We learn from Theocritus, that the shepherds of Acharnæ, one of the Attic demi, excelled in playing on the pipe†.

In the adjoining country of *Megaris* was a temple of great antiquity in honor of Δημητηρ Μαλοφόρος. It was said, that Ceres was worshipped under that title, THE BRINGER OF FLOCKS, by those who first kept sheep in the country‡. Theognis (v. 55.) mentions, that the people of Megaris used before his time to wear goat-skins, which shows the late introduction of the growth and manufacture of wool. Here, as in Attica, it was usual to protect the sheep with *skins*; and, as the *boys* were sometimes seen *naked* after the Doric fashion, Diogenes, the cynic, said in reference to these practices, *he would rather be the ram of a Megarensian than his son*§.

In the Peloponnesus, *Arcadia* was always remarkable for the attention paid to sheep.

Arcadia claims our especial consideration, because in it the shepherd life assumed that peculiar form, which has been the subject of so much admiration both in ancient and modern times. Here the lively genius and imaginative disposition common to the Greek nation were directed to the daily contemplation of the most beautiful and romantic varieties of mountain and woodland scenery, and hence their employments, their pleasures, and their religion, all acquired a rustic character, highly picturesque and tasteful, and, as it appears to us, generally favorable to the development of the domestic and social virtues. To attempt a full investigation of this subject, and to show in what degree the want of higher attainments in *religious knowledge* and *moral cultivation* was supplied by the peculiar rites, ideas, and customs of Arcadia, would lead us too far from our proper subject. We only wish to bring forward

* Apud Non. Marcellum.

† Idyll. vii. 71.

‡ Paus. i. 44. 4.

§ Diog. Laert. vi. 41. Æliani Var. Hist. xii. 56.

the principal facts and authorities, and to give a succinct account of the genuine Arcadian system of religion and manners without attempting to refute at length the opposite views, which have been adopted by ancient and modern writers.

The peculiar Divinity of Arcadia, whose worship had a constant and manifest reference to the principal employments of the inhabitants, was *Pan*. Hence he is called by Virgil and Propertius "the God of Arcadia*." According to Herodotus (ii. 145.), Pan, the son of Mercury (who was born at Cyllene in Arcadia, where Mercury was previously worshipped,) first saw the light after the Trojan war, and about 800 years before his own time. Thus we are able to refer the supposed birth of Pan, and consequently the commencement of his worship to about the year 1260 B. C.†.

The circumstances of the birth of this divinity, with his habits and employments, are described as follows in the most ancient document which we have relating to him, viz. Homer's Hymn to Pan. Mercury tended rough flocks at Cyllene in the service of a mortal man, being enamored of a beautiful nymph. In the course of time she bore him a son, *having the feet of a goat, two horns upon his forehead, a long shaggy beard, and a bewitching smile*. This was Pan, who became the god of the shepherds, and the companion of the mountain nymphs, penetrating through the densest thickets, and inhabiting the most wild, rough, and lofty summits of the sylvan Arcadia. There it is his business to destroy the wild beasts; *and when, having returned from hunting, he drives his sheep into a cave, he plays upon his reeds a tune sweet as the song of any bird in spring*. The nymphs, delighting in melody, listen to him when they go to the dark fountain, and the god sometimes appears among them, wearing on his back the hide of a *lynx*, which he has lately killed, and he joins with them in the choral song and dance upon a meadow variegated with the *crocus* and the *hyacinth*. He is beloved by Bacchus,

* Virg. Buc. x. 26. and Georg. iii. 385. See also Propert. i. 17

† Hist. d'Herodote, par Larcher, tome vii. p. 359. 582.

and is the delight of his father Mercury, and he celebrates their worship beyond that of all the other gods.

Callimachus (Hymn. in Dianam, 88.) represents Pan at his fold in Arcadia, feeding his dogs with the flesh of a lynx, which he has caught on Mænalus. It is to be observed, that the care of dogs to guard the flock was an indispensable part of the pastoral office. Philostratus, in his Second Book of Pictures*, supposes the nymphs to have been reproving Pan for his want of grace in dancing, *telling him that he leapt too high and like a goat*, and offering to teach him a more gentle method. He pays no attention to them, but tries to catch hold of them. Upon this they surprise him sleeping at noon after the toils of the chase; and he is represented in the picture with his arms tied behind him, and enraged and struggling against them, while they are cutting off his beard and trying to transform his legs and to humanize him.

In the Bucolics and Georgics of Virgil we find frequent invocations to Pan as the god of shepherds, the guardian of flocks, and the inventor of the syrinx, or Pandean pipes.

Ipse, nemus linquens patrium, saltusque Lycæi,
Pan, ovium custos, tua si tibi Mænala curæ,
Adsis, O Tegeææ, favens.

Georg. i. 16-18.

God of the fleece, whom grateful shepherds love,
Oh, leave Lycæus and thy father's grove;
And if thy Mænalus yet claim thy care,
Hear, Tegeæan Pan, th' invoking prayer.

Georg. i. 16-18.

Delightful Mænalus, 'mid echoing groves,
And vocal pines, still hears the shepherds' loves;
The rural warblings hear of skilful Pan,
Who first to tune neglected reeds began.

Bucol. viii. 22-24.—Warton's Translation.

O that you lov'd the fields and shady grots,
To dwell with me in bowers and lowly cots,
To drive the kids to fold, the stags to pierce;
Then shouldst thou emulate Pan's skilful verse,

* Philostrati Senioris Imag. l. ii. c. 11.

Warbling with me in woods: 'twas mighty Pan
 To join with wax the various reeds began.
 Pan, the great god of all our subject plains,
 Protects and loves the cattle and the swains:
 Nor thou disdain thy tender rosy lip
 Deep to indent with such a master's pipe.

Bucol. ii. 28-34.—Warton's Translation.

Besides the four places in Arcadia, which are referred to in the above-cited passages of Virgil, Pausanias informs us of several others, in which he saw temples and altars erected to Pan. He says*, that Mount Mænalus was especially sacred to this deity, *so that those who dwelt in its vicinity asserted, that they sometimes heard him playing on the syrinx.* A continual fire burnt there near his temple.

Herodotus gives a very curious account of the introduction of the worship of Pan into Attica†. He says, that before the battle of Marathon the Athenian generals sent Philippides as a herald to Sparta. "On his return Philippides asserted, that Pan had appeared to him near Mount Parthenius above Tegea, had addressed him by name and with a loud voice, and commanded him to ask the Athenians why they did not pay any regard to him, a god, who was kind to them, who had been often useful to them and would be so in future. The Athenians, believing the statement of Philippides, when they found themselves prosperous, erected a temple to Pan below the Acropolis, and continued to propitiate him by annual sacrifices and by carrying the torch." From various authorities we know, that this temple was in the cave on the northern side of the Acropolis below the Propylæa‡.

* L. viii. c. 36. 5. and c. 37. 8.

† Lib. vi. c. 105.

‡ Eurip. *Jon.* 492-504. 937. Paus. i. 28. 4. Stuart's *Ant. of Athens.* Hobhouse's *Travels*, p. 336. Dodwell's *Tour*, vol. i. p. 304.

In Sir R. Worsley's collection of Antiques at Appledurcombe in the Isle of Wight is a bas-relief, in which Pan is reclining as if after the chase near the mouth of this cave. He holds the syrinx in the left hand, a drinking-horn in the right. A train of worshippers are conducting a ram to the altar within the cave. See *Museum Worsleianum*, Lon. 1794. plate 9. In the vestibule of the University Library at Cambridge is a mutilated statue of Pan clothed in a goat-skin and holding the syrinx in his left hand. This statue was discovered near the

In later times a cave near Marathon was dedicated to Pan, the stalactitic incrustations within it being compared to goats, and to their stalls and drinking-troughs*.

Chandler and Dodwell in their Travels describe another cave larger than that at Marathon and containing more varied stalagmitic concretions. It is near the summit of Mount Rapsana between Athens and Sunium. ΠΑΝΟΣ is inscribed on the rock near the entrance, proving that it was considered sacred to Pan. It is no doubt the Panion mentioned by Strabo†.

The Corycian cave on Mount Parnassus was dedicated by the surrounding inhabitants to Pan and to the Nymphs‡. Theocritus also (Idyll. viii. v. 103.) speaks of Homole, a mountainous tract in the south of Thessaly, as belonging to Pan. Altars were dedicated to Pan on the race-course at Olympia in Elis§, as we may presume, out of respect to the Arcadians, who resorted to the Olympic games. Pindar states||, that he had near his door a statue of Pan. Here, as his able commentators Heyne and Böckh observe, his daughters with other Theban virgins sung hymns in honor of the god.

same cave, and from its style, (the Æginetic,) may be supposed to have been carved soon after the battle of Marathon. See Dr. E. D. Clarke's Greek Marbles, p. 9. No. xi. Wilkins's Magna Græcia, p. 71, and Dodwell's Tour, vol. i. p. 304.

* Paus. l. i. 32. 6. Dodwell's Tour, vol. ii. p. 162. Mapat, p. 330 of Mem. on Eur. and As. Turkey, edited by Walpole.

† L. ix. cap. 1. § 21. It was consecrated to the Nymphs as well as to Pan, this association of the Nymphs with that deity being universally practised. Dodwell's Tour, vol. i. p. 550-555. "The countryman and shepherd, as well as the sportsman, has often repaired, it is likely, to this cave, to render the deities propitious by sacrificing a she-goat or lamb, by gifts of cakes or fruit, and by libations of milk, oil, and honey; simply believing, that this attention was pleasing to them, *that they were present though unseen*, and partook without diminishing the offering; their appetites as well as passions, caprices, and employments resembling the human. At noon-day the pipe was silent on the mountains, *lest it might happen to awake Pan, then reposing after the exercise of hunting, tired and peevish.*" Chandler's Travels in Greece, c. 32. p. 155.

‡ Paus. l. x. 32. 5. Strabo, l. ix. cap. 3. § 1. p. 488. ed. Siebenkees Raikes's Journal in Memoirs edited by Walpole, p. 311-315.

§ Paus. l. v. c. 15. § 4.

|| Pyth. iii. 137-139.

Time has spared the traces of hymns performed on such occasions, of which the following Scholion is the most entire specimen.

Ἦ Πᾶν, Ἀρκαδίας μέδων κλεινῶς,
 ὀρχηστὰ βρομίαις ὀπαδὲ νύμφαις,
 γέλασεας, ὦ Πᾶν, ἐπ' ἐμαῖς
 εὐφροσύναις, αἰδαῖς κεχαρημένος*.

O Pan, Arcadia's sovereign lord,
 Dancing and singing with the nymphs ;
 Smile, Pan, responsive to my joys,
 O shout, delighted with my songs.

On a vase of Greek marble in the Royal Museum at Naples (This vase was first described in Bayardi, *Catalogo degli antichi monumenti dissottarretti da Ercolano*. Napoli, 1754, p. 290. No. 914.), we see Pan dancing with the nymphs exactly as he is represented in the preceding song. The sculpture is in that very ancient style, which is called *Etruscan*. Pan is here exhibited with goats' feet and horns (Hom. Hymn. in Pana, l. 2.). He wears the skin of an animal, and employs his right hand in drawing it up towards his left shoulder. In his left hand he holds the crook or pastoral staff, which is one of his usual emblems. Pan and the three females, with whom he is dancing, form a distinct group by themselves. They are moving round a large stone, and the artist probably imagined them to be moving first in one direction, and then in the opposite, as if performing the Strophe and Antistrophe around an altar. We learn from Mr. Dodwell, that the modern Greeks in their circular dances hold each other with a handkerchief, and not by the hand†.

That the Romans considered Pān and Faun to be the same, using the two names indiscriminately, the one as the Greek, the other as the Latin form, is evident from such passages as the following :

Pan from Arcadia's hills descends
 To visit oft my Sabine seat,

* Athenæus, l. xv. 50. 1547. ed. Dindorf. Pindari Op. a Böckh. ii. 2. p. 592. Brunck, *Analecta*, vol. i. p. 156 ; and vol. iii. *Lect. et. Emend.* p. 27.

† Dodwell's *Tour*, vol. ii. p. 21, 22.

And here my tender goats defends
From rainy winds and summer's heat.

For when the vales, wide-spreading round,
The sloping hills, and polish'd rocks,
With his harmonious pipe resound,
In fearless safety graze my flocks.

Hor. Od. l. i. c. 17. v. 1-12.

The names Pan and Faun, scarcely differ except in this, that the one begins with P, the *lenis*, and the other with F, which is its *aspirate*: in the second place, both were conceived to have not only the same form and appearance, but the same habits, dispositions, and employments: thirdly, the goat was sacrificed to Pan in Greece* and to Faunus in Italy†, because the Arcadian and Roman deity was conceived to be the guardian of goats as well as sheep, but this animal was not sacrificed to the Egyptian Mendes, because

In safety through the woody brake
The latent shrubs and thyme explore,
Nor longer dread the speckled snake,
And tremble at the wolf no more.

Francis's Translation, abridged.

in Egypt the goat itself was supposed to be Mendes, an incarnation of the god; and lastly, it is recorded as an historical fact, that the worship of Faunus was brought to Rome from Arcadia, whereas the supposition of the introduction of the same worship into Arcadia from Egypt, though found in the pages of an historian, is not given by him as a matter of history, but only as a matter of opinion. The account of the origin of the worship of Faunus at Rome, is as follows: *Evander, the Arcadian, introduced a colony of his countrymen into Italy, and established there the rights of Mercury and of the Lycean Pan on the hill, which was afterwards called the Palatine Mount and became part of the city of Rome.* A cave

* Longi Pastor. l. ii. c. 17. In an epigram by Leonidas of Tarentum (No. xxx. Brunckii Analecta, tom. i. p. 228.) Bito, an aged Arcadian, dedicates offerings to Pan, to Bacchus, and to the Nymphs. To Pan he devotes a kid.

† Ovid. Fasti, ii. See also Hor. Od. l. i. 4. v. ii.

at the base of the hill was dedicated to Pan, as we have seen was the case some centuries afterwards at Athens*.

In the preceding observations we have endeavored to give a correct representation of the real sentiments and practices of the Arcadians in regard to the proper divinity of their country; and from this account we are naturally led to inquire what influence this peculiar belief and worship had upon their manners and their social life. Whilst the elegant simplicity and innocence of the Arcadian shepherds, their graceful chorusses, their dance and song, their love for their fleecy charge, which they delighted and soothed with the melody of the pipe, have been the theme and ornament of poetry and romance from the earliest times, the question is highly important and interesting, whether these ideal visions are realised by historical testimony? whether the shepherds of the ancient Arcadia were so entirely and so favorably distinguished from men of the same class and employment in almost all other times and countries? One modern writer denies this fact. He says, "The refined and almost spiritualized state of innocence, which we call the pastoral life of Arcadia, was entirely unknown to the ancients:" and he quotes in support of this assertion several expressions, used by Philostratus and other writers, and denoting contempt for the Arcadians as a rude, ignorant, stupid race of people†. Polybius, who was an Arcadian, confidently asserts, that they had throughout Greece a high and honorable reputation, not only on account of their hospitality to strangers and their benevolence towards all men, but especially on account of their *piety towards the divine being!* It is true they make no figure in Grecian history, because they were too wise to take part in the irrational contests, which continually embroiled the surrounding states. Their division into small independent communities, each presenting a purely *democratic* constitution, rendered it impossible for them to acquire celebrity in legis-

* Dionys. Halicarn. Hist. Rom. l. i. p. 20, 21, ed. R. Steph. Paris 1546. Strabon l. v. cap. iii. § 3. Aur. Victor, Origo Gentis Romanæ. Livii l. i. c. 5. Pausanias, viii. 43. 2. Virg. Æn. viii. 51-54. 342-344. Heyne's Excursus ad loc. Ovidii Fasti, ii. 268-452. v. 88, &c.

† J. H. Voss, Virgil's Ländliche Gedichte, tom. ii. p. 353.

lation; and yet we are informed of some of the citizens of Arcadia, who were reputed excellent lawgivers for the sphere in which they acted*. It appears to be no inconsiderable evidence of their progress in the art of government upon republican principles, *that in the choice of magistrates at Mantinea they proceeded upon the plan of a double election*†. We have the most decisive proofs of their public spirit in the splendid cities, which they erected, and which were adorned with theatres, temples, and numerous other edifices. We are informed by Pausanias‡, that of all the temples in Peloponnesus the most beautiful and admirable were those of Minerva at Tegea and of Apollo at Phigalia; and these were both cities of Arcadia. Now it should be observed, that the taste and splendor of their public edifices are the more decisive proofs of their national enthusiasm, when it is considered, *that among them property was exceedingly subdivided; that they had no overpowering aristocracy*, no princes or great landed gentry, who might seek for renown or court popularity by bestowing their wealth upon public institutions; but that the noble temples, the sculptures, and other works of art, which ornamented their cities and were subservient to purposes of common interest, could have been produced only by the united deliberations and contributions of the mass of the inhabitants. They seem therefore to *prove the universal* prevalence both of a liberal patriotic feeling, and of a cultivated taste for the beautiful and the sublime.

Virgil bears his testimony to their superior skill in vocal and instrumental music.

Arcadian swains,
Ye best artificers of soothing strains.
Bucol. x. 32.—Warton's Translation.

This must of course be understood as referring only to music and poetry of the pastoral kind. To the composition of the higher species of poetry, by which the Greeks of other countries laid a foundation for the instruction and delight of all suc-

* Wachsmuth, Hellen. Alterthumskunde, i. 1. p. 180; i. 2. p. 305.

† Aristot. Polit. l. vi. 2. 2.

‡ L. viii. c. 41. 5. p. 429, ed. Siebel.

ceeding ages, the Arcadians never aspired. At the same time there can be no doubt that they bestowed great care upon the exhibition of dramatic compositions, though they did not attempt to write them: of this fact we have sufficient proof in the remains of the theatres found upon the sites of their principal cities, and especially of the theatre of Megalopolis, which was the greatest in all Greece*.

But with respect to their cultivation of music and its influence on their national character, we have upon record the full and explicit testimony of one of their most distinguished citizens, the historian Polybius, whose remarks will appear especially deserving of the reader's attention, when it is considered, that he must himself have gone through the whole course of discipline and instruction which he describes. Having had occasion to mention the turbulent character as well as the cruel and perfidious conduct of the Cynætheans, who occupied a city and district in the north of Arcadia, he proposes to inquire why it was that, although they were indeed Arcadians, they had acted in a manner so entirely at variance with the usual habits and manners of the Greeks, and he then proceeds with earnestness and solemnity to explain upon the following principles the cause of this extraordinary contrast. It was, as he states, that the Cynætheans were the only inhabitants of Arcadia who had neglected to exercise themselves in music; and he then gives the following account of the established practice of the rest of the Arcadians in devoting themselves to the study of *real* music, by which he means the united arts of music, poetry, and dancing, of all those elegant and graceful performances, over which the Muses were supposed to preside. He informs us that the Arcadians, whose general habits were very severe, were required by law to go on improving themselves in music, so understood, until their thirtieth year. "In childhood," says he, "they are taught to sing in tune hymns and pæans in honor of the domestic heroes and divinities. They afterwards learn the music of Philoxenus and Timotheus. They dance to the pipe in the theatres at the annual festival of Bacchus; and

* Pausanias, l. viii. 32. 1. Leake's Travels in the Morea, vol. ii. p. 32. 39, 40.

they do this with great emulation, the boys performing mock-fights adapted to their age, and the young men the so-called manly fights. In like manner throughout the whole of life their pleasure at feasts and entertainments consists, not in listening to singers hired for the purpose, but in singing themselves in their turns when called upon. For, although a man may decline any other performance on the ground of inability and may thereby bring no imputation on himself, no one can refuse to sing, because all have been obliged to learn it, and to refuse to take a part, when able, is deemed disgraceful. The young men also unite together to perform in order all the military steps and motions to the sound of the pipe, and at the public expense they exhibit them every year before their fellow-citizens. Besides these ballets, marches, and mock-fights, the men and women unite in great public assemblies and in numerous sacrifices, to which are to be added the circular or choral dances by the boys and virgins." Polybius adds, that these musical exercises had been ordained as the means of communicating softness and refinement to the otherwise rough and laborious life of the Arcadians, and he warns them by the example of the half-savages of Cynæthæ never to abandon such wholesome institutions*. With how great benefit to our own social character might we adopt this counsel! How greatly might we contribute both to the innocent enjoyment and to the more improved and elevated tastes of our rustics and artisans, if well-regulated plans were devised, by which graceful recreations, providing at the same time exercise for the body, amusement for the imagination, and employment for the finer and more amiable feelings, were made to relieve the degrading and benumbing monotony of their protracted labors, whether in the factory or in the field!

It will be readily perceived, that the education here described, and the tastes and habits which it produced, were immediately associated with the popular religion, and especially with the notions and rites entertained towards the peculiar god of the shepherds. Other deities indeed, such as Apollo, Diana, and

* Polyb. l. iv. c. 20, 21.

Minerva, who were also worshipped in Arcadia, may have contributed to the same effect; and especially this may have been the case with Mercury, perhaps the only one of the higher Greek divinities, who was conceived to have a benevolent character, who was the father of Pan, and was himself reported to have been born in a cave of the same mountain in Arcadia, on which he was worshipped. He was a lover of instrumental music, having invented the lyre, and he was frequently represented on coins and gems, riding upon a ram, or with his emblems so connected with the figures of sheep, and more rarely of goats and of dogs, as to prove that in his character as the god of gain the shepherds looked up to him together with his offspring to bless the flocks and to increase their produce*. Hence Homer, in order to convey the idea that Phorbas was remarkably successful in the breeding of sheep, says that he was beloved by Mercury above all the other Trojans†. The inhabitants of one territory even in Arcadia, viz. the city of Phineos, honored Mercury more than all the other gods, and expressed this sentiment by procuring a statue of him made by a celebrated

* Buonaroti (*Osservazioni sopra alcuni Medaglioni Antichi*, p. 41.) has exhibited brass coins, in one of which Mercury is riding on a sheep; in a second the sheep is seen with Mercury's bag of money on its back; and in a third the caduceus is over the sheep, and two spikes of corn, emblems of agricultural prosperity, spring out of the ground before it. Among the gems of the Baron de Stosch, now belonging to the Royal Cabinet at Berlin, No. 381. Class II. represents Mercury sitting upon a rock with a dog by his side: Winckelmann observes, that "the dog is the symbol of Mercury as the protector of shepherds." Nos. 392, 393, 396-402, in the same collection, represent him with sheep, and one of them (399.) exhibits him standing erect in a chariot drawn by four rams, and holding the bag or purse in his right hand and the caduceus in his left.

Some of the coins of Sicily appear to refer in like manner to the character of Mercury as the promoter of the trade in wool.

The Honorable Keppel Craven (*Excursions in the Abruzzi*, London, 1838, vol. i. ch. 4. p. 109.) mentions a temple at Arpinum, a city of Latium, which was dedicated, as appears from an inscription found on its site, to MERCURIUS LANARIUS. This title evidently represented Mercury as presiding over the growth of wool and the trade in it.

Perhaps the very ancient idea of Mercury making the fleece of Phryxus golden by his touch may have originated in the same view. See Apollonius Rhodius, *Argonautica*, l. 11. 1144, and Scholion ad locum.

† Il. xiv. 490. See also Hom. Hymn to Mercury, 569. Hesiod, *Theog.* 444.

sculptor in Ægina, in which he was represented carrying a ram under his arm, and which they placed in the great temple of Jupiter at Olympia*. At Corinth there was a brazen statue of Mercury in a sitting posture with a ram standing beside him. According to Pausanias (ii. 3, 4.) the reason of this representation was, that of all the gods Mercury was thought most to take care of flocks and to promote their increase. But, as the Corinthians had little or nothing to do with the tending of sheep and were devoted to commerce, we may ask what interest had they in this attribute of Mercury? It is very evident that it could only be an interest arising from the part which Corinth took in the wool-trade. That the Arcadians did not themselves consume their wool is manifest. How could they have built cities, which were so large, numerous, and handsome in proportion to the extent of their country, and have lived even in that degree of elegance and luxury, to which they attained, *unless they had been able to dispose of the chief produce of their soil in a profitable manner?* It is probable therefore, that the representation of Mercury or of his emblems in conjunction with the figure of the sheep on the coins of Corinth and Patræ may be regarded as an intimation, that the Arcadians disposed of their wool in those cities for exportation to foreign countries.

But, notwithstanding the important share, which Mercury had in the religious sentiments and observances of the Arcadians, the proper god of the shepherds of Arcadia was Pan, and we have already had abundant evidence to suggest the conviction, that their songs and dances were performed principally in honor of him, and were supposed to be taught, guided, and animated by him.

Arcadia has for many centuries exhibited a most melancholy contrast to that condition of hardy and yet peaceful independence, of rustic simplicity united with tasteful elegance, of social kindness and domestic enjoyment undisturbed by the projects of ambition, which has supplied many of the most beautiful pictures to the writers of poetry and romance. The great

* PAUS. l. v. 27. 5. and l. viii. 14. 7.

natural features of the country are unalterable. The pine-forests of Lycæus, its deep glens continually refreshed with sparkling streams and cataracts, its savage precipices where scarce even a goat can climb, remain in their original beauty and grandeur. This region also affords pasture to flocks of sheep more numerous than those which feed in any other part of Greece*. But whatever depends on the moral nature of man is changed. The valleys, once richly cultivated and tenanted by an overflowing population, are scarcely kept in tillage. The noble cities are traced only by their scattered ruins. The few descendants of the ancient Arcades have crouched beneath a degrading tyranny. The thick forests and awful caverns but a few years ago served to shelter fierce banditti; and the traveller startled at the sound of their fire-arms instead of being charmed with the sweet melody of the syrinx†. But a new dynasty has been established under the sanction of the most powerful and enlightened nations of Europe. It remains to be seen whether this or any other part of Greece will again become wise, virtuous, and renowned. The philanthropist, who amidst the gloom and desolation of the moral world depends with confidence upon an all-wise and all-disposing Providence, may console himself with the hope, that that great Being who bestowed such inestimable blessings upon Arcadian shepherds in their ignorance, will not abandon those of their descendants, who with superior means of knowledge, aim at corresponding attainments in the excellencies of political, social, and private life.

According to the representation in the *Odyssey* (xiv. 100.)

* Bartholdy, *Bruchstücke zur Kenntniss des heut. Griechenlands*, p. 238.

† *Dodwell's Tour*, vol. ii. p. 388-393. *Leake's Travels in the Morea*, vol. i. p. 486-490. The latter author gives the following account of a visit which he paid to the family of a shepherd, consisting of twelve or fifteen individuals, who lived together in a tent on Mount Lycæus:—"Milk and misithra (a preparation made by boiling milk and whey together) is their usual food. 'We have milk in plenty,' they tell me, 'but no bread.' Such is the life of a modern Arcadian shepherd, who has almost reverted to the balanephagous state of his primitive ancestors (*Orac. Pyth. ap. Pausan. Arcad. c. 42.*). The children, however, all look healthy and are handsome, having large black eyes and regular features with very dark complexion."

Ulysses had twelve flocks of sheep, and as many of goats on the continent opposite to Ithaca. At a much later period Neoptolemus, a king of Molossis, in possession of flocks and herds, which were superintended by a distinct officer appointed for the purpose*. In Macedonia also the king, though living in a state of so little refinement that his queen *baked the bread for the whole household*, was possessed at an early period of flocks of sheep and goats together with horses and herds of oxen, which were entrusted to the care of separate officers. We are informed that three Argive brothers, having taken refuge in the upper part of Macedonia bordering upon Illyria, became hired servants to the king, one of them having the custody of the horses, another of the oxen, and a third of the sheep and goats†. Here then we find in Europe a state of society *analogous to that which*, as we have seen, *existed in Palestine under David*. Indeed we may observe, that all the countries bordering on Macedonia were contrasted with Attica and Arcadia in this respect, that, while the Athenians and Arcadians were in general small landed proprietors, each shepherd tending his flock upon his own ground, Phrygia‡, Thrace, Macedonia, Epirus, and even Bœotia belonged probably to an aristocracy, the richest and most powerful individuals of which became shepherd kings, their landed possessions giving them a superiority over the rest of their countrymen, and leading to the employment of numerous persons as their servants engaged in tending their cattle and in other rural occupations.

Respecting the attention paid to sheep-breeding in Epirus we have the testimony of Varro in his treatise *De Re Rustica*. He informs us (ii. 2.) that it was usual there to have one man to take care of 100 coarse-wooled sheep (*oves hirtæ*), and two men for the same number of "*oves pellitæ*," or sheep which wore skins. The attention bestowed upon dogs is an indirect evidence of the care which was devoted to flocks. It is worthy

* Plutarchi Pyrrhus, p. 705. ed. Steph.

† Herod. viii. 137.

‡ Theopompus, as quoted by Servius on Virgil, Buc. vi. 13, makes mention of the shepherds, who kept the flocks of Midas, king of Phrygia.

of remark, that the dogs used to guard the flocks in the modern Albania, appear to be the genuine descendants of the ancient "canes Molossici," being distinguished by their size as well as by their strength and ferocity*. Further notices respecting them may be found in Virgil's *Georgics*, l. iii. 404–413, and in the Notes of his editors and translators, Heyne, Martyn, and J. H. Voss. See also *Ælian de Nat. An.* iii. 2. and *Plautus*, *Capt.* l. i. 18.

There is another important circumstance, in which probably the habits of the modern shepherds of Albania are similar to those of the ancient occupants of the same region, viz. the annual practice of resorting to the high grounds in summer and returning to the plains in winter, which prevails both here and in most mountainous countries devoted to sheep-breeding. The following extract from Dr. Holland's *Travels in the Ionian Isles, Albania, &c.* (p. 91–93.), gives a lively representation of this proceeding :

"When advanced eight or nine miles on our journey (from Cinque Pozzi to Joannina; October 31st, 1813,) and crossing another ridge of high and broken land, we were highly interested in a spectacle, which by a fortunate incident occurred to our notice. We met on the road a community of migrating shepherds, a wandering people of the mountains of Albania, who in the summer feed their flocks in these hilly regions, and in the winter spread them over the plains in the vicinity of the Gulph of Arta and along other parts of the coast. The many large flocks of sheep we had met the day before belonged to these people, and were preceding them to the plains. The cavalcade we now passed through was nearly two miles in length with few interruptions. The number of horses with the emigrants might exceed a thousand; they were chiefly employed in carrying the moveable habitations and the various goods of the community, which were packed with remarkable neatness and uniformity†. The infants and smaller children were variously attached to the luggage, while the men, women, and elder children travelled for the most part on foot; a healthy and masculine race of people, but strongly marked by the wild and uncouth exterior connected with their manner of life. The greater part of the men were clad in coarse white woollen garments; the females in the same material, but more curiously colored, and generally with some ornamented lacing about the breast." He then adds, "These migratory tribes of shepherds generally come down from the mountains about the latter end of October, and return thither from the plains in April,

* Holland's *Travels*, p. 443. Hughes's *Travels*, vol. i. p. 483, 484. 496.

† No one has described this pastoral migration more minutely or more beautifully, than Mr. Charles Fellows, in his *Discoveries in Lycia*.

after disposing of a certain proportion of their sheep and horses. In travelling, they pass the night on the plains or open lands. Arrived at the place of their destination, they construct their little huts or tents of the materials they carry with them, assisted by the stones, straw, or earth, which they find on the spot."

According to Dr. Sibthorp (*in Walpole's Memoirs*, p. 141.), "a wandering tribe of Nomads" on the other side of Greece drive their flocks from the mountains of Thessaly into the plains of Attica and Bœotia to pass the winter. "They give some pecuniary consideration to the Pasha of Negropont and Vaivode of Athens. These people are much famed for their woollen manufactures, particularly the coats or cloaks worn by the Greek sailors."

CHAPTER II.

SHEEP-BREEDING AND PASTORAL LIFE OF THE ANCIENTS —ILLUSTRATIONS OF THE SCRIPTURES, &c.

Sheep-breeding in Sicily—Bucolic poetry—Sheep-breeding in South Italy—Annual migration of the flocks—The ram employed to aid the shepherd in conducting his flock—The ram an emblem of authority—Bells—Ancient inscription at Sepino—Use of music by ancient shepherds—Superior quality of Tarentine sheep—Testimony of Columella—Distinction of the coarse and soft kinds—Names given to sheep—Supposed effect of the water of rivers on wool—Sheep-breeding in South Italy, Tarentum, and Apulia—Brown and red wool—Sheep-breeding in North Italy—Wool of Parma, Modena, Mantua, and Padua—Origin of sheep-breeding in Italy—Faunus the same with Pan—Ancient sculptures exhibiting Faunus—Bales of wool and the shepherd's dress—Costume, appearance, and manner of life of the ancient Italian shepherds.

Still shall o'er all prevail the shepherd's stores,
For numerous uses known ; none yield such warmth,
Such beauteous hues receive, so long endure ;
So pliant to the loom, so various, none.—*Dyer.*

WE now pass over to *Sicily*. The pastoral life of the Sicilians was marked by peculiar characters as well as that of the Arcadians. The bucolic poems of Theocritus represent many of its circumstances in the most lively colors ; and, while their dramatic spirit and vivacity are unrivalled, they seem to be most exact copies of nature, the dialogues which they contain being in the style, the language, and the precise dialect of the Sicilian shepherds, and indeed only differing from their real conversation by being composed in hexameters. It is to be observed, that the mountains and pastures of Sicily were browsed by goats and oxen as well as by sheep. These animals were, however, under distinct keepers, called respectively Shepherds, Goatherds, and Herdsmen. But the tastes, manner of life, and the superstitions of these three classes of rustics appear to have been undistinguishable. They were probably not always independent proprietors of the soil, but in many cases the servants of a landed aristocracy who lived in *Syracuse* and

other splendid cities. They appear, however, to have enjoyed far greater comforts and advantages than the corresponding class of hired laborers in the countries to the north of the Peloponnesus and of Attica. In composing pastoral verses and in playing on the pipe and the syrinx they probably equalled the Arcadians. Whilst they were watching their flocks and herds, it was a frequent amusement with them for two persons to contend for a stipulated prize, such as a goat, a carved wooden bowl, or a syrinx, which was to be awarded by an appointed judge to him who most excelled either in instrumental music, or in singing alternate and extemporaneous verses*.

That this elegant recreation was of Sicilian origin we have clear and abundant evidence. Bion (*Idyll* vii. 1.) calls pastoral poetry "a Sicilian strain;" which certainly implies, that of all places where the Greek language was used Sicily was the most noted for it, and that in fact it properly belonged to Sicily. So Moschus (*Idyll* iii.) speaks of "the Sicilian muses;" and throughout this *Idyll*, which is the lament of Moschus on the death of Bion, he repeatedly speaks of the pastoral poetry, such as Bion cultivated, as proper to Sicily. In Virgil's *Bucolics* we find frequent allusions to the same acknowledged fact. Thus he says,

* According to the learned German traveller, Baron Riedesel, the custom was not extinct in his time; for in his *Travels through Sicily*, page 148 of Forster's English translation, he says, "The shepherds still sing with emulation to gain the crook or the purse, which is the prize of the best performer." Nevertheless, the modern can be only a very faint imitation of the ancient practice; for thus the same author speaks in other passages.

"Here I had an opportunity of pitying the wretched situation of modern Sicily in comparison with what it was in former ages. Many towns and different nations are destroyed; immense riches are dissipated; the whole island can at present scarce show 1,200,000 inhabitants, *the number which Syracuse alone formerly had*. Many beautiful spots, which used to produce corn and fruits, are now deserted for want of laborers; many spacious ports are without any ships for want of trade; and many people want bread, *whilst the nobility and the monks* are in possession of all the lands." p. 112, 113.

"To conclude, the climate, the soil, and the fruits of the country are as perfect as ever. But the precious Greek liberty, population, power, magnificence, and good taste, are now not to be met with as in former times, and the present inhabitants can only say, *Fuimus Troes*." p. 151

“ I will set my verses to the tune of a Sicilian shepherd.”

Buc. x. 51.

The historian Diodorus, himself a Sicilian, who lived about the commencement of the Christian æra, supposes bucolic poetry and music to be the peculiar invention and exercise of his own country, and says, that it continued in use at his time and was held in the same estimation as formerly*. In less than 200 years from this period the art lost much of its original simplicity. Maximus Tyrius (Diss. xxi.) says, that “ the Dorians of Sicily became, to use the mildest term, *more weak in understanding,*” (*more dissolute*) “ when instead of the simple Alpine music, which they used to employ in the presence of their flocks and herds, they began to love the tunes of the Sybarites, and a style of dancing adapted to them, such as was required by the Ionic pipe.”

But, although the rustic Dorians of Sicily had the full credit of this invention and were never surpassed in the practice of it by any other people, yet the imitation of it was attempted in various instances by the pastoral inhabitants of other countries. More especially, it appears to have been adopted in the neighboring district of Magna Græcia ; for it is near *Sybaris* that Theocritus has placed the scene of his Fifth Idyll, in which, a shepherd having staked a lamb and a goatherd a kid, they contend in alternate verses, whilst a wood-cutter, whom they have called from his labor, listens as judge, and awards the prize to the goatherd, who hereupon joyfully sacrifices his newly acquired lamb to the Nymphs.

In the Seventh Idyll (*v. 12, 27, 40.*) Theocritus mentions the goatherd, *Lycidas* of Crete, who was his contemporary, and also his predecessors and supposed instructors, *Asclepiades of Samos*, and *Philetas of Cos*, as distinguished for skill in pastoral music.

The bucolic poems of Theocritus prove, that the Arcadian belief in the attributes of Pan had extended itself into Sicily and the South of Italy, so that the rustics of those countries not only invoked him by name, but even sometimes offered

* L. iv. c. 84, p. 283.

sacrifices to him. Thus, in *Idyll* v. 58, the Lucanian goatherd already referred to says, that he will set aside for Pan eight dishes of milk and six of honey.

But besides importing the belief in Pan from Arcadia the Sicilians recognized two demigods of native origin, who contributed, if not to excite feelings allied to religion, at least to amuse their imagination and to contribute greatly to the variety and liveliness of their poetry. These were the shepherd Polyphemus, who was horridly deformed, and the herdsman Daphnis, who was endowed with the most surpassing beauty.

Polyphemus was the son of Neptune. Notwithstanding his forbidden aspect he is represented as susceptible of some tender emotions, and it is his misfortune to be deeply enamored of the beautiful *Nereid* or Mermaid Galatea, whom he sees sporting in the green waves, while he surveys the coast from the summit of a mountain and plays upon the syrinx for the amusement of himself and his flock*.

The Sicilian Daphnis, like the Arcadian Pan, was the son of Mercury and of a mountain nymph, and excelled in playing on the syrinx; but his form was entirely human and the most beautiful that could be imagined.

The guardian of fair kine, himself more fair.

Virg. Buc. v. 44.

He tended his cattle upon the picturesque Heræan mountains to the north of Ætna, and did not mix in the society of men. At the time when the beard was beginning to grow on his upper lip, the nymph Echenais became enamored of him, and enjoined him upon pain of losing his eye-sight not to approach any other female. He consented, and for some time persisted in obeying her; but at length a Sicilian princess, having intoxicated him with wine, accomplished her purpose. He shared the fate of *Thamyras*, the Thracian, and was thus punished for his folly†. He then pined away, and died of hopeless love

* *Theocritus*, *Idyll* vi. and xi. *Lucian*, *Dial. Doridis et Galatææ*. *Ovid*, *Met.* L. xiii. 739–870.

† *Timæus*, author of the *Hist. of Sicily*, as quoted by *Parthenius*, c. 29. *Ælian*, *Var. Hist.* L. x. c. 18. *Diod. Sic.* L. iv. c. 84. p. 283.

for the nymph, whom he had offended*. According to Virgil (*Buc.* v. 56-71.) *he was raised to the stars*, and sacrifices were offered to him by the shepherds.

Daphnis was the frequent subject of pastoral poetry, being regarded as an ideal representation of the perfection of the shepherd's culture and manner of life. Of this we have a proof in the epigram of Callimachus on the death of Astacides, and which concludes thus: "We (shepherds) will no longer sing of Daphnis, but of Astacides." The poet's design was to extol Astacides, by comparing him with Daphnis. According to Ælian (*l. c.*) the first bucolic poems related to the blindness of Daphnis and its cause; and the first poet, who composed verses upon this subject, was Stesichorus of Himera in Sicily. In Theocritus the allusions to the beautiful story of Daphnis are very frequent†, and his sad fate is described at length by contending shepherds or goatherds in the First and Seventh Idylls. We shall quote only his dying words, where he calls on Pan to leave the great Mænalus and the long ridges of Lycæus, and to come to Sicily in order to receive from his own hand the syrinx, on which he had been accustomed to play.

Ἐνθ' ὄναξ, καὶ τάνδε φέρ' εὐπάκτιοι μελίπνου
 Ἐκ κηρῶ σφύριγγα καλὰν, περὶ χεῖλος ἐλικτάν·
 Ἢ γὰρ ἐγὼν ὑπ' ἔρωτος ἔς ἄδᾶν ἔλκομαι ἤδη.

Come, mighty king, come, Pan, and take my pipe,
 Well join'd with wax and fitted to my lip;
 For now 'tis useless grown, Love stops my breath,
 I cannot pipe, but must be mute in death.

Creech's Translation.

Pliny informs us, that in his time the wool of Apulia was in the highest repute; that throughout the South of Italy the best sheep were bred in the vicinity of Tarentum and Canusium; and that the wool of Tarentum was admired for its tinge of black, and that of Canusium for its fine brown or yellow color‡.

* Theocritus, Idyll i. 66-141. and vii. 72-77.

† Idyll v. 20. See also v. 80. In Idyll vi. Daphnis is one of the performers, and gives a description of Galatea.

‡ See Appendix A.

The directions for the management of sheep, given by Varro, Columella, Virgil, and other writers on rural affairs, all tend to show the pains taken by the Romans to improve the breed of sheep, and especially to produce wool of the finest quality.

The first of these authors (*De Re Rustica*, L. ii. *Præf.*) mentions his own flocks of sheep in Apulia. It appears from his account that every man was obliged to report the number of his sheep to the publican and to have them inscribed in a register, the earliest allusion, to a code of laws, which may probably have been in some respects similar to that now called "La Mesta" in Spain. Varro further speaks expressly of the summer and winter migrations of the flocks; and to show the great distances to which they were conducted on these occasions, he states that the sheep of Apulia were taken every year to pass the summer in the mountains of Samnium, and sometimes even in those of Reate*.

Of the nature and circumstances of these annual migrations we are enabled to form some judgment, not only from the animated description already quoted from Dr. Holland in relation to Albania, but still more distinctly from the following accounts by the Honorable Keppel Craven, one of which relates to the first group of mountains mentioned by Varro, the other to the second.

In the year 1818 Mr. Craven visited a large farm a few miles to the south of Foggia, and consequently not far from the site of the ancient Arpi in Apulia. He mentions the following particulars.

"Above 200 persons were employed, and resided on the spot. The stock of sheep consisted of 8000, divided into several flocks; to which those of cows, goats, and buffaloes, together with a set of brood mares and a suitable quantity of poultry, bore an equivalent proportion. All the cattle are guarded by large milk-white dogs of the Abruzzo breed. These animals are very handsome and resemble the Newfoundland species, but have sharper noses; they are very intelligent and equally fierce. The flocks are tended by natives of Abruzzo, who also undertake the care of milking them, as well as making the cheese, &c.; they are assisted by their wives and children, who accompany them in their yearly migrations to and from the mountains. These shepherds are clothed in the skins of the animals

* *De Re Rustica*, L. ii. c. 1. p. 161. ed. Bip. See also, c. 2. p. 167.

which they watch, and are reckoned a quiet, attentive, frugal, and trust-worthy race." *Tour through the southern Provinces of the Kingdom of Naples, by the Honorable Keppel Craven*, p. 80.

The scene of the following extract is the valley of the Aternus, descending from the region of the highest Apennines, the "montes Reatini" of Varro, not very remote from the ruins of his farm and villa, (These ruins are described at page 45 of the volume from which this passage is extracted.); and proceeding towards the sites of the modern Aquila and of the ancient Amiternum.

"One of the broad tratturos, or cattle-paths, runs in the same line with the high-road to Aquila; and I was so fortunate as to see it occupied by a very extended line of flocks, which slowly passed by the carriage for the space of a mile or more. The word 'fortunate' adapted to such a spectacle, may excite a smile in my readers; but I own that I never beheld one of these numerous animal congregations plodding across the flats of Capitanata, or the valleys of Abruzzo, as far as the eye could reach, without experiencing a sensation of a novel and exciting kind, nearly allied to that of enjoyment, but which I shall not attempt to account for.

"One shepherd heads each division of cattle, of which he has the peculiar care and direction. Armed with his crook, he walks some paces in advance of his flock, followed by an old ram termed *il manso*; which word, meaning tame or instructed, has undoubtedly a more apposite signification than that of our bell-wether, though he is, as well as ours, furnished with a large deep-toned bell.

"The sheep march in files of about twelve in each; and every battalion, if I may so call it, is attended by six or eight dogs, according to its number; these accompanying the herd, walking at the head, middle, and rear of each flank. The beauty and docility of these animals, which are usually white, has often been described, and their demeanor is gentle as long as the objects of their solicitude are unmolested, but at night they are so savage, that it would be dangerous to approach the fold they guard.

"The goats, which bear a very small proportion to the sheep, and are in general black, wind up the array, and evince their superior intelligence by lying down whenever a temporary halt takes place. The cows and mares travel in separate bodies. A certain number of these flocks, commonly those belonging to the same proprietor, are under the immediate management and inspection of an agent, entitled *fattore*, who accompanies them on horseback, armed with a musket, and better clad than the shepherds, who, both in summer and winter, wear the large *sheep-skin jacket*, and are in other respects provided with substantial though homely attire, including good strong shoes.

"These Fattores are all natives of Abruzzo, an Apulian never having been known to undertake the profession: the former, through particular habits and the repeated experience of years, are looked upon as so peculiarly fitted for the care required by cattle, and indeed animals of all kinds, that all the helpers in the sta-

bles of the capital are natives of these provinces, or of the adjoining county of Molise. In addition to these qualifications, they are esteemed an abstemious and honest race.

“When following the calling of shepherds, and occupied, as I saw them, in the duties of their charge in travelling, their countenances are almost invariably marked by the same expression, which combines mildness and sagacity with immovable gravity, and, it is painful to add, a look of deep-seated sadness; the whole caravan, animal as well as human, exhibiting, at least while engaged in one of those tedious peregrinations, a general appearance of suffering and depression, distinguishable in every individual that composes it. The shepherd that opens the march, the independent manso jingling his brazen bell, the flocks that follow, the dogs that watch over their security, and even the Fattore who directs the procession, all appear to be plodding through a wearisome existence of monotony and toil. The extreme slowness of their progress, the downcast expression of every head and eye, and, above all, the indications of exhaustion and fatigue which are but too perceptible after a journey of more than a month’s duration, may well account for this impression.

“The animals suffer greatly from heat until they reach their summer dwelling, and full as much from lameness, which, when it has reached a certain pitch, becomes the signal for destruction. I saw a mule bearing no other load than the skins of those that had perished in this manner.

“Several other beasts of burden follow the rear of the herds, laden with the various articles necessary for them and their guardians during their protracted march: these consist in the nets and poles requisite to pen the folds at night, the coarse cloth tents for the use of the shepherds, and a limited stock of utensils for milking, and boiling the produce of the flock. Among these are to be noticed some portable jointed seats of very ingenious though simple construction, composed of the stems of the giant fennel, a substance remarkable for its light and compact texture.

“The cattle which I thus met near Aquila were within two days’ journey of their resting-place, which is generally in some of the valleys placed on the lower flanks of the mountain ridges, but sufficiently elevated above the larger plains to afford fresh and abundant herbage and a cooler temperature.

“The duration of their abode in these regions is regulated by the rapid or slow progression of the summer season; in the course of which they shift their quarters, as the heat increases, till they reach the highest spots, which are the last divested of the deep snows, in which they have been buried during three quarters of the year. Here large tracts of the finest pasture, rills of the coldest and purest water, and shady woods of considerable extension, are occupied by them during the remainder of the fine weather, and afford the *ne plus ultra* of enjoyment allotted to an existence of such restricted variety.” *Excursions in the Abruzzi by the Honorable Keppel Craven. London, 1838, vol. i. p. 259–264.*

The account, given in the second paragraph of this extract, of the shepherd marching at the head of his battalion of sheep illustrates in a striking manner the remark made respecting

the comparison of kings to shepherds, and to their leading rams in Homer and in the Scriptures.

The Greek word Κρίλος, originally an adjective, corresponds exactly to the Italian *manso*. It appears to have been applicable to all trained tame animals. Hence it was used specially to denote the large and powerful ram, which was instructed to assist the shepherd in disposing the sheep in proper order and in leading them to and from their daily pasture as well as during their long migrations. In the third book of the Iliad (l. 196–198), where Priam is described surveying the Greek troops from the Scæan gate, after the account of Agamemnon, who was considered as their shepherd, we find Ulysses, who was inferior to him both in rank and in stature, represented as his *manso*, that is, as the ram, which immediately follows the shepherd and aids him in conducting the flock. The same image is repeated in the thirteenth book (l. 492, 493), where Pope's translation, though very paraphrastic, is an admirable representation of the real circumstances.

In order follow all th' embodied train,
Like Ida's flocks proceeding o'er the plain :
Before his fleecy care, erect and bold,
Stalks the proud ram, the father of the fold ;
With joy the swain surveys them, as he leads
To the cool fountains, through the well-known meads.

Propertius presents us with a similar picture in the following lines ;

Corniger Idæi vacuum pastoris in aulam
Dux aries saturas ipse reduxit oves. *Lib. iii. El. 13.*

The fold receives the sheep on Ida fed,
By the great ram, their horned chieftain, led.

Aristotle calls these rams "the leaders of the sheep," and he states, that the shepherds provided for each flock such a leader, *which, when called by name by the shepherd, placed himself at the head of the flock*, and was trained to execute this office from an early age*. The employment of the *manso* was probably the ground, on which many of the Orientals adopted the

* Hist. Animal. viii. 19.

ram as the emblem of military authority*. According to this supposition it would rather denote secondary than supreme command; and if so, *the representation of the king of Persia by the symbol of a ram in the 8th chapter of Daniel is the more expressive, because it indicated that he was the agent of the supreme Deity.* Probably also the same sentiment was intended to be conveyed by the enthusiastic Sapor, or Shah-poor II., King of Persia in the *fourth century*, when he rode to battle in front of his army wearing instead of a diadem a ram's head wrought in gold and studded with precious stones†.

Any one, who has seen the collection of ancient bronze bells in the Museum at Naples, and compared them with those now worn in Italy about the necks of sheep and other cattle, will be struck with their similarity. We know also from various ancient laws and other evidence‡ that the shepherds fastened bells upon their sheep as they do at the present day.

There is a striking correspondence between the words of Varro, "crates, retia, cæteraque utensilia," and Craven's account of the provision of nets, &c. for making folds, and of the other necessary utensils.

At Sepino, the ancient Sæpinum, situated in the highest part of the mountains of Samnium near the source of the Tamarus, Mr. Craven saw over the Eastern gate the remains of a very remarkable inscription referring to the same practice§. This inscription has been accurately published by Muratori||. It clearly distinguishes between the "fattores" (*conductores gregum oviaricorum*) and the shepherds who were under them (*pastores quos conductores habent*). These were molested by the magistrates of Sæpinum and the neighboring town of Bovianum, and by the "stationarii" or soldiers, who, instead of being ready to protect them in case of need, charged them with being fugitives and with cattle-stealing, and under this

* E. F. K. Rosenmuller, *Bibl. Alterthumskunde*, iv. 2. p. 83.

† Ammianus Marcell. xix. 1.

‡ See note of Sweertius on the treatise of Hieron. *Magius de Tintinnabulis*, cap. viii.

§ See *Excursions in the Abruzzi*, vol. ii. p. 135, 136.

|| *Novus Thesaurus Vet. Inscriptionum*, p. DCVI.

pretence drove back even those sheep which belonged to the emperor (*oves quoque dominicas*) and thus greatly injured his revenue. These grievances were consequently represented to an officer at Rome who kept the emperor's accounts (*Cosmus, Augusti Libertus a Rationibus*); and he writes in the terms of the inscription to Basseus Rufus and Macrinus Vindex, officers of rank in the army, in order that the evil might be remedied. This inscription must have been erected about the commencement of the Christian æra. As Mr. Craven remarks, "It not only corroborates what was already known, that the periodical migration of the herds from Apulia is of most ancient origin, but it proves, that they observed the same line of route which they follow to the present day; the road, that runs from the east to the western gate of this inclosure, falling into the line of the *tratturos*, or sheep-paths, exclusively allotted to the use of the flocks in their annual journeys."

Whilst we discover these numerous points of resemblance between the ancient and the modern practice, it is probable that in other respects there was a greater diversity. If the author whose observations have been cited had witnessed a similar procession in very ancient times, he would have seen less reason to deplore its toilsome and melancholy aspect. Music was then probably of no little service in animating both the shepherds and their flocks. The sonorous *bagpipe* may have contributed to this effect*. At least Mr. Craven's account of a modern pastoral march is strikingly contrasted with the following description by Apollonius Rhodius, in which he compares the ship *Argo* and the music of *Orpheus*, followed by multitudes of fishes, to a shepherd playing on the *syrinx* and followed by his sheep.

᾿Ως δ' ὀπὸτ' ἀγραύλοιο κατ' ἔχνια σημαντῆρος
 μυρία μῆλ' ἐφέπονται ἄδην κεκορημένα ποίης
 εἰς αὐλιν, ὃ δέ τ' εἶσι πάρος σύριγγι λιγείῃ
 καλὰ μελιζόμενος νόμιον μέλος· ὡς ἄρα τοί γε
 ὠμάρτενν' πῆν δ' αἰὲν ἐπασσύτερος φέρεν οὖρος.

Argon, L. i. 575-579.

* According to Montfaucon (*Ant. Expliquée, Suppl. Tom. iii. p. 188.*) the bagpipe was seen under the arm of a shepherd in the collection of Cardinal Albani at Rome.

As sheep in flocks thick-pasturing on the plain
 Attend the footsteps of the shepherd-swain,
 His well-known call they hear, and fully fed,
 Pace slowly on, their leader at their head ;
 Who pipes melodious, as he moves along,
 On sprightly reeds his modulated song :
 Thus charm'd with tuneful sounds the scaly train
 Pursued the flying vessel o'er the main.

Fawkes's Translation.

The testimony afforded by Varro relative to the management of the South-Italian sheep, having been given and illustrated, it is to be deplored that Italy, once so renowned for its sheep, can now boast little of this production of her bounteous clime. The Romans, whose dress was woollen, cultivated in an especial degree the fineness of the fleece ; and it was not until the days of the Empire that the silk and cotton of the East began to supersede the ancient raiment of the Roman people. The finest wools of ancient Italy were produced in Apulia and Calabria, being the eastern parts of the present kingdom of Naples*.

We now proceed to the other writers on Rural Affairs, viz., Columella and Palladius.

The first attests the high estimation in which the sheep of Calabria and Apulia were held by the Romans, especially before his own time, and he says that among them the Tarentine sheep were the best of all. In speaking of the practice so prevalent in this district of covering them with skins, he shows, that these "oves pellitæ" were also called "soft" (*molles*), and "covered" (*tectæ*). Indeed he makes the great distinction of sheep to be into the "*genus molle*," i. e. the soft kind, and the "*genus hirsutum*," or "*hirtum*," i. e. the coarse kind. We further learn that the soft sheep were called by the Romans Greek sheep, because they were bred in Græcia Magna, and

* It appears from the following passage of Varro, that the Apulian was sold at a higher price than some other kinds of wool which were equally beautiful, because it wore better. By *lana Gallicana* in this passage we must understand the wool of Gallia Cisalpina, of which we shall next treat.

Sic enim lana Gallicana et Appula videtur imperito similis propter speciem, cum peritus Appulam emat pluris, quod in usu firmior sit.

De Lin. Lat., lib. ix. 28. p. 484. ed. Spengel.

Tarentine, because the best of all were bred at Tarentum. According to Palladius they were also sometimes called Asiatic (*Asianæ*). It is to be observed that by *Asia*, Palladius and his contemporaries would understand the celebrated sheep-country of which Miletus was the centre*; and considering the frequent, long-established, and very friendly intercourse between Miletus and Tarentum†, we may infer that the Milesians imported into Tarentum their fine breed of sheep, and at the same time introduced the art of *dyeing* and *preparing* the wool. The same sheep, which were called Greek by the Romans, were called *Italian* by the Egyptians and others, to whom the word *Greek* would not have been distinctive. Columella (vii. 4.) insists particularly on the great pains and care, which it was necessary to bestow upon this description of sheep, the "covered" or "soft," in regard to food, warmth, and cleanliness, and he says that they were principally brought up in the house‡.

As there was in general a great affinity between the manners and ideas of Sicily and South Italy, we might infer that the pastoral habits of these two districts were in many respects similar. Theocritus accordingly lays the scene of some of his Idylls on the coast opposite to Sicily. The fifth Idyll describes a contest between a shepherd and a goatherd, who are supposed to have been employed as hired servants in the vicinity of Sybaris. The shepherd, observing some of his sheep to be feeding on an oak, which could not be very good for them, utters the following exclamation, showing that it was customary to give proper names to sheep, and thus confirming the fact,

* Cellarii Ant. Orbis Notitia, iii. 1. 7, 8, 9.

† Herod. vi. 21. and Wesseling *ad locum*.

‡ According to Bochart (Hieroz. cap. 45. p. 486, ed. Leusden), the Talmud and another rabbinical book, lambs soon after their birth were invested with garments fastened upon them with thongs or buckles.

In the sheep-breeding countries of Europe the practice seems to have been very general. Besides South Italy, Attica, Megaris, and Epirus, in regard to which countries positive evidence has been produced, we find that soft sheep, or "oves pellitæ" were kept by an inhabitant of Cynethæ in Arcadia (Polybius, L. ix. c. 17.), by the Roman settlers in the North of Gaul and in Spain.

that in ancient times they were regarded as the objects of affection, and not of profitable speculation merely :

Ὅκ ἀπὸ τᾶς ἄρνυδος οὗτος ὁ Κώνναρος, ἃ τε Κυνναίθα·
 Τοῦτέϊ βοσκησεῖσθε ποτ' ἀντολᾶς, ὡς ὁ Φάλαρος.

Ho ! Sharphorn, Browning, leave those hurtful weeds,
 And come and graze this way, where Colly feeds.

Creech's Translation.

The passage has often been cited in illustration of the following verses from the Gospel of St. John. Our Savior, describing himself as a shepherd, here alludes to various indications of care and attachment, which distinguish the owner of a flock from the hireling, who, being engaged to tend the sheep only for a season, could not be so well known by them, nor so much interested in their security and welfare.

“ He calleth his own sheep by name, and leadeth them out. And when he putteth forth (from the fold) his own sheep, he goeth before them, and the sheep follow him ; for they know his voice. And a stranger will they not follow, but will flee from him : for they know not the voice of strangers.”—*John*, x. 3-5.

In reference to this passage of Scripture the following remarks of a late traveller are instructive :

“ I asked my man if it was usual in Greece to give names to sheep. He informed me that it was, and that the sheep obeyed the shepherd when he called them by their names. This morning (*March 5, 1828*), I had an opportunity of verifying the truth of this remark. Passing by a flock of sheep, I asked the shepherd the same question which I put to my servant, and he gave me the same answer. I then bade him to call one of his sheep. He did so, and it instantly left its pasturage and its companions, and ran up to the hand of the shepherd, with signs of pleasure and with a prompt obedience which I had never before observed in any other animal. It is also true of the sheep in this country, *that a stranger will they not follow, but will flee from him ; for they know not the voice of the strangers.* The shepherd told me that many of his sheep are still WILD ; that they had not yet learned their names ; but that by teaching they would all learn them. The others, which knew their names, he called *TAME.*”—*Researches in Greece and the Levant, by the Rev. John Hartley*, p. 321.

The city of Sybaris stood between two rivers, the Sybaris and the Crathis. The ancients asserted that the sheep which drank of the Crathis, were white, and those which drank of the

Sybaris, black. They attributed similar virtues to other streams in various parts of the world*.

According to Strabo (*L. vi. cap. 3. § 9. p. 303. ed Siebenkees*) the hilly promontory of Garganus was particularly celebrated for its sheep. He says, that their wool was softer than the Tarentine, but less shining.

The Roman poets allude in various instances to the excellence of the Apulian wool, and especially to that of Tarentum. Horace in the following stanza expresses his predilection for this celebrated city, and mentions its "soft" or "covered" sheep. He had been asserting his wish to end his days at Tibur, the modern Tivoli.

But, should the partial Fates refuse
That purer air to let me breathe,
Galesus, thy sweet stream I'll choose,
Where flocks of richest fleeces bathe :
Phalanthus there his rural sceptre sway'd,
Uncertain offspring of a Spartan maid.

Od. l. ii. 6.—Francis's Translation.

Martial alludes to the celebrity of the Tarentine wool in no less than five of his epigrams.

Spartan Galesus did your toga lave,
Or from a flock select fair Parma gave.
L. ii. ep. 43. l. 3, 4.

The poet intended here to describe a toga of the most expensive and fashionable kind.

You give, O Chloe, to Lupercus,
Your tender favorite, lacernas
Of Spanish, Tyrian, scarlet fleeces,
And togas wash'd in warm Galesus.
L. iv. ep. 28. l. 1-3.

Thou wast more sweet, O lovely child !
Than song of aged dying swans :
Thy voice, thy mien were soft and mild
As Phalantine Galesus' lambs.
L. v. ep. 37. l. 1, 2.

The last lines were written by Martial on the death of Ero

* Ælian, *Nat. Anim.* xii. 36. Plinii *Hist. Nat.* xxxi. 9. Kruse's *Hellas*, i. p. 369. (See Appendix A.)

tion in her sixth year. He describes her interesting qualities by comparing her to a lamb of the soft Tarentine breed, always clothed and usually kept in the house and hence remarkably tender and delicate.

The following epigram (L. viii. *ep.* 28.) was written on the receipt of a handsome toga from the wealthy and munificent Parthenius, chamberlain to the emperor Domitian. In expressing his admiration of it, the poet enumerates the places from which the Romans of his time obtained the best and most fashionable garments of this description. He next proceeds to extol its whiteness; and in conclusion observes how ridiculous he would appear wearing his old *lacerna* over this new and snowy garment, and he thus conveys a hint to Parthenius how acceptable and suitable would be the present of a *lacerna* in addition to the toga.

De Partheniana toga.

Dic, toga, facundi gratum mihi munus amici,
 Esse velis cujus fama, decusque gregis?
 Appula Ledæi tibi floruit herba Phalanthi,
 Quà saturat Calabris culta Galesus aquis?
 An Tartessiacus stabuli nutritor Iberi
 Bætis in Hesperia te quoque lavit aqua?
 An tua multifidum numeravit lana Timavum,
 Quem prius astrifero Cyllarus ore bibit?
 Te nec Amyclæo decuit livere veneno;
 Nec Miletus erat vellere digna tuo.
 Lilia tu vincis, nec adhuc dilapsa ligustra,
 Et Tiburtino monte quod albet ebur.

Spartanus tibi cedit olor, Phaphiæque columbæ:
 Cedet Erythræis eruta gemma vadis.
 Sed licet hæc primis nivibus sint æmula dona,
 Non sunt Parthenio candidiora suo.

Non ego prætulerim Babylo-nica picta superbè
 Texta, Semiramia quæ variantur acu.

Non Athamantæo potius me mirer in auro,
 Æolium dones si mihi, Phryxe, decus.

O quantos risus pariter spectata movebit
 Trita Palatina nostra lacerna toga!

Say, grateful gift of mine ingenious friend,
 What happy flock shall to thy fleece pretend?
 For thee did herb of famed Phalantus blow,
 Where clear Galesus bids his waters flow?

Did thy wool count the streamlets, more than seven,
 Of him, who slaked the warrior horse of heaven?
 Or did Tartessian Guadalquiver lave
 Thy matchless woof in his Hesperian wave?
 Thou didst not need to taste Amyclæ's bane,
 And wouldst have tried Milesian art in vain.
 With thee the lily and the privet pale
 Compared, and Tibur's whitest ivory fail.
 The Spartan swan, the Paphian doves deplore
 Their hue, and pearls on Erythrean shore.
 But, though the boon leave new-fall'n snows behind,
 It is not purer than the donor's mind.
 I would prefer no *Babylonian vest*,
Superbly broider'd at a queen's behest;
 Nor better pleased should I my limbs behold,
 Phryxus, in *webs* of thine Æolian gold.
 But O! what laughter will the contrast crown,
 My worn lacerna on th' imperial gown!

It may be observed, that in this ingenious epigram, as well as in two of the preceding, which relate to togas, Martial supposes the Tarentine wool to be white: for the Roman toga was of that color except in mourning, and one object of the last-cited epigram is to praise the whiteness of the particular toga, which it describes. The Tarentines therefore must have produced both dark-colored and white fleeces.

The fifth passage of Martial (xii. 64.), which mentions the sheep of the Galesus, more directly refers to those of Spain, and will therefore be quoted under that head.

Besides the epigrams, now cited, in which Martial commends the wool of Tarentum in particular, we find others, in which he celebrates that of Apulia in general. In Book xiv. Ep. 155. he gives an account of the principal countries, which yielded white wools, and informs us that those of the first quality were from Apulia.

White Wools.

The first Apulia's; next is Parma's boast;
 And the third fleece Altinum has engrost.

Elphinston's Translation.

Also in the following lines Martial alludes to the large and numerous flocks of Apulia, and to the whiteness of their wool.

Of white thou hast to clothe a tribe sufficient stock,
The produce fair of more than one Apulian flock.

L. ii. *Ep.* 46. l. 5, 6.

On the other hand the wool from the vicinity of Canusium was no less esteemed for its dark colors, whether inclining to brown or to red. These saved the expense of dyeing. The testimony of Pliny to their value has been already produced. In the two following Epigrams (*l.* xiv. 127 and 129.) Martial alludes to the peculiar recommendations and uses, first of the brown, and secondly of the reddish variety.

This Canusine lacerna, it is true,
Looks muddy: but it will not change its hue*.
Rome in the brown delights, gay Gaul in red:
This pleases boys, and whose is blood to shed.

On referring to the passages produced from Pliny, Columella, and Martial, it will be seen that the Romans ascribed a very high value to the white wool of Gallia Cisalpina, i. e. of North Italy, or the region about the Po. Parma was considered second only to Apulia for the whiteness of its wool. Besides the two epigrams of Martial already cited, he refers to Parma as a great place for sheep-breeding in the following passage, addressed to the wealthy Callistratus;

And Gallic Parma shears thy num'rous flocks.

L. v. *ep.* 13.

Columella speaks moreover (*l. c.*) of the superiority of the wool of Mutina, now Modena; and Martial (*l. v. ep.* 105.) mentions the circumstance of a *fuller*, or *clothier*, in that city having exhibited a show to the public, which is a presumptive evidence that he had a great business in manufacturing the produce of the surrounding country.

Strabo in his account of the productions of Cisalpine Gaul divides the wool into three kinds; First, the soft kind, of which the finest varieties were grown about Mutina and the river

* It appears from this epigram that, when shaken, it had the color of the brown wool of Canusium, a kind of drab. The lacerna was a mantle, which the Romans wore out of doors over their white toga, with which it was well contrasted, whether it was purple, scarlet, or brown; but the last color, though less showy at first, must have had the advantage of durability. See Appendix A.

Scutana, which is the modern Scultenna, a tributary of the Po, rising in the Apennines; Secondly, the coarse kind, grown in Liguria and the country of the Insubres, which was very much used for the common wearing apparel of the Italians; and Thirdly, the middle kind, grown about Patavium (now Padua) and employed for making valuable *carpets* and various descriptions of *blankets**. By comparing the statements of this author with those of Columella and Martial it will appear, that the whole region watered by the parallel rivers Parma, Gabellus, and Scultenna, and known by the name of *Macri Campi*, or the Barren Plains, was esteemed for the production of the fine white wool.

That the tending of both sheep and goats was a principal occupation of the people of Mantua we learn from Virgil, a native of that city, who places the scene of most of his pastorals in its vicinity. His First and Ninth Eclogues more particularly relate to the calamities, which the Mantuans were compelled to sustain, when Augustus seized on their lands to reward his veteran soldiers after the battle of Philippi. These eclogues mention flocks both of sheep and goats, and show that those who had the care of them cultivated music and poetry after the manner of the Sicilians. The commencement of the Seventh Eclogue is especially instructive, because it gives us reason to believe, that while many of the Arcadians left their country in consequence of that excess of population, to which mountainous regions are subject, in order to become foreign mercenaries, others, on the contrary, entered into foreign service as shepherds and goatherds, and in this condition not only made themselves useful by their experience, skill, and fidelity, but also introduced at the same time their native music together with that refinement of manners and feelings which it promoted. The poet thus describes two such individuals, who had been employed in tending flocks upon the banks of the Mincius (*l.* 12, 13), and who were either born in Arcadia, or were at least of Arcadian origin.

Two blooming swains had join'd their flocks in one,
Thyrsis his sheep, and tuneful Corydon

* Strabo, L. v. c. 1. § 12. p. 119. ed. Siebenkees.

His goats, which bore their treasur'd milk along ;
Arcadians both, both skill'd in amœbean song.

At a considerable distance to the North-East of Mantua lay Altinum, which is mentioned by Columella*, Tertullian, and Martial, as one of the principal places for the produce of *white* wool. Martial says, that it ranked in this respect next to Parma†, and we must understand him as referring to the same region in Book viii. Epig. 28, where he asks, "Did thy wool count the many streams of the Timavus, which Cyllarus previously drank with his starry mouth?" The Timavus was indeed a considerable way still further towards the North-East, and must have been very insignificant in connection with the sheep-breeding of the Altinates. The poet introduces it here only on account of its picturesque and mythological interest, just as we have seen that the Galesus, a small, though clear and very beautiful stream, is repeatedly named in order to designate the pastoral region about Tarentum. It may also be observed, that in this epigram, where Martial alludes to three of the principal places for the growth of white wool, he indicates each of them by its river, the three rivers being the Galesus, the Bætis, and the Timavus; and he probably did so on account of the supposed effect of the waters of these rivers in improving the wool.

We can make no question, after what we have seen of the universal practice of both ancient and modern times, that the sheep, which in the winter were pastured in the plains and lower grounds about Altinum, were taken to pass the summer in the vallies of the Carinthian Alps about the sources of the Brenta, the Piave, and the Tagliamento. We may also trace the wool, after it was manufactured, in its progress towards Rome, where was the chief demand for garments of this description. For Strabo says, that Patavium (*Padua*), which was situated at no great distance from Altinum on the way to Rome, was a great and flourishing mart for all kinds of merchandize intended to be sent thither, and especially for every kind of cloth‡. It appears, therefore, that the wool-growers

* L. vii. cap. 2.

† L. xiv. Ep. 155.

‡ L. v. cap. 1. § 6, 7. Strabo alludes to the pastoral occupations of the territory about Altinum and the Timavus.

and clothiers of the country to the North-East of Padua, the modern Trevisano, employed that city as an entrepôt where they disposed of their goods to the Roman dealers. At the same time we learn, that this place served as a market for *carpets* and *blankets* made of a stronger and more substantial material, which, according to the same authority*, was produced in its more immediate vicinity.

In the North-Western portion of Cisalpine Gaul the wool was generally coarse, and according to Strabo (*l. c.*) the garments made of it were used by the Italians for the ordinary clothing of their domestic establishments. Nevertheless, black wool of superior value was grown at Polentia, now Polenza, on the Stura, which is a tributary of the Po†. The following two Epigrams of Martial (*l. xiv. 157 and 158.*) allude to the use of the dark wool of Polentia for mourning and for the dress of inferior domestic servants.

Polentine Wools.

1. Not wools alone, that wear the face of woe ;
Her goblets once did proud Polentia show.
2. Our sable hue to croplings may belong,
That tend the table, not of primal throng.

Elphinston's Translation.

The country people about Modena and in other parts of the Northern Apennines still wear *undyed* woollen cloth of a gray color. Muratori quotes from the statutes of the city of Modena, A. D. 1327, a law to *prevent the makers of such cloth from mixing with their gray wool the hair of oxen, asses, or other animals*‡.

Before quitting Italy we may properly inquire, whence and how came the practice of sheep-breeding into Great Britain. It has already been observed that the very improved state of the art at Tarentum may be in part ascribed to the intercourse

* Strabo.

† Pliny, *l. viii.* Columella, *vii. 2.* To these testimonies may be added Silius Italicus de Bello Punico, *l. viii. 597.*

‡ *Dissertazioni sopra le Antichità Italiane*, Diss. 30. tomo ii. 48, 49, 4to edition. This author in his 21st Dissertation endeavors to assign reasons for the decline of the modern Italians in the growth and manufacture of wool.

of its inhabitants with the Milesians. The reader will have noticed the fact that the worship of Pan was introduced into Italy from Arcadia by Evander, from which circumstance it may be reasonably inferred, that improvements in the management of sheep were also introduced at the same time. According to Dionysius of Halicarnassus, Evander with his companions was said by the Romans to have migrated to Latium *about sixty years before the Trojan war**. The same historian alleges that this colony taught in Italy the use of letters, of instrumental music and other arts, established laws, and brought some degree of refinement instead of the former savage mode of life. The story of the birth of Romulus and Remus supposes sheep-breeding to have been practiced at the period of that event, and in a state of society similar to that which we have found prevailing further eastward; for it is stated, that Faustus, who discovered them, kept the king's flocks. He was "magister regii pecorist."

According to Pausanias (*l. viii. c. 3. § 2.*) the first Greek colony, which went into Italy, was from Arcadia, being conducted thither by CEnotrus, an Arcadian prince†. This was several centuries before the expedition under Evander, and the part of Italy thus colonized was the southern extremity, afterwards occupied by the Bruttii§. If with Niebuhr we regard this tradition only in the light of a genealogical table, designed to indicate the affinities of tribes and nations, still the simple fact of the colonization of South Italy by Arcadians certainly authorizes the conjecture, that Arcadia was one of the stepping-stones, by which the art of sheep-breeding was transported from Asia into Europe.

* *Hist. Rom. l. i. p. 20, 21. ed. R. Stephani, Par. 1546. folio.*

As it has been a frequent error with nations to push back their annals into a higher antiquity than was consistent with fact, this may have been the case in the present instance. For it is to be observed, that according to Herodotus the worship of Pan did not arise in Arcadia until after the time when according to this latter statement it was introduced from Arcadia into Latium.

† *Livii l. i. c. 4.*

‡ As further evidence for this tradition see Pherecydis *Fragmenta*, a Sturtz, p. 190. *Virg. Æn. i. 532, and iii. 165.* Compare Heyne, *Excursus vi. ad Æn. l. iii.*

§ Heyne, *Excursus xxi. ad Æn. l. i.* Niebuhr, *Röm. Geschichte, i. p. 57.*

The reader will have perceived from the observations already made on the worship of Faunus in Italy, that the Roman Faunus was the same with the Arcadian Pan. It seems no sufficient objection to this hypothesis, that a few Roman authors have supposed Faunus to be either the son of Mars*, or of Picus and the grandson of Saturn, thus connecting him with their native mythology, or that his oracle was held by them in high repute†. It is here sufficient to remark, that we find him extensively recognized in Italy as a pastoral divinity.

Stretch'd on the springing grass, the shepherd swain
 His reedy pipe with rural music fills;
 The god, who guards his flock, approves the strain,
 The god, who loves Arcadia's gloomy hills.

Horat. Carm. iv. 12. 9-12.—Francis's Translation.

The above stanza occurs in a description of the beauties of spring, and the poet no doubt alludes to the pastoral habits of his Sabine neighbors.

From ancient monuments as well as from the language of the poets we find, that the worship of other divinities was associated with that of Faunus in reference to the success of all agricultural pursuits including that of sheep-breeding. Boisard, in the Fourth Part of his *Antiquitates Romanæ*, has published somewhat rude engravings of the bas-reliefs upon two altars, one of them (No. 130) dedicated to *Hope*, the other (No. 134) to *Silvanus*. The altar to Hope was erected, as the inscription expresses, in a garden at Rome by M. Aur. Pacorus, keeper of the temple of Venus. He says, that he had been admonished to this deed of piety by *a dream*; and, if the representation in the bas-relief was the image thus presented to his mind, his dream was certainly a very pleasant one. Hope, wearing on her head a wreath of flowers, places her right hand upon a pillar and holds in her left poppy-heads and ears of corn. Beside her is a bee-hive on the ground, and on it there is also fixed a bunch of poppy-heads and ears of corn. Above these emblems of the fruitfulness of the field and of the garden is the figure of a bale of wool.

* Appian apud Photium.

† Virgil, *Æn.* vii. 48, 81-105, and Heyne, *Eecursus v. ad loc.*

The altar to Silvanus exhibits that divinity crowned with the cones and foliage of the pine. A pine grows moreover beside his terminal statue, bearing the large cones, which were used for food at entertainments and carried in bacchanalian processions. Faunus, or Pan, sits at the foot of the pine, the syrinx and the double pipe being placed at his feet. In his right hand he holds an olive branch, while a young winged genius advances towards him as if to receive it, and another genius of the same kind appears to be caressing him and whispering into his ear. On the other side of the terminal statue of Silvanus we see the caduceus of Mercury and the bale of wool, manifest indications of success in the wool trade. In this sculpture the bale is surrounded with cords, which are twisted round one another where they cross. In the former instance the compression of the wool appears to be effected by the use of thongs instead of cords*. There is also introduced the figure of a shepherd of the same country. This statue was found in the vicinity of Rome and is now preserved in the Vatican†. The extremities are in part restorations. A cameo in the Florentine Museum‡ represents the shepherd Faustulus sitting upon a rock, and contemplating the she-wolf, which is suckling Romulus and Remus. It is of the Augustan age, and no doubt exhibits the costume and general appearance of a Roman shepherd of that period. He wears a *tunica cucullata*, i. e. a tunic of coarse woollen cloth with a cowl, which was designed to be drawn occasionally over the head and to protect it from the injuries of the weather. This garment has also sleeves, which Columella mentions (*tunica manicata*) as an additional comfort. On his feet the shepherd wears high shoes, or boots, which, as we may suppose, were made of leather.

The appearance of the shepherds, who are represented in these ancient works of art, is, doubtless, adapted to produce the

* The bas-relief on the first altar is copied from Boissard by Montfaucon, *Ant. Expliquée*, tome i. p. 332. and that on the second, tome ii. p. 275. The latter is also represented by the Rev. Henry Moses, *Collection of Antique Vases, &c.* Plate 52.

† Museo Pio-Clementino, tomo iii. tav. 34 and p. 44.

‡ Museum Florentinum. *Gemmæ Antiquæ a Gorio illustratæ*, tav. ii. No. 10.

impression, that their condition, even if it were that of slaves, was nevertheless one of comfort and respectability. Neither their garb, nor their attitude, suggests the idea of anything base or miserable. On the contrary, the countenance of each indicates trust-worthiness, steadiness, and care. That many of the agricultural laborers of ancient Italy had this character may be inferred also from written testimonies.

In reference to this subject, and with a view to illustrate at the same time the habits and employments of the ancient farmer among the *Sabine* or *Apulian* mountains, we will here quote some parts of Horace's Second Epode, in which he describes the pleasures of a country life.

Like the first mortals blest is he,
From debts, and usury, and bus'ness free,
With his own team who ploughs the soil,
Which grateful once confess'd his father's toil.

The sounds of war nor break his sleep,
Nor the rough storm, that harrows up the deep ;
He shuns the courtier's haughty doors,
And the loud science of the bar abjures.

Either to poplars tall he joins
The marriageable offspring of his vines ;
Or lops the useless boughs away,
Inserting happier as the old decay :

Or in a lonely vale surveys
His lowing herds, safe-wand'ring as they graze ;
Or stores in jars his liquid gold
Prest from the hive, or shears his tender fold.

* * * *

And, if a chaste and prudent wife
Perform her part in the sweet cares of life,
Of sun-burnt charms, but honest fame,
Such as the Sabine or Apulian dame ;

If, when fatigued he homeward turns,
The sacred fire, built up with faggots, burns ;
Or if in hurdles she inclose
The joyful flock, whence ample produce flows ;

Though unbought dainties she prepare,
And this year's wines attend the homely fare ;
No fish would I from foreign shore
Desire, nor relish Lucrine oysters more.

Olives, fresh gather'd from the tree ;
*Mallows, the frame from heaviness to free**;
A kid snatch'd from the wolf, a lamb
To Terminus with due devotion slain ;

Such is the meal, his labor o'er ;
No bird from distant climes I'd relish more.
Meanwhile how pleasant to behold
His sheep well fed, and hasting to their fold ;

To see his wearied oxen bow
Their languid necks, and drag th' *inverted* plough ;
And then his num'rous slaves to view
Round his domestic gods their mirth pursue.

* See chap. xii. p. 191.

CHAPTER III.

SHEEP BREEDING AND PASTORAL LIFE OF THE ANCIENTS—ILLUSTRATIONS OF THE SCRIPTURES, &c.

Sheep-breeding in Germany and Gaul—In Britain—Improved by the Belgians and Saxons—Sheep-breeding in Spain—Natural dyes of Spanish wool—Golden hue and other natural dyes of the wool of Bætica—Native colors of Bætic wool—Saga and chequered plaids—Sheep always bred principally for the weaver, not for the butcher—Sheep supplied milk for food, wool for clothing—The moth.

ACCORDING to Tacitus*, the ancient Germans had abundance of cattle, although we have no reason to suppose that they had acquired any of that skill in sheep-breeding, by which their successors in Silesia and Saxony are now distinguished. On the contrary, we are informed by the same author that the only woollen garment, which they commonly wore, was the *Sagum*, a term implying the coarseness of the material†.

We find almost as little in any ancient author in favor of the wool of Gallia Transalpina, the modern France. Pliny mentions a coarse kind, more like hair than wool, which was produced in the neighborhood of Pezenas in Provence‡. Martial's account of the Endromis Sequanica, coarse, but useful to keep off the cold and wet, bears upon the same point ;

The frousy foster of a female hand ;
Of name Laconian, from a barb'rous land ;
Though rude, yet welcome to December's snow,
To thee we bid the homely stranger go :

* * * * *

That into glowing limbs no cold may glide,
That baleful Iris never drench thy pride :

* Terra pecorum fecunda, sed plerumque improcera.—Germania, v. 2.

† Nudi, aut sagulo leves.—Germania, vi. 3. Tegumen omnibus sagum. xvii. 1.

‡ See Appendix A.

This fence shall bid thee scorn the winds and showers ;
The Tyrian lawn pretends no equal powers.

Elphinston's Translation.

In the following epigram of Martial (vi. 11.), addressed to his friend Marcus, we observe a similar opposition between the fine and fashionable cloth of Tyre, and the thick coarse "sagum" produced in Gaul.

Proud Tyrian thine, gross Gaulish mine array :
In purple thee can e'er I love in gray ?

Juvenal gives exactly the same account of the woollen manufactures of Gaul. In the following passage the needy dependant of a rich man is speaking of the lacernas from that country, which were sometimes presented to him by his patron.

Some coarse brown cloaks perhaps I chance to get,
Of Gallic fabric, as a fence from wet.

Satir. ix. v. 30.—Owen's Translation.

To the same effect are several passages in the Epistles of Sidonius Apollinaris, who was Bishop of Clermont in Auvergne in the fifth century. He mentions, for example, that the attendants on Prince Sigismer at his marriage wore green *Saga* with red borders, and he describes a friend of his own as wearing the *Endromis**. Also in an account of his own villa he speaks of the pipe with seven holes, as the instrument of the shepherds and herdsmen, who used to entertain themselves during the night with musical contests, while their cattle were grazing with bells upon their necks.

All these passages are confirmed and illustrated by the testimony of Strabo. According to him Gaul produced cattle of all kinds†. The Belgæ, who occupied the most northern part, opposite to Britain, excelled the rest of the Gauls in their manufactures. Nevertheless their wool was coarse, and was spun and woven by them into the thick *Saga*, which were both worn by the natives of the country and exported in great quantities to Rome and other parts of Italy. The Roman settlers, indeed,

* *Viridantia saga limbis marginata puniceis.* L. iv. Ep. 20. *Tu endromidatus exterius.* L. iv. Ep. 2.

† L. iv. cap. i. § 2. p. 6. ed. Siebenkees.

in the most northern parts had flocks of covered sheep, and their wool was consequently very fine*.

Here also may be produced the evidence of Eumenius, who in his Oration, which will be quoted more fully hereafter, intimates the abundance of the sheep on the western banks of the Rhine by saying, that the flocks of the Romans were washed in every part of the stream†.

Cæsar informs us, that the ancient inhabitants of Britain had abundance of cattle (*pecoris magnus numerus*); under the word (*pecus*) "cattle," sheep must no doubt be understood to be included. It also appears, that in his time the Celts, or proper Britons, lived to the North of the Thames, the Belgians having expelled them and taken possession of the part to the South, called *Cantium* or *Kent*. These last were by far the most civilized inhabitants of the island, not much differing in their customs from the Gauls. With respect to the others, Cæsar says, that for the most part they did not sow any kind of grain, but lived upon milk and flesh, and clothed themselves with skins‡.

It appears therefore, that before our æra, sheep, and probably goats, were bred extensively in England, their milk and flesh being used for food, and their skins with the wool or hair upon them for clothing; and that the people of Kent, who were of Belgic origin, and more refined than the original Britons, had attained to the arts of spinning and weaving, although their productions were only of the coarsest description.

Eumenius, the Rhetorician, who was a native of Augustodunum, now called Autun, delivered his Panegyric in praise of the Emperors Constantius and Constantine in the city of Treves about A. D. 310. In the following passage he congratulates Britain on its various productions, and also on the

* L. iv. cap. iv. § 3. pp. 56-59. ed. Siebenkees.

† Arat illam terribilem aliquando ripam inermis agricola, et toto nostri greges flumine bicorni mersantur. p. 152.

‡ Ex his omnibus longè sunt humanissimi, qui Cantium incolunt; quæ regio est maritima omnis; neque multum a Gallicâ differunt consuetudine. Interiores perique frumenta non serunt; sed lacte et carne vivunt, pellibusque sunt vestiti. De Bello Gallico, l. v. cap. 10.

circumstance, that Constantine had been recently declared Emperor at York on the death of his father :

O fortunate Britain, now the happiest country upon earth ; for thou hast been the first to see Constantine made Emperor. It was fit that on thee Nature should bestow every blessing of climate and of soil. Suffering neither from the excessive severity of winter, nor the heat of summer, thy harvests are so fruitful as to supply all the gifts both of Ceres and of Bacchus ; thy woods contain no savage beasts, thy land no noxious serpents, but an innumerable multitude of tame cattle, distended with milk, and loaded with fleeces*.

The improvements in sheep-breeding which were first introduced into England by the Belgians, appear to have been advanced still further by the Saxons.

The only country, which now remains to be surveyed in relation to the production of sheep's wool, is Spain ; and, as this kingdom retains its pre-eminence at the present day†, so we find none, in which sheep-breeding was carried to a greater extent in ancient times.

Of all the countries in Europe, says Mr. Low, Spain has been the longest distinguished for the excellence of its wool. This fine country, more varied in its surface and natural productions than any other region of the like extent in Europe, produces a great variety of breeds of sheep, from the larger animals of the richer plains, to the smaller races of the higher mountains and arid country. Besides the difference produced in the sheep of Spain by varieties of climate and natural productions ; the diversity of character in the animals may be supposed to have been increased by the different races introduced into it :— first, from Asia, by the early Phœnician colonies ; secondly, from Africa by the Carthaginians, during their brief possession ; thirdly, from Italy by the Romans, during their dominion of six hundred years ; and fourthly, again from Africa, by the Moors, who maintained a footing in the country for nearly eight centuries. The large sheep of the plains have long wool, often

* Panegyrici Veteres, ed. Cellarii, Halæ Magd. 1703. pp. 147, 148.

† For accounts of the state of sheep-breeding in modern Spain, including the annual migration of the flocks, which is conducted there as in Italy, the reader is referred to "Travels through Portugal and Spain in 1772, 1773, by R. Twiss," pp. 72-82 ; and to De la Borde's View of Spain, vol. iv. pp. 45-61, English Translation. London, 1809.

colored brown or black. The sheep of the mountains, downs, and arid plains have short wool, of different degrees of fineness, and different colors. The most important of these latter breeds is the merino, now the most esteemed and widely diffused of all the fine-wooled breeds of Europe.

Pliny not only refers in general terms to the various natural colors of the Spanish wool, but mentions more particularly the red wool produced in the district adjoining the river Bætis, or Guadalquivir*.

Among the natural colors of the Bætic wool, Columella, a native of Cadiz, (vii. 2.) mentions, as has been already stated, *gray* and *brown*. The latter is what we call *drab*, and the Spaniards *fusco*. It is now commonly worn by the shepherds and peasants of Spain, the wool being made into clothes without dyeing.

Nonius Marcellus (*cap. 16. n. 13*), explaining the word *pulus*, which was called a *native* color, because it was the natural color of the fleece, also shows, that this was a common quality of the Spanish wool. Another testimony is that of Tertullian.

The sheep of Tarentum were imported into this part of Spain, and there also their fleeces were protected by clothing. Columella (L. vii. 2.) gives a very interesting account of the experiments made by his uncle, a great agriculturalist of Bætica, in crossing his Tarentine breed with some wild rams of an extraordinary color, which had been brought from Africa to Cadiz. (See latter part of next chapter.)

We have a further evidence of the pains taken to improve the Spanish breed in the circumstance, that Italian shepherds passed into Spain, just as we have formerly seen, that they migrated into Italy from Arcadia. In the following lines of Calpurnius (Ecl. iv. 37-49.), Corydon, a young shepherd, tells his friend and patron, Melibœus, that he should have been transported into Bætica, had not the times improved, and his master's favor enabled him to remain in Italy.

Through thee I rest secure beneath the shade,
Such plenty hath thy generous bounty made,

* See Appendix A.

But for thy favor, Melibæus, sent
 Where Bætis' waves the western plains indent,
 Plains at the earth's extremest verge, expos'd
 To the fierce Moors, which Geryon once inclos'd.
 There had I now been doom'd to tend for hire
 Iberian flocks, or else of want expire :
 In vain I might have tun'd my seven-fold reed :
 Mid thickets vast no soul my strains would heed :
 Not even Pan on that far-distant shore
 Would lend his vacant ear, or be my solace more.

Juvenal in his Twelfth Satire (*l.* 37–42.) describes a merchant overtaken by a dreadful storm, and to save the ship throwing his most valuable goods into the sea. It will be observed, that the poet attributes the excellence and fine natural color of the woollen cloth of Bætica to three causes, the rich herbage, the occult properties of the water, and those of the air.

“Over with mine,” he cries ; “be nothing spar'd ;”
 To part with all his richest goods prepar'd ;
 His vests of Tyrian purple, fit to please
 The softest of the silken sons of ease,
 And other robes, which took a native stain
 From air and water on the Bætic plain.

Owen's Translation.

Strabo (*iii.* 144. *p.* 385. *ed.* *Sieb.*) gives the following account of the wool of Turdetania.

Πολλὴ δὲ καὶ ἐσθῆς πρότερον ἤρχετο· νῦν δὲ καὶ ἔρια μᾶλλον τῶν Κυραζῶν, καὶ ὑπερβολὴ τις ἐστὶ τοῦ κάλλους· ταλαντιαίους γοῦν ὠνοῦνται τοὺς κριοὺς εἰς τὰς ὀχείας, ὑπερβολὴ δὲ καὶ τῶν λεπτῶν ὑφασμάτων, ἅπερ οἱ Σαλτιῆται κατασκευάζουσιν.

“Much cloth used formerly to come from this country. Now also fleeces come from it more than from the Coraxi ; and they are exceedingly beautiful, so that rams for breeding are sold for a talent each. Also the fine webs are very famous, which are made by the Saltiatæ.”—*Yates's Translation.*

The reader will please to remark, that this is the passage of Strabo, formerly referred to as containing evidence respecting the Coraxi.

Martial, a Spaniard by birth, frequently alludes to the sheep of Bætica and especially to the various natural colors of their wool, which were so much admired, that it was manufactured without dyeing. Two of his epigrams (*iv.* 28. and *viii.* 28.)

have been already quoted, as they refer also to the sheep of Tarentum : to these the seven following may be added.

In the Tartessian lands a house appears,
Where Cordova o'er placid Bætis rears
Her wealthy domes ; and where the fleeces show
Metallic tints, like living gold that glow.

ix. 62.

Corduba, more joyous far
Than Venafrum's unctuous boast ;
Nor inferior to the jar,
That renowns glad Istria's coast :
Who surmount'st the fleecy breed,
That the bright Galesus laves ;
Nor bidd'st lying purple bleed
O'er the hue, that nature craves.

xii. 63.—*Elphinston's Translation.*

Bætis, with wreaths of unctuous olive crown'd,
For Bacchus' and for Pallas' gifts renown'd ;
Whose waters clear a golden hue impart
To fleeces, that require no further art ;
Such wealth the Ruler of the waves conveys
In ships, that mark with foam thy liquid ways.

xii. 99.

Lacernas from Bætica.

My wool disdains a lye, or caldron hue.
Poor Tyre may take it : me my sheep imbue.

xiv. 133.—*Elphinston's Translation*

Charming Ero's golden lock
Beat the fleece of Bætic flock.

v. 37. See § 21.—Ib.

Bætic fleeces, many a pound.

xii. 65. l. 5.

Let him commend the sober native hues ;
Of Bætic drab, or gray, lacernas choose,
Who thinks no man in scarlet should appear,
And only women pink or purple wear.

i. 97.

The numerous passages, which have now been produced relative to the native colors of the Spanish wool, explain the following line of Virgil, in which he describes the clothing of a warrior ;

With broider'd chlamys bright, and Spanish rust.

Æn. ix 582

The poet probably intended to describe an outer garment, a chlamys, made of undyed Spanish wool of a clear brown or yellowish color, resembling that of rust; and afterwards enriched with embroidery.

Ramirez de Prado, the Spanish commentator on Martial (*4to. Paris, 1607.*), says, that two native colors were common in Spain in his time, the one a golden yellow, the other more brown or ferruginous.

In the North of Spain the Celtiberi wore saga made of a coarse wool like goats'-hair (*Diod. Sic. v. 33. tom. i. p. 356. Wesseling.*), and woven *double* according to Appian*.

At Salacia in Lusitania, according to Pliny, a chequered pattern was employed in the manufacture of the coarse wool. This was in all probability the same as the shepherd's plaid of the Scotch, the weaver taking advantage of the natural difference of the white and black wool to produce this variety of appearance. (See Appendix A.)

Estremadura, a part of the ancient Bætica, is still famous for its wool. There the Spanish flocks hibernate, and under the direction of a peculiar code of laws, called *La Mesta*, are conducted every spring to pasture in the mountains of Leon and Asturias. Other flocks are led in the same season from great distances to the heights of the Sierra Morena, lying to the east of the ancient Bætica, where the vegetation is remarkably favorable to the improvement of their wool.

As bearing directly upon the present inquiry it may be observed, that sheep have always been bred principally for the weaver, not for the butcher, and that this has been more especially the case in ancient times and in eastern countries.

If we may judge from the following epigram of Martial, the Romans regarded with feelings little short of aversion the act of killing a sheep for food except on solemn or extraordinary occasions.

The Ram's head.

Hast pierc'd the neck of the Phryxean lord,
Who oft had shelter'd thine? O deed abhorr'd!

xii. 211.—*Elphinston's Translation.*

* Appiani Hist. Rom. l. vi. de Rebus Hispan., vol. i. p. 151. ed. Schweighäuser.

The customs of the shepherd tribes in the East are in this respect remarkably like those of the ancients.

“The Arabs rarely diminish their flocks by using them for food, but live chiefly upon bread, dates, milk, butter, or what they receive in exchange for their wool. They however sell their sheep to the people in the towns. A lamb or kid roasted whole is a favorite dish at Aleppo, but seldom eaten except by the rich*.” When the Arabs have a sheep-shearing, they perhaps kill a lamb, and treat their relations and friends with it together with new cheese and milk, but nothing more. Among the Mohammedans sheep are sacrificed on certain days as a festive and at the same time a religious ceremony; these ceremonies are of great antiquity and derived from Arab heathenism. On the pilgrimage to Mecca every one is required to sacrifice a sheep at a certain place near Mecca†.

By the Law of Moses the sheep was a *clean* animal, and might consequently be eaten or sacrificed. A lamb or kid, roasted whole, was the principal and characteristic dish at the feast of the passover. The rich man kills a lamb to entertain his guest in the beautiful parable of Nathan. (2 *Sam.* xii. 4.) Sheep were killed on the festive occasion of shearing the very numerous flocks of Nabal. (1 *Sam.* xxv. 2. 11. 18.) An ox and six choice sheep were sacrificed daily for the numerous guests of Nehemiah, while he was building the wall of Jerusalem. (*Neh.* v. 17, 18.) Immense numbers of sheep and oxen were sacrificed at the dedication of Solomon’s temple. (1 *Kings*, viii. 5. 63.) The prophet Ezekiel (xxxiv. 3.) describes the bad shepherd as selfishly eating the flesh and clothing himself with the wool of the sheep, without tending them with due care and labor.

In the *Suovetaurilia* among the Romans a hog, a sheep, and a bull, their principal domestic animals, were sacrificed. A sheep was killed every day for the guards, who watched the tomb of Cyrus. (*Arrian*, vol. i. p. 438, *Blancardi*.) In the

* Harmer’s Observations, vol. i. p. 393. ed. Clarke.

† Harmer, p. 39.

Pallas (*Spicilegia Zoologica*, Fasc. xi. p. 79.) speaks of the beautiful lamb-skins from Bucharica, as being admired for their curled gray wool.

Odyssey (o. 180-182.) a sacrifice is made and a feast prepared of sheep, goats, hogs, and a cow. Also in Od. v. 3. 250. sheep are sacrificed and furnish part of a feast. In order to ratify a treaty between the Greeks and Trojans, the former sacrificed a lamb of the male sex to Jupiter; the latter one of the male sex and white to the Sun, and another of the female sex and black to the Earth. (Il. γ. 103, 104.) Sheep are sacrificed to Apollo at Delphi in Euripides, Ion, l. 230. 380. The rare instances of the use of sheep for food or sacrifice by the Egyptians have been already noticed.

But, although sheep, both old and young, male and female, were sacrificed to the objects of religious worship and on other festive occasions were eaten, especially by the rich and great, yet their chief use was to supply clothing, and the nourishment they yielded consisted in their milk and the cheese made from it, rather than in their flesh.

This fact is illustrated by the words of Solomon, formerly quoted, and in which he speaks of lambs for *clothing* and goat's *milk* for food. In like manner St. Paul says (1 Cor. ix. 7.), "Who planteth a vineyard, and eateth not of the fruit thereof? or who feedeth a flock, and eateth not of the milk of the flock?"

Varro thinks, that sheep were employed for the use of man *before any other animal* on account of their usefulness and placidity, and he represents their use to consist in supplying cheese and milk for food, fleeces and skins for clothing*. In like manner Columella in his account of the use of sheep (vii. 2.) says, they afforded the chief materials for clothing. In treating of their use for food, he mentions only their milk and cheese. Pliny refers to the employment of sheep both for sacrifices and for clothing. He also remarks, that as the ox is principally useful in obtaining food, to wit, by ploughing and other agricultural processes, the sheep, on the other hand, supplies materials for clothing†.

The fact, that wool was among the ancients by far the most common material for making clothes, accounts for the various

* De Re Rustica, l. ii. cap. i.

† See Appendix A.

expressions in scripture respecting the destructiveness of the moth.

“Your garments are moth-eaten.” James v. 2. “He, as a rotten thing, consumeth, as a garment that is moth-eaten.”—Job xiii. 28. “They all shall wax old as a garment, the moth shall eat them up.”—Is. l. 9. “The moth shall eat them up like a garment, and the worms shall eat them like wool.” Is. li. 8. “From garments cometh a moth.” Eccles. xlii. 13. “Treasures, where moth and rust corrupt.” Matt. vi. 19.

But it is to be observed, that the sacred writers mention not the moth, but the minute worm, which changes into a moth, and which alone gnaws the garments. In the passages which have been quoted, the word “moth” must be understood to signify the larva* of the clothes-moth (*Phalæna Vestianella*, Linn.), or of some insect of the same kind.

* When an insect first issues from the egg, it is called by naturalists *larva*.

CHAPTER IV.

GOATS-HAIR.

ANCIENT HISTORY OF THE GOAT—ILLUSTRATIONS OF THE SCRIPTURES, ETC.

Sheep-breeding and Goats in China—Probable origin of sheep and goats—Sheep and goats coeval with man, and always propagated together—Habits of Grecian goat-herds—He-goat employed to lead the flock—Cameo representing a goat-herd—Goats chiefly valued for their milk—Use of goats'-hair for coarse clothing—Shearing of goats in Phrygia, Cilicia, &c.—*Vestes caprina*, cloth of goats'-hair—Use of goats'-hair for military and naval purposes—Curtains to cover tents—Etymology of Sack and Shag—Symbolical uses of sack-cloth—The Arabs weave goats'-hair—Modern uses of goats'-hair and goats'-wool—Introduction of the Angora or Cashmere goat into France—Success of the project.

THE inquiry into the origin and propagation of the Goat, no less than that of the sheep, may justly be considered a subject for interesting investigation. Goats were no less highly prized by the ancient inhabitants of Greece and Italy than by the modern. We have seen, that the great value of sheep always consisted in its fleece. The goat, on the contrary, was more valued for the excellence and abundance of its milk, and for its suitability to higher and more rugged and unproductive land*.

We observe a clear allusion to this distinction between the principal uses of sheep and of goats in the twenty-seventh chapter of the book of Proverbs†. The management and use

* Virgil, *Georg.* iii. 305–321.

† “Be thou diligent to know the state of thy flocks, and look well to thy herds. The lambs are for thy clothing, and the goats are the price of thy field; and thou shalt have goats' milk enough for thy food, for the food of thy household, and for the maintenance of thy maidens.” *Prov.* xxvii. 23, 26, 27.

Bochart has quoted a great variety of ancient testimonies to the value of goats'-milk in his *Hierozoicon*, l. ii. cap. 51. pp. 629, 630. ed. Leusden.

of goats has from time immemorial formed a striking feature in the condition of man, and especially of those nations which belong to the Caucasian, or, as Dr. Prichard more properly denominates it, the *Iranian* or *Indo-Atlantic* variety of our race*. Their habits of sheep-breeding seem no less characteristic than the form of their countenances, a no less essential part of their manner of life than any other custom, by which they are distinguished: and, as all the circumstances, which throw any light upon the question, conspire to render it probable, that the above-mentioned variety of the human race first inhabited part of the high land of central Asia, so it is remarkable, that our domestic sheep and goats may with the greatest probability be referred to the same stock with certain wild animals, which now overspread those regions. The sheep, as has been already observed in chapter I., is regarded as specifically the same with

* See Prichard's *Researches into the Physical History of Mankind*, third edition, vol. i. pp. 247. 257-262. 303, 304. These nations are characterized by the *oval* form of the skull. Their distribution over the face of the earth may be seen in the Map, Plate VII.

The only remarkable exception to this limitation of ancient sheep-breeding, is the case of the Chinese. It would appear from the following evidence, that they had both sheep and goats in ancient times.

The Chinese character for a sacrifice is a compound of two characters, one placed above the other; the upper one, *Yang*, is the character for a *lamb*, the lower is the character for *fire*; so that a *lamb on the fire* denotes a *sacrifice*. See Morison's *Chinese Dictionary*, vol. iii. part i.

According to the mythology of the Chinese, which as well as their written characters is of high antiquity, one of the four rivers, which rise in Mount Kaen-lun and run towards the four quarters of the globe, is called the *Yang-Choui*, i. e. the *Lamb-River*. Thomas Stephens Davies, Esq. in Dr. Robert Thomson's *British Annual* for 1837, p. 271. 277.

Yang-Ching, i. e. *Sheep-city*, was an ancient name of Canton. Morison, p. 55. There is a character for the *Goat*, which means the *Yang of the mountains*, *Yang* being a general term like the Hebrew זֶמֶר , including both sheep and goats. *Ib.* p. 61, 62.

In the following passage of Rufus Festus Avienus, who flourished about A. D. 400, we have a distinct testimony, that the ancient Seres, the probable ancestors of the Chinese, employed themselves in the care of sheep at the same time that they were devoted to the production of silk.

Gregibus permixti oviumque boumque,

Vellera per silvas Seres nemoralia carpunt.

Descriptio Orbis Terræ, l. 935, 936

the Argali; and in the opinion of Pallas, which has been very generally adopted by zoologists, the goat is the same with the *Ægagrus*, a gregarious quadruped, which occupies the loftiest parts of the mountains extending from the Caucasus to the South of the Caspian Sea, and thence to the North of India*. Indeed the history of these animals is so interwoven with the history of man, that those naturalists have not reasoned quite correctly, who have thought it necessary to refer the first origin of either of them to any wild stock at all. They assume, that these quadrupeds first existed in an undomesticated state, that is, entirely apart from man and independent of him; that, as he advanced in civilization, as his wants multiplied, and he became more ingenious and active in inventing methods of supplying them, the thought struck him, that he might obtain from these wild beasts the materials of his food and clothing; and that he therefore caught and confined some of them and in the course of time rendered them by cultivation more and more suitable to his purposes.

We have no reason to assume, that man and the two lesser kinds of horned cattle were originally independent of one another. So far as geology supplies any evidence, it is in favor of the supposition, that these quadrupeds and man belong to the same epoch. No properly fossil bones either of the sheep or goat have yet been found, and we have no reason to believe, that these animals were produced until the creation of man. But, as we must suppose, that man was created perfect and full-grown, and with those means of subsistence around him, which his nature and constitution require, there is no reason why the sheep and the goat may not have been created in such a state as to be adapted immediately both for clothing and for food, or why it should be considered more probable that they were at first entirely wild. They may have been produced originally in the same abode, which was occupied by that variety of the human race, to whose habits and mode of life the use of them has always been so essential; and, if we assume,

* Pallas, *Spicilegia Zoologica*, Fasciculus xi. pp. 43, 44. See also Bell's *History of British Quadrupeds*, London, 1837, p. 433.

that this abode was somewhere in the elevated land of central Asia, in the region, for example, of Armenia, we adopt an hypothesis, which explains in the most simple and satisfactory manner the apparent fact of the propagation not only of men, but of these quadrupeds with them, from that centre over immense regions of the globe.

With regard to historical evidence, it is certainly very defective. No express testimony assures us of the facts included in the above-named hypothesis. One thing, however, is certain, and it appears very deserving of attention, viz. that the sheep and the goat have *always* been propagated together. We find great nations, which had no acquaintance with either of these quadrupeds, but depended for their subsistence upon either oxen or horses. We find others, on the contrary, to whose mode of life the larger quadrupeds were of much less importance than the smaller; but we find none, which were accustomed to breed sheep without goats, or goats without sheep.

The reader will find numerous illustrations of this fact on reviewing the evidence contained in the preceding chapters. General terms were employed in the ancient world to include both sheep and goats*. Where more specific terms are used, we still find "rams and goats," "ewes and she-goats" mentioned together. Sheep and goats were offered together in sacrifice, and the instances are too numerous to mention, in which the same flock, or the wealth of a single individual, included both these animals.

In consequence of this prevailing association of sheep and goats, they are often represented together in ancient bas-reliefs and other works of art. Of this we have a beautiful example in the Rev. Robert Walpole's collection of "Travels in various countries of the East." At the end of the volume is a plate taken from a votive tablet of Pentelic marble dedicated to Pan, and representing five goats, two sheep, and a lamb. As the goats are in one group, and the sheep and lamb in another, the artist probably designed to represent a flock of each. For,

* It should be observed, that the Hebrew word translated *sheep* in Ex. ix. 3. included Goats.

though sometimes mixed in the same flock, the two kinds of animals were generally kept apart; and to this circumstance our Savior alludes in his image of the shepherd dividing the sheep from the goats*.

A sheep and a goat are seen reposing together in a Roman bas-relief in the *Monumenta Matthæiana*, vol. iii. tab. 37. fig. 1.

Rossellini gives two paintings from Egyptian tombs, which exhibit both sheep and goats†; and he mentions an inscription on the tomb of Ranni, according to which that person had 120 goats, 300 rams, 1500 hogs, and 122 oxen.

In the account given in chapter II. of the Sicilian Daphnis, an epigram by Callimachus on Astacides, who was a goatherd in Crete, was partially quoted, probably remarkable for his beauty and his immature death. The translation of the passage will now be given.

Ἄστακίδην τὸν Κρηῖτα, τὸν αἰπόλον, ἤρπασε Νύμφη
 Ἐξ ὄρεος· καὶ νῦν ἱερὸς Ἀστακίδης
 Οἰκίῃ Δικταίρῃσιν ὑπὸ δρυσίν· οὐκέτι Δάφνιν
 Ποιμένες, Ἀστακίδην δ' αἰὲν ἀεισόμεθα.

A nymph has snatch'd Astacides away;
 Beneath Dictæan oaks our goatherd lies:
 Shepherds! no more your songs to Daphnis pay;
 For now with him the sacred Cretan vies.

Yates's Translation.

Theocritus (*Idyll.* vii. 12–20.) describes a goatherd of Cydon in Crete, named Lycidas; and from the account which he gives of his attire, we may judge of that commonly used in ancient Greece by the same description of persons. He wore on his shoulders the dun-colored hide of a shaggy goat, and an old shawl was fastened about his breast with a broad girdle. In his right hand he held a crook of wild olive.

The same author (*Idyll.* iii. 5.) mentions a fine strong

* “When the Son of man shall come in his glory, and all the holy angels with him, then shall he sit upon the throne of his glory: and before him shall be gathered all nations: and he shall separate them one from another, *as a shepherd divides his sheep from the goats*: and he shall set the sheep on his right hand, but the goats on the left.”—Matt. xxv. 31–33.

† Monumenti dell' Egitto, parte ii. Mon. Civili, tomo i. cap. iii. § 2. tavola xxviii. xxix.

he-goat, which was brought from Lybia to Sicily. The design of its transportation was, no doubt, to improve the breed. Probably Chromis, the Lybian (*Idyll.* i. 24.), who resided in Sicily, had migrated there to undertake the management of goats and to improve their quality.

Maximus Tyrius (*Diss.* xxvii.) seems to suppose, that a flock of goats could not even exist without the music of the syrinx. "If you take away," says he, "the goatherd and his syrinx, you dissolve the flock of goats; in like manner, if you take away reason from the society of men, thus depriving them of their leader and guide, you destroy the flock, which by nature is tame, but may be injured by a bad superintendence."

The he-goat was employed to lead the flock as the ram was among sheep. The following passages of scripture allude to this custom. "Remove out of the midst of Babylon, and go forth out of the land of the Chaldeans, and be as the he-goats before the flocks." *Jer.* i. 8. "Mine anger was kindled against the shepherds, and I punished the goats." *Zech.* x. 3. In Proverbs xxx. 31., according to the Septuagint version, we read of "the goat which leads the flock." Julius Pollux (*Lib.* i. *cap.* 12. *sect.* 19.) says, that "The he-goat leads the goats*."

On a cameo in the Florentine Museum there is a representation of an ancient goatherd†. The goatherd holds the syrinx in his left hand, and a young kid in his right. A goat stands beside him, and his dog appears partially concealed within a kennel formed in the rock, upon which the goatherd is seated. The herdsman is represented sitting under an aged ilex. At least this supposition accords with the language of Tibullus already quoted.

A modern authoress, who spent some of the summer months in the year 1819 among the mountains east of Rome, notices goats in the following terms as part of the stock of the farmers in that country.

"We frequently walked to one of these little farms, to meet the goats coming in at night from the mountain. As the

* See also Ælian, *Hist. Anim.* vi. 42. and Pausanias, ix. 13. 4.

† Mus. Florentinum. Gemmæ antiquæ a Gorio illustratæ. tab. xc. No. 7.

flock crowded down the broken road leading to the fold, followed by their grotesque-looking shepherd and his rough dogs, *the pet-kids crowding round their master and answering to his call*, we could not help thinking of the antique manners described by the poets, and represented in the pictures of Herculaneum and Pompeii.

“The goats are the most useful domestic animals. Here no other cheese or milk is tasted. Besides, the ricotta, a kind of curd, and junkets, are made of goats’-milk, and, with bread serve many of the country people for food*.”

From Athenæus† we learn the superior excellence of the goats of Scyros and Naxos.

Virgil (*l. c.*), after mentioning the use of goats for food, goes on to show their contributions to the *weaver*.

Cloth’d in their shaven beards and hoary hair,
Fence of the ocean spray and nightly air,
The miserable seaman breasts the main,
And camps uninjur’d press the marshy plain.

Sotheby’s Translation.

The last line of this passage of Virgil is quoted by Columella (*L. vii. 6.*) in speaking of the utility of the he-goat ;

For he himself is shorn “for the use of camps and to make coverings for wretched sailors.”

Virgil, moreover, has here followed Varro, who writes thus ;

As the sheep yields to man wool for clothing, so the goat furnishes hair for the use of sailors, and to make ropes for military engines, and vessels for artificers.
* * * * * The goats are shorn in a great part of Phrygia, because there they have long shaggy hair. Cilicia (i. e. hair-cloths), and other things of the same kind, are commonly imported from that country. The name *Cilicia* is

* Three Months passed in the Mountains east of Rome, by Maria Graham (*Lady Calcott*), p. 36. 55, 56.

The same writer says, that “black sheep are rather encouraged here for the wool,” and that “the clothing of the friars is of this undyed wool.” p. 55.

† Quoted in Chapter I. p. 236. Ælian bears testimony to the same fact, observing, that the cows of Epirus were said to yield the greatest quantity of milk, and the goats of Scyros. *Hist. Anim. l. iii. cap. 33.*

From Tournefort, Sonnini, and other modern travellers we learn, that both Scyros and Naxos are very rocky and mountainous, and that they still produce goats. See also Dapper, *Déscription des Isles de l’Archipel*, p. 256. 350.

said to be derived from the circumstance, that in Cilicia goats were first shorn for this purpose. *De Re Rustica*, L. ii. c. ii. p. 201. ed. Bip.

The language of Varro in this passage indicates, that the female goat was shorn as well as the male; and that the excellence of goats'-hair, which was used only for coarse articles, consisted in its length. Columella mentions the long bristly hair of the Cilician goats*.

Aristotle says, "In Lycia goats are shorn, as sheep are in other countries." *Hist. Anim.* viii. 28. This testimony of Aristotle agrees with that of his nephew and pupil, Callisthenes, who says (*ap. Ælian. de Nat. Anim.* xvi. 30.), "that in Lycia goats are shorn just as sheep are everywhere else; for that they have a very thick coat of excellent hair, hanging from them in locks or curls; and that this hair is twisted so as to make ropes, which are used in navigation instead of cables."

Pliny, in his account of goats†, says, "In Cilicia and about the Syrtes they are covered with hair, which admits of being shorn." From this it may be inferred, in conformity with the testimonies already cited from Varro and Virgil, that the longest and best goats'-hair was obtained in Cilicia, and on the coast of Africa opposite to Sicily and Malta, the modern Tripoli. It is remarkable, that Virgil, in order to designate the latter district, refers to the romantic river Cinyps, which flowed through it, observing the same practice, which we have seen to be so common with the poets in regard to the countries noted for the produce of the most excellent wool. In the interior and more hilly portion of this district of Africa both sheep and goats are still reared‡.

The geographer Avienus asserts that goats'-hair was obtained for the purpose of being *woven* in the country of the Cynetæ in Spain§. Isidore of Seville, in his enumeration of the different kinds of cloth (*Orig.* xix. 22.), uses the following expres-

* *Setosum*, quale est in Cilicia. *De Re Rustica*, l. i. Præf. p. 20. ed. Bip.

† L. viii. c. 76. See Appendix A.

‡ Proceedings of the Expedition to explore the Northern Coast of Africa from Tripoli Eastward, by Beechey, ch. iv. p. 73. In the same chapter, p. 52: 62-68, is an account of the Wad'el Khahan, the ancient Cinyps.

§ *Rufi Festi Avieni Ora Maritima*, l. 218-221.

sions: "Fibrini (vestis est) tramam de fibri lanâ habens: caprina." Thus the text now stands, evidently defective. The writer no doubt alluded to a kind of cloth called *caprina*, because goats'-hair was used in the manufacture of it. Beckmann (*History of Inventions, Eng. Trans., vol. iv. p. 224.*) proposes to read, "tramam de fibri lanâ habens, stamen de caprinâ," i. e. "having the woof of beaver-wool, the warp of goats'-wool." But the ancients were unacquainted with the fine wool of certain goats, and it is highly improbable, that they used goats'-hair in the case referred to, since the "Vestes Fibrinæ" were of great value, as will soon be shown, and not made in any part of coarse materials.

The cloth of goats'-hair would be suitable for sailors, both on account of their hardy mode of life, and because it was better adapted than any other kind to bear exposure to water.

Its use as clothing to express mourning and mortification will be noticed presently.

The employment of goats'-hair for military and naval purposes was far more extensive, and is proved by the following passage from the *Geoponica* (xviii. 9.) in addition to the former testimonies.

Προσόδους δίδωσιν οὐκ ὀλίγας, τὰς ἀπὸ γάλακτος καὶ τυροῦ καὶ (σάρκός)· πρὸς δὲ τούτοις τὰς ἀπὸ τῆς τριχός. ἡ δὲ θριξὶ ἀναγκαία πρὸς τε σχοίνους καὶ σάκκους, καὶ τὰ τούτοις παραπλήσια, καὶ εἰς ναυτικὰς ὑπηρεσίας, οὔτε κοπτόμενα ῥαδίως, οὔτε σηπόμενα φυσικῶς, ἐὰν μὴ λίαν κατολιγωρηθῇ.

The goat yields no small profit from its milk, cheese, and (flesh). It also yields a profit from its hair, which is necessary for making ropes, sacks, and similar articles, and for nautical purposes, since it is not easily cut, and does not rot from natural causes, unless it be much neglected.—*Yates's Translation.*

Cicero (*in Verrem, Act i.*) mentions *Cilicia* together with hides and sacks, and Asconius Pedianus in his Commentary on the passage (*p. 95. ed. Crenii.*) gives the following explanation: "Cilicia texta de pilis in castrorum usum atque nautarum." Servius on Virgil, *Georg. iii. 313.* says, that these Cilicia, or cloths of goats'-hair, were used to cover the towers in sieges, because they could not be set on fire.

The reader is referred to the *Poliorcetica* of Lipsius, L. iii. Dial. 3. p. 158. for evidence respecting the use of hair ropes for

military engines, and to L. v. Dial. ix. for passages from Thucydides, Arrian, Ammianus, Suidas, Vegetius, Curtius, and others, proving, that the besieged in cities hung Cilicia over their towers and walls to obviate the force of the various weapons hurled against them, and especially of the arrows, which carried fire.

From Exodus we learn*, that the Israelites in the wilderness among their contributions to the Tabernacle gave goats'-hair, and that it was spun by women. The spun goats'-hair was probably used in part to make cords for the tent; but part of it at least was *woven* into the large pieces, called in the Septuagint "curtains of goats'-hair." Such curtains, or *Saga*, of spun goats'-hair seem to have been commonly used for the covering of tents†.

Cloths of the same kind were used for rubbing horses‡. The term for goats'-hair cloth in Hebrew, Chaldee, and Syraic, is קַשׁ or קַשׁ, i. e. SHAC, or SAC, translated ΣΑΚΚΟΣ in the Septuagint, and SACCUS in the Vulgate version of the Scriptures. The Latin SAGUM, appears to have had the same origin. In English we have *Sack* and *Shag*, scarcely differing from the oriental and ancient terms either in sound or sense.

* "And thou shalt make curtains of goats'-hair to be a covering upon the tabernacle: eleven curtains shalt thou make. The length of one curtain shall be thirty cubits, and the breadth of one curtain four cubits: and the eleven curtains shall be all of one measure. And thou shalt couple five curtains by themselves, and six curtains by themselves, and shalt double the sixth curtain in the forefront of the tabernacle. And thou shalt make fifty loops on the edge of the one curtain that is outmost in the coupling, and fifty loops in the edge of the curtain which coupleth the second. And thou shalt make fifty taches of brass, and put the taches into the loops, and couple the tent together, that it may be one. And the remnant that remaineth of the curtains of the tent, the half curtain that remaineth, shall hang over the backside of the tabernacle. And a cubit on the one side, and a cubit on the other side of that which remaineth in the length of the curtains of the tent, it shall hang over the sides of the tabernacle on this side and on that side, to cover it."—Ex. xxvi. 7-13.

† "And he made curtains of goats'-hair for the tent over the tabernacle: eleven curtains he made them. The length of one curtain was thirty cubits, and four cubits was the breadth of one curtain: the eleven curtains were of one size."—Ex. xxxvi. 14, 15.

‡ *Vegetii Ars Veter. l. i. c. 42.*

Cilice, the modern French term for a hair-shirt, is immediately derived from *Cilicium*, the origin of which has been explained*.

This kind of cloth, which was black or dark brown, the goats of Syria and Palestine being chiefly of that color even to the present day, is alluded to in the sixth chapter of Revelations†, and in Is. l. 3. "I clothe the heavens with blackness and make sack-cloth their covering." It was worn to express mourning and mortification. In Jonah we have a very remarkable case, for on this occasion blankets of goats'-hair were put on the bodies both of men and beasts, and one was worn even by the king of Nineveh himself‡. When Herod Agrippa was seized at Cæsarea with the mortal distemper mentioned in Acts xii. (See chap. vi. p. 93.), the common people sat down on hair-cloth according to the custom of their country, beseeching God on his behalf.—*Josephus, Ant. Jud. l. xix. cap. 8. p. 872. Hudson.* So according to Josephus (*Ant. Jud. l. vii. cap. 7. p. 299.*), David fell down upon sack-cloth of the same description and lay on the ground praying for the restoration of his son.

Hence the use of the hair-shirt by devotees in more recent times. St. Basil, Bishop of Cæsarea in the fourth century, in answer to the question, Whether a monk ought to have besides his night-shirt (*post nocturnam tunicam*) a *Cilicium* or any other, says, "*Cilicii quidem usus habet proprium tempus. Non enim propter usus corporis, sed propter afflictionem carnis inventum est hujusmodi indumentum, et propter humilitatem animæ§.*" He then adds, that as the word of God forbids us to

* Menage, Dict. Etym. v. *Cilice*.

† "And I beheld when he had opened the sixth seal, and lo, there was a great earthquake; and the sun became as black as sack-cloth of hair, and the moon became as blood."—Rev. vi. 12.

‡ "So the people of Nineveh believed God, and proclaimed a fast, and put on sack-cloth, from the greatest of them even to the least of them. The word came unto the king of Nineveh, and he arose from his throne, and he laid his robe from him, and covered him with sack-cloth, and sat in ashes."—Jonah iii. 5, 6. In v. 5. we should translate "put on hair-cloths;" for the word is *plural* in the Hebrew.

§ From the ancient version of Rufinus, p. 175. ed. 1513.

have two shirts, we ought not to have a second except for the purpose here mentioned. From this it is clear, that the Cilicium was not commonly worn by the monks, but only at particular times for the sake of humiliation.

Dr. Sibthorp (*in Memoirs, edited by Walpole,*) informs us, that in the present day the shepherds of Attica “shear the goats at the same time with the sheep, about April or May,” and that the hair is made into sacks, bags, and *carpets*, of which a considerable quantity is exported. In modern as in ancient times, the inhabitants of Greece subsist in a great measure upon goats'-milk and the cheese made from it*.

The wives of the Arabian shepherds still *weave* goats'-hair for their tents. This hair-cloth is nearly black, and resembles that of which our modern coal-sacks are made†. The Arabs also hang bags of the same cloth, containing barley, about the heads of their horses to supply them with food‡.

The goat, as is the case with some other quadrupeds, if confined to a country, which is hot in summer and very cold in winter, is always protected in the latter season by an additional covering of fine wool beneath its long hair. A specimen of the Syrian goat in the Hunterian Museum at Glasgow shows both the hair and the wool. In Kerman and Cashmere this very fine wool is obtained by combing the goats in the spring, when it becomes loose; and, having been spun into yarn, it is used to make the beautiful *shawls* brought from those countries.

We will now conclude this chapter with the following interesting communication from Mr. E. Riley, being the substance of a paper lately read before the Society of Arts, London.

Mr. Riley “in 1825 and 1828 transported to that territory two flocks of the finest sheep procurable throughout Germany,

* Dodwell's Tour, vol. i. p. 144.

† Harmer's Observations, ch. ii. Obs. 36. Dr. Shaw's Travels, Part iii. ch. 3. § 6. E. F. K. Rosenmuller, Biblische Alterthumskunde, iv. 2. p. 89.

The use of goats'-hair for making cloth among the Moors is mentioned by Rauwolff, *Travels*, part ii. ch. 1, p. 123 of Ray's Translation. The herdsmen on the wide plains about Smyrna live in tents of “black goats'-hair.”—C. Fellows's *Discoveries in Lycia*, p. 8.

‡ D'Arvieux and Thevenot, ap. Harmer, ch. v. Obs. 9.

my father had also long contemplated introducing there the celebrated Cashmere goat, anticipating that the fulfilment of his views would, in proving advantageous to himself, become also of ultimate benefit to the colony ; in which expectation, he has been encouraged from the results that have attended the importation of the Saxon breed of sheep into their favored climates, the wools of New South Wales, and in proportion to their improvement, those also of Van Dieman's Land being now eagerly purchased by the most intelligent manufacturers in preference to those of equal prices imported from any part of Europe.

“ With this object in view, he subsequently, during an agricultural tour on the Continent, directed my attention to the Cashmere flocks of Mons. Ternaux, and in October 1828, I met this distinguished man at his seat at St. Onen (Mons. Ternaux is a great shawl manufacturer and a Peer of France,) where he preserved the elite of his herds ; the animals were a mixture of various sizes and colors, from a perfect white to brown, with scarcely any stamped features as if belonging to one race exclusively ; they were covered with long coarse hair, under which so small a quantity of soft short down was concealed, that the average produce of the whole collection did not exceed three ounces each ; therefore, under these unfavorable circumstances, my father deferred for a time his intention of sending any of them to Australia.

“ I was then advised by the Viscomte Perrault de Jotemps, to see the stock of M. Polonceau at Versailles, he having, by a happily selected cross, succeeded in increasing the quantity and value of the qualities of the Cashmere goat beyond the most sanguine anticipations, and in consequence of his enlightened taste for agricultural pursuits, was also honored with the directorship of the model farm at Grignon. He became among the first to purchase a chosen selection of the original importation of the Cashmere goat from M. Ternaux, and some time after seeing, at one of the estates of the Duchesse de Beri, an Angora buck with an extraordinary silkiness of hair, having more the character of long coarse but very soft down, he solicited permission to try the effects of a union with this fine animal and his own

pure Cashmeres. The improvement even in the first drop was so rapid that it induced him to persevere, and when I first saw his small herd they were in the third generation from the males produced solely by the first cross; the unwillingness however of M. Polonceau to part with any number of them at this period (the only alienation he has made from the favorite products of his solicitude being two males and two females to the *King of Wirtemberg*, for the sum of 3400 francs,) caused my father again to postpone his intentions until my return from the Australasian Colonies, judging that M. Polonceau would then probably be enabled to dispose of a sufficient number, and that the constancy and properties of the race would by that time be more decidedly determined.

“On my arrival in England at the close of 1831, he again recurred to his favorite project of introducing these animals into our colonies, for which purpose I went to France with the intention of purchasing a small flock of M. Polonceau, should I find all his expectations of the Cashmere Angora breed verified, which having perfectly ascertained, I at length succeeded in persuading M. Polonceau to cede to me ten females in kid, and three males, and I fortunately was able to convey the whole in health to London, with the intention of proceeding as speedily as possible with them to Port Jackson, looking sanguinely forward not only to their rapid increase but also to *crossing* the *common goats* of the country with this valuable breed, in full expectation that they may, exclusive of their own pure down, become thus the means of forming a desirable addition to the already much prized importations from New South Wales and Van Dieman's Land. I am led to the conclusion that the latter result may be accomplished, as M. Polonceau, who has tried the experiment with the native goat of France, has obtained animals of the second cross very little inferior to the breed that has rendered his name so distinguished. He has also crossed the common goat with the pure Cashmere, but only obtained so tardy an amelioration, that it required eight or ten generations to produce a down simply equal to their inferior quantity and quality when compared to the produce of the Cashmere Angora.”

Mr. Polonceau has unremittingly persevered in the improvement so immediately effected, and has proved during the several years which have elapsed since the first experiment in the year 1822, that an entire satisfactory result in the union of the most essential qualities of down, *abundance, length, fineness, lustre, and softness*, was accomplished by the first cross, without any return having ensued to the individual characters of either of the primitive races, and in consequence, he has since constantly propagated the produce of that cross among themselves, careful only of preserving animals entirely white and of employing for propagation those bucks which had the down in the greatest quantity and of the finest quality with the smallest proportion of hair.

In 1826 ; the "Societie Royale et Centrale d'Agriculture de Paris" acquainted with the interesting result of M. Polonceau's flock, being at that time in the third generation, and considering that the down of this new race was *more valuable than that of the East*, and that it was the most beautiful of filaceous materials known, as it combines the softness of Cashmere with the lustre of silk, awarded him their large gold medal at their session, 4th April, 1826, and nominated him a member of their society in the following year.

In 1827, at the exhibition of the produce of National Industry, the jury appointed to judge the merits of the objects exposed, also awarded him their medal.

At present the animals are in the twelfth generation, their health and vigor, the constancy of their qualities, and abundance of their down *without any degeneration*, prove that this new race may be regarded as one entirely fixed and established, requiring solely the care that is generally observed with valuable breeds ; that is to say, a judicious choice of those employed for their reproduction, and in such a climate as New South Wales it may be reasonably expected that the brilliant qualities of their down may yet be improved as has been so eminently the case with the wool of the merino and Saxon sheep imported there.

M. Polonceau has goats that have yielded as many as thirty ounces of the down, in one season, and he states that the whole

of his herd produce from twelve to twenty ounces ; thus showing the astonishing advantages this new breed has *over the uncrossed Cashmere*, which never yield more than four ounces and seldom exceed two ounces each.

This gentleman also states, that, the Cashmere Angora goats, are more robust and more easily nourished than the common goat, and that they are less capricious and more easily managed in a flock ; and from the experience he has already had, he finds them much more docile than even sheep. They prefer the leaves of trees, as do all other goats, but they thrive either on hay or straw, or green fodder, or in meadows ; they also feed with equal facility on heaths, and on the most abrupt declivities, where the sheep would perish ; they do not fear the cold, and are allowed to remain all the winter in open sheds. For the first year or two of M. P.'s experiments he thought it prudent to give them aromatic herbs, from time to time, but during the last six years he has not found it necessary. He knows not of any particular disease to which they are subject, his flock never having had any. M. P. arranges they should kid in March, but occasionally he takes *two* falls from those of sufficient strength during the year.

The down commences to grow in September, and developes itself progressively until the end of March, when it ceases to grow and detaches itself, unless artificially removed.

To collect the down, he waits the period when it begins to detach itself, and then the locks of down which separate from the skin with little force are taken off by hand ; the down is removed from the animals every three or four days ; in general it first begins to fall from the neck and shoulders, and in the following four or five days from the rest of the body ; the collection is completed in the space of eight or ten days. Sometimes the entire down can be taken from the animal at one shearing, and almost in an unbroken fleece, when it begins to loosen. The shearing has the advantage of preserving more perfectly the parallelisms of the individual filaments, which much increase the facility of combing and preparing the down for manufacturing purposes.

CHAPTER V.

BEAVERS-WOOL.

Isidorus Hispalensis—Claudian—Beckmann—Beavers'-wool—Dispersion of Beavers through Europe—Fossil bones of Beavers.

THE passage quoted from Isidore of Seville, in the last chapter, shows that the ancients made a cloth, the woof of which was of Beavers'-wool (*de fibri lanâ*), and which was therefore called *Vestis Fibrina*. By *lana* he must have meant the very fine wool, which, agreeably to the observation in the last paragraph, grows under the long hair of the beaver. Isidore in the same Book, observes, "Fibrinum lana est animalium, quæ fibros vocant: ipsos et castores existimant."

The following Epigram of Claudian seems intended, as Beckmann (iv. p. 223.) supposes, to describe "a worn-out beaver dress, which had nothing more left of that valuable fur but the name."

ON A BEAVER MANTLE.

The shadow of its ancient name remains :
But, if no nap of beaver it retains,
A Beaver Mantle it can scarce be nam'd.
The price, however, proves its claim : it cost
Six pounds. Hence, though all lustre it has lost,
Yet, bought so dear, as beaver let it still be fam'd.

Sidonius Apollinaris calls those who used this costly apparel *castorinati*. *Lib. v. Epist. 7. p. 313. Paris, 1599, 4to.*

Gerbert, or Gilbert, surnamed the Philosopher, and afterwards Pope Silvester II., commenting on the qualities of a good Bishop according to 1 Timothy iii. 1., says in reference to the word "ornatum :"

"Quod si juxta sensum literæ tantùm respiciamus, non aliud, sacerdotes, quam amictum quæremus clariorem; verbi gratiâ, castorinas quæremus et sericas vestes: et ille se inter episcopos credet esse altiorem, qui vestem induerit clariorem. Sed S. Apostolus taliter se intelligi non vult, quia non carne, &c."—*De Informatione Episcoporum, seu De Dignitate Sacerdotali, in ed. Benedict. Opp. S. Ambrosii, tom. ii. p. 358.*

“An upper garment of this cloth was worn by the Emperor Nicephorus II. at his coronation in the year 936.”—*Beckmann*, l. c. § 31.

“This method of manufacturing beavers’-hair,” observes Beckmann, “seems not to have been known in the time of Pliny; for, though he speaks much of the *castor*, and mentions *pellis fibrina* three times, he says nothing in regard to manufacturing the hair, or to beaver-fur.”

It seems probable, that the Greeks and Romans did not use cloth of beavers’-wool until the 4th century. In an earlier age the furs and drugs supplied by beavers were obtained from the countries to the North of the Euxine Sea. But in the period now under consideration the intercourse of the Romans with the West of Europe would open a much more extended sphere for procuring the *Vestes Fibrinæ*, since we have traces of the existence of beavers in almost all parts of Europe. Their appearance in Wales, Scotland, Germany, and the North of Europe generally, is attested by Giraldus Cambrensis*.

Dr. Patrick Neill, in a valuable paper on this subject,† has given an account of the bones of recent beavers found in Perthshire and Berwickshire. They have also been found in Cambridgeshire‡. We learn from the life of Wulstan§, that *beaver-furs*, as well as those of *sables*, *foxes*, and other quadrupeds, were used by the Anglo-Saxons in very early times for *lining* their garments. Other modern authors speak of their occurrence in Austria, Hungary, and the North of Italy||. They are still found in Sweden.¶ Strabo informs us, that in his time they frequented the rivers of Spain**.

Buffon says (*Hist. Nat. tome 26. p. 98.*), “There are beavers in Languedoc in the islands of the Rhone, and great num-

* Topographia Hiberniæ, c. 21, and Itinerarium Cambriæ, l. ii. c. 3.

† Edinburgh Philosophical Journal, vol. i. p. 177-187.

‡ Transactions of the Cambridge Philosophical Society, vol. i. part i. p. 175.

§ See Extracts in Henry’s History of Britain, vol. iv.

|| Muratori, Antichità Italiane, tomo ii. p. 110. Napoli, 1783. The authors, cited by Muratori, are Gervase of Tilbury, and Mathioli.

¶ Travels in Sweden, by Dr. Thomas Thomson, p. 411.

** Lib. iii. 163. vol. i. p. 737, ed. Siebenkees.

bers of them in the North of Europe." "But as human population extends," he observes, "beavers, like other animals, are dispersed, become solitary, fugitive, or conceal themselves in the ground: they cease to unite in bands, to engage in building or other undertakings."

"We have been unable to ascertain," says Cuvier*, "after the most scrupulous comparisons, if the *Castors* or Beavers, which burrow along the Rhone, the Danube, and the Weser, are different in species from those of North America, or if they are prevented from building by the vicinity of man." The same distinguished author in his work on Fossil Bones says, "The greater part of our European rivers having formerly supported beavers, and some of them doing so still, viz. the Gardon and the Rhone in France, the Danube in Bavaria and Austria, and several small rivers in Westphalia and Saxony, we cannot be surprised to find their bones preserved in our mosses, or turbaries." He then mentions instances of the heads and teeth of beavers, in the valley of the Somme in Picardy, in the valley of Tonnis-stein near Andermach, and at Urdingen on the Rhine in Rhenish Prussia†.

* *Règne Animal*, vol. iii. p. 65. of Griffith's Translation.

† Cuvier, *Ossemens Fossiles*, tome v. partie 1ère, p. 55.; partie 2nde, p. 518. See also *Annales du Museum d'Hist. Naturelle*, tome xiv. p. 47.

CHAPTER VI.

CAMELS-WOOL AND CAMELS-HAIR.

Camels'-wool and Camels'-hair—Ctesia's account—Testimony of modern travelers—Arab tent of Camels'-hair—Fine cloths still made of Camels'-wool—The use of hair of various animals in the manufacture of beautiful stuffs by the ancient Mexicans—Hair used by the Candian women in the manufacture of brodered stuffs—Brodered stuffs of the negresses of Senegal—Their great beauty.

WE are informed by Ctesias, in a fragment of the 10th Book of his Persic History, that there were camels in a part of Persia, whose hair, soft as Milesian fleeces, was used to make garments for the priests and the other potentates*.

John the Baptist wore a garment of camels'-hair; but this must be supposed to have been coarse. (*Matt.* iii. 4., *Mark* i. 6.)†. This passage of scripture is illustrated by Harmer in the following observation‡ :

“This hair, Sir J. Chardin tells us (in his MS. note on 1 *Sam.* xxv. 4.) is not shorn from the camels like wool from sheep, but they pull off this woolly hair, which the camels are disposed to cast off; as many other creatures, it is well known, change their coats yearly. This hair is made into cloth now. Chardin assures us the modern dervishes wear such garments.”

Campbell, the poet, mentions a tent of camels'-hair cloth, which he saw at an Arab encampment between Oran and Mascara in the kingdom of Algiers. It was 25 feet in diameter and very lofty. (*Letters from the South*, 1837, vol. ii. p.

* Apollonii Mirabilia xx. Ælian, Hist. An. xvii. 34. Ctesiaæ Fragmenta, a Bähr, p. 224.

† “And the same John had his raiment of camels'-hair, and a leathern girdle about his loins; and his meat was locusts and wild honey.”—*Matt.* iii. 4, also in *Mark* :

“And John was clothed with camels'-hair, and with a girdle of a skin about his loins; and he did eat locusts and wild honey.”—*Mark* i. 6.

‡ Ch. xi. Obs. 83. vol. iv. p. 416. ed. Clarke.

212.) He also mentions (*vol. i. p. 161.*) that the Kabyles or Berbers, who live in the vicinity of Algiers, and are descended from the original occupants of the country, dwell in “tents of camels’-hair.” We are informed that the Chinese make *carpets* of the same material*. *Coverlets* of goats’ or camels’-hair are used by the soldiers in Turkey to sleep under†. “The Circassians, when marching, or on a journey, always add to their other garments a cloak made from camel or goats’-hair, with a hood, which completely envelopes the whole person. It is impenetrable by rain; and it forms their bed at night, and protects them from the scorching sun by day‡.”

Fortunatus, in his life of St. Martin (l. iv.), describes a garment of such cloth; but it may be doubted whether he took his description from actual knowledge of the use of it, or only from the account in Matthew of the dress of John the Baptist already quoted.

Camels’-hair of annual growth would vary in fineness according to circumstances, and might be used either for the coarse raiment of prophets and dervises, or for the costly *shawls*, to which Ctesias alludes. Fine wool, adapted to the latter purpose, might also grow, as in the goat and beaver, beneath the long hair of the camel. It has been doubted whether cloth so fine and beautiful as Ctesias asserts, could possibly be obtained from camels. The following accounts by modern travellers illustrate and justify the statement of the suspected ancient.

Marco Polo, who travelled in the 13th century, in his account of the city of Kalaka, which was in the province of Tangut and subject to the Great Kahn, says§, “In this city they manufacture beautiful camelots, the finest known in the world, of the hair of camels and likewise of fine wool.” According to Pallas, (*Travels*, vol. ii. § 8.,) “From the hair of the camel the Tartar women in the plains of the Crimea manufacture a narrow

* China, its Costume, Arts, Manufactures, &c., by Bertin: translated from the French. London, 1812, vol. iv.

† *Travels in Circassia*, by Edmund Spencer, vol. i. p. 202.

‡ *Ibid.* vol. ii. p. 219.

§ Book i. ch. 52. p. 235. of Marsden’s Translation.

cloth, which is used in its natural color, and is extremely warm, soft, and light." According to Prosper Alpinus, (*Hist. Nat. Ægypti*, l. iv. c. 7. p. 225.) the Egyptians manufactured from the hair of their camels not only coarse cloth for their tents, but other kinds so fine as to be worn not only by princes but even by the senators of Venice.

Elphinstone, in his account of Cabul (*p.* 295.), mentions, that "Oormuck, a fine cloth made of camels'-wool," is among the articles imported into Cabul from the Bokhara country. This country lies North of the Oxus, and East of the Southern extremity of the Caspian Sea, and is probably the country, to which Ctesias more especially referred. A still more recent authority is that of Moorcroft, who informs us, that "Cloth is now made from the wool of the wild camels of Khoten in Chinese Tartary," and that "at Astrakhan a fine cloth is manufactured from the wool of the camel foal of the first year*."

* Journal of the Royal Geographical Society, vol. i. p. 241, 242.

It is customary in many parts of the East, as it was in Mexico in the time of Cortes (See Part Third, Chapter I.) to use the hair of various animals in embroidering garments. The Candian women even embroider with their own hair, as well as that of animals, with which they make splendid representations of flowers, foliage, &c.: they also insert the skins of eels and serpents.

According to M. de Busson, the negresses of Senegal, embroider the skins of various beasts, representing figures, flowers, and animals, in every variety of color.



PART THIRD.

ANCIENT HISTORY OF THE COTTON MANUFACTURE.

CHAPTER I.

GREAT ANTIQUITY OF THE COTTON MANUFACTURE IN INDIA—UNRIVALLED SKILL OF THE INDIAN WEAVER.

Superiority of Cotton for clothing, compared with linen, both in hot and cold climates—Cotton characteristic of India—Account of Cotton by Herodotus, Ctesias, Theophrastus, Aristobulus, Nearchus, Pomponius Mela—Use of Cotton in India—Cotton known before silk and called *Carpasus*, *Carpasum*, *Carbasum*, &c.—Cotton awnings used by the Romans—*Carbasus* applied to linen—Last request of Tibullus—Muslin fillet of the vestal virgin—Linen sails, &c. called *Carbasa*—Valerius Flaccus introduces muslin among the elegancies in the dress of a Phrygian from the river Rhyndacus—Prudentius's satire on pride—Apuleius's testimony—Testimony of Sidonius Apollinaris, and Avienus—Pliny and Julius Pollux—Their testimony considered—Testimony of Tertullian and Philostratus—Of Martianus Capella—Cotton paper mentioned by Theophylus Presbyter—Use of Cotton by the Arabians—Cotton not common anciently in Europe—Marco Polo and Sir John Mandeville's testimony of the Cotton of India—Forbes's description of the herbaceous Cotton of Guzerat—Testimony of Malte Brun—Beautiful Cotton textures of the ancient Mexicans—Testimony of the Abbe Clavigero—Fishing nets made from Cotton by the inhabitants of the West India Islands, and on the continent of South America—Columbus's testimony—Cotton used for bedding by the Brazilians.

AMONG all the materials which the skill of man converts into comfortable and elegant clothing, that which appears likely to be the most extensively useful, though it was the last to be generally diffused, is the beautiful produce of the cotton-plant.

The properties of cotton strongly recommend it for clothing, especially in comparison with linen, both in hot and cold countries. Linen has, indeed, in some respects the advantage; it forms a smooth, firm, and beautiful cloth, and is very agreeable wear in temperate climates; but it is less comfortable than cot-

ton, and less conducive to health, either in heat or in cold. Cotton, being a bad conductor of heat, as compared with linen, preserves the body at a more equable temperature. The functions of the skin, through the medium of perspiration, are the great means of maintaining the body at an equable temperature amidst the vicissitudes of the atmosphere. But linen, like all good conductors of heat, freely condenses the vapor of perspiration, and accumulates moisture upon the skin: the wetted linen becomes cold, chills the body, and checks perspiration, thus not only producing discomfort, but endangering health. Calico, on the other hand, like all bad conductors of heat, condenses little of the perspiration, but allows it to pass off in the form of vapor. Moreover, when the perspiration is so copious as to accumulate moisture, calico will absorb a greater quantity of that moisture than linen. It has therefore a double advantage,—it accumulates less moisture, and absorbs more.

From the above considerations, it is evident that in cold climates, or in the nocturnal cold of tropical climates, cotton clothing is much better calculated to preserve the warmth of the body than linen. In hot climates, also, it is more conducive to health and comfort, by admitting of freer perspiration*.

Wool, as we have seen, was principally used for weaving in Palestine and Syria, in Asia Minor, Greece, Italy and Spain; hemp in the Northern countries of Europe; flax in Egypt (The history of the two last, hemp and flax, is given in Part IV. to which the reader is referred.); silk in the central regions of Asia†. In like manner cotton has *always* been characteristic of India. We find this circumstance distinctly noticed by Herodotus‡. Among the valuable products, for which India was remarkable, he states, that “the wild trees in that country bear fleeces as their fruit, surpassing those of sheep in beauty and excellence; and the Indians use cloth made from these

* Bains's "History of the Cotton Manufacture," p. 12.

† See Map Plate VII. at the end of Part IV.

‡ L. iii. c. 106.

trees." In the same book (c. 47.) Herodotus says, that the thorax or cuirass sent by Amasis, king of Egypt, to Sparta, was "adorned with gold and with fleeces from trees." These substances were perhaps used in the weft to form the figures ($\zeta\tilde{\omega}\alpha$), which were woven into the thorax; but it appears equally probable that the gold only was thus employed, the cotton being used as an inside lining or stuffing: and in this case it is possible, that the down of the *Bombax Ceiba*, a tree allied to the Cotton-plant (*Gossypium*), may have been used, since, though not fitted for spinning or weaving, it has long been used in India for the stuffing of pillows and similar purposes, and would be included under the phrase employed by Herodotus, "wool" or "fleeces from trees." The thorax may have been made in Egypt; but the materials, used to enrich it, were probably imported: for we have no proof, that either gold or cotton of any kind was found in that country as a native product in the time of Amasis.

Ctesias, the contemporary of Herodotus, seems also to have known the fact of the use of a kind of wool, the produce of trees, for spinning and weaving among the Indians. It is evident that Ctesias referred exclusively to cotton cloths, as may be inferred from the testimony of Varro, as we find it in Servius (*Comm. in Virgilio Æn.* i. 649.). "Ctesias ait in Indiâ esse arbores, quæ lanam ferant."

The expedition of Alexander the Great into India contributed to make the Greeks better acquainted than before with cotton. Hence it is distinctly mentioned by Theophrastus, the disciple of Aristotle. He says, "The trees, from which the Indians make cloths, have a leaf like that of the Black Mulberry; but the whole plant resembles the dog-rose. They set them in the plains arranged in rows, so as to look like vines at a distance*." In a succeeding part of the same book (c. 7. p. 143, 144. *ed. Schneider*) he notices the growth of cotton, not only in India, but in *Arabia*, and in the island called *Tylos*, which he places in the Arabian Gulf, although it was probably

* *Hist. Pl.* iv. c. 4. p. 132. *ed. Schneider.*

in the Persian Gulf, near the Arabian coast*. According to his account in the latter passage, "The wool-bearing trees, which grew abundantly in this island, had a leaf like that of the vine, but smaller; they bore no fruit, but the capsule containing the wool, was, when closed, about the size of a quince, when ripe, it expanded so as to emit the wool, which was woven into cloths, either cheap, or of great value."

Sprengel in his German translation (*p.* 150. *vol.* ii.) supposes the *Broussonetia Papyrifera* to be meant in the former passage. But he gives no good reason for this supposition, and he admits, that the *Broussonetia Papyrifera* grows in China, not in India. The expression of Theophrastus, ὤσπερ ἐλέχθη, which he employs in the latter passage (*c.* 9. *p.* 144. *ed.* *Schneider*), clearly proves, that he is speaking of the same plant in both passages, and Sprengel himself (*p.* 164.) supposes the *Gossypium Arboreum* of Linnæus, the Cotton Tree, to be meant in the latter, though not in the former. The description of Theophrastus is remarkably exact, if we consider it as applying, not to the Cotton Tree (*Gossypium Arboreum*), but to the Cotton Plant (*G. Herbaceum*), from which the chief supply of cotton for spinning and weaving into cloth has always been obtained.

Aristobulus, one of Alexander's generals, made mention of the cotton-plant under the name of the Wool-bearing Tree, and stated that its capsule contained seeds, which were taken out, and that what remained was combed like wool†.

The testimony of Nearchus, who was the admiral of Alexander, is also preserved to the following effect; "that there were in India trees bearing, as it were, flocks or bunches of wool; that the natives made linen garments of it, wearing a shirt, which reached to the middle of the leg, a sheet folded about the shoulders, and a turban rolled round the head; and that the linen made by them from this substance was fine and whiter than any other." It is to be observed, that Nearchus, or

* See the Map,—Plate vii. at the end of Part iv. Bochart, *Geogr. Sacra*, p. 766. Cadomi, 1651. Heeren, *Ideen*, i. 2. p. 214–219.

† Strabo, *L.* xv. c. 1. vol. vi. p. 43. *ed.* Siebenkees.

rather the two later authors who quote him, viz. Arrian and Strabo, use the terms for linen in a general sense, as including all fine light cloths made of vegetable substances*.

We read in the account of India by Pomponius Mela (L. iii. c. 7.), that the woods produced wool, used by the natives for clothing. He distinctly mentions the use of flax likewise. It has been conjectured, that he may have taken his account from Nearchus, or some other Greek writer, and that he may have intended to speak only of the use of cotton. But in reply to this it is to be observed, that Pomponius Mela here mentions flax in opposition to cotton, and that his assertion, so understood, was probably true, since we have other evidence to show that flax grows in India as well as cotton. (See Part IV.) Nevertheless it seems necessary to understand other authors of the same period as meaning cotton by the term *λίνον*, or *linum*. Thus Dyonisius Periegetes (l. 1116), speaking of the employments of the Indians, says, *Οἱ δὲ ἱστοῦς ὑφάσσει λινεργίας*, which probably meant "some weave muslins." In the same manner we must interpret the assertion of Quintus Curtius, "Terra *lini* ferax, unde plerisque sunt vestes;" i. e., The land produces flax, from which the greater part obtain garments. Soon after this Curtius says in terms more strictly proper,

Corpora usque pedes *carbasa* velant, soleis pedes, capita linteis vinciunt.

They cover their bodies from head to foot with *carbasa*; they bind shoes about their feet, linen cloths about their heads.

Again, speaking of the dress of the King, he says,

Distincta sunt auro et purpurâ *carbasa*, quæ indutus est. L. viii. 9.

The *carbasa* which he wore, were spotted with purple and gold.

In like manner, Lucan, describing the Indian nations, says,

Who drink sweet juices from the tender cane,
With dyes of crocus stain their hair, and fix
With color'd gems the flowing *carbasa*s.

L. iii. v. 239.

Strabo says, (L. xv. c. 1. vol. vi. p. 153. ed. Sieb.)

That the Indians use white raiment, and fine white cloths and *carpasa*.

* Arriani Rer. Indic. p. 522. 539. ed. Blancardi. Strabo, L. xv. c. 1. vol. vi. p. 40. ed. Sieb.

Also the Periplus of the Erythrean Sea states, that the region about the Gulf of Barygaza in India was productive "of *Carpasus* and of the fine Indian cloths made of it*." These were what we now call *India muslins*. These muslins we are informed by Dr. Vincent, were imported into Egypt, and accordingly Pacatus† represents Antony's army as wearing cotton in that country.

The term *Carbasus*, is evidently used by the five last-cited authors to signify cotton; for they employ it in describing the common dress of the Indians. As the Greeks and Romans became acquainted with cotton much earlier than with silk, we find that *Carpas*, the proper Oriental name for cotton, was also in use among them at a comparatively early period; and we shall now endeavor to trace the progress of this term from India, Westward. With little variation it is found in the same sense in the Sanscrit, Arabic, and Persic languages‡.

This word occurs once in the Hebrew Scriptures, viz. Esther, i. 6., and there evidently as a foreign term. The hangings, used to decorate the court of the royal palace at Susa on occasion of the great feast given by Ahasuerus, are thus described in the common version of the Scriptures:—

"Where were white, green, and blue hangings, fastened with cords of fine linen and purple to silver rings and pillars of marble: the beds were of gold and silver upon a pavement of red and blue and white and black marble."

The word, corresponding to "*green*" in the original is *Carpas* (כרפס). It has been translated "green" by the authors of the common version on the authority of the Chaldee Paraphrase.

The earliest instance of the use of the oriental name in any classical author is the line from Statius Cæcilius, who died 169 B. C. as quoted by Nonius Marcellus (*l. xvi.*) from the *Pausimachus* of Statius:

* Arriani Opp. v. ii. p. 165. ed. Blancard.

† Paneg. Theodosii, c. 33.

‡ Celsii Hierobot. vol. ii. p. 159. Sir W. Jones, in *As. Researches*, vol. iv. p. 226. London Edition. Schlegel, *Indische Bibliothek*, ii. p. 393. E. F. K. Rosenmüller, *Biblische Alterthumskunde*, 4. 1. p. 173.

Carbasina, molochina, ampelina*.

As these words are all three Greek, and the play, in which the verse occurred, was also called by a Greek name, we cannot doubt, that Statius translated it according to his usual custom from one of the writers of the New Comedy. We may therefore infer with some confidence from this expression, that the Greeks made use of muslins or calicoes, or at least of cotton cloths of some kind, which were brought from India as early as 200 years B. C.

After some time the oriental custom of using cotton as a protection from the sun's rays was adopted also by the Romans. Cotton was not only a cheaper and commoner article than silk, but it was particularly adapted for this purpose on account of its lightness, as well as its beauty and fineness; and, besides the instance already cited from the book of Esther, we may observe also, that where the *Latin* authors mention the use of "Carbasa," it is sometimes for purposes of this kind. "Tabernacula carbaseis intenta velis," *i. e.* "Tents with coverings of cotton," were among the expensive novelties which contributed to the luxury of Verres, when Prætor in Sicily†. The same species of ornament was first displayed at Rome in the magnificent ædileship of P. Lentulus Spinther, at the Apollinarian games and in the year 63 B. C.

"At a later period awnings of linen were used to keep out the sun, but originally in the theatres only, which contrivance was first adopted by Q. Catulus, when he dedicated the capitol. After this Lentulus Spinther is said to have first introduced cotton awnings in the theatre at the Apollinarian games. By and by Cæsar the Dictator covered with awnings the whole Roman forum, and the sacred way, from his own house even to the ascent of the Capitoline hill, which is said to have appeared more wonderful than the gladiatorial exhibition itself. Afterwards, without exhibiting games, Marcellus the son of Octavia, sister of Augustus, when he was Ædile and his uncle consul the eleventh time‡, on the day before

* See C. C. Statii Fragmenta, a Leonhardo Spengel, Monachii 1829, p. 35.

Statius chiefly copied from Menander (*Gellius* ii. c. 16.); but we cannot find, that Menander wrote any play called *Pausimachus*.

† This was about the year 70 B. C. Cic. in Verrem, Act. ii. l. v. c. 12.

‡ The following are the dates of the display of awnings on the several occasions referred to:—

the Kalends of August, protected the forum from the rays of the sun, that the persons engaged in lawsuits might stand with less injury to their health. What a change from the manners which prevailed under Cato the Censor, who thought that the forum should even be strewn with caltrops! Of late sky-blue awnings, spotted with stars, have been extended by means of strong ropes, even in the amphitheatre of the Emperor Nero. Red awnings are used to cover the atria of houses, and they defend the moss from the sun. As for the rest, white linen has always remained in favor. This plant was honored in the Trojan war. *For why should it not perform its part in battles as well as in shipwrecks?* Homer testifies, that a few of his warriors fought in linen cuirasses. The tackle of his ships was also of flax, according to some of his more learned interpreters, who argue that by the term *sparta* he meant *sata*, or things that are sown."—*Pliny*, Lib. xix. chap. vi.

Lucretius apparently refers to the introduction by Lentulus Spinther of the cotton awnings above mentioned (vi. 108.), when he is theorising on the cause of thunder, and compares the clouds spread over the sky to the awnings of calico, which veiled the theatres and sheltered the spectators from the sun :

Carbasus ut quondam magnis intenta theatris
 Dat crepitum, malos inter jactata trabeisque.
 As flaps the cotton, spread above our heads
 In the vast theatres from mast to beam.

We now find frequent mention of cotton by the poets of the Augustan age and by many subsequent writers. As in the case of silk, these authors introduce cotton, not only historically, but for the purpose of embellishment; and, considering *Carbasus* as a poetical term, they often by a *catachresis* employ it where they mean to speak of linen. Also as was before observed in regard to silk (Part I. chapter II.), it may likewise be noticed here, that the wars against Mithridates and the Parthians may have contributed to make the Romans familiar with the use of cotton, although their chief supply of it was more probably through Egypt, than through Persia and Babylonia.

<i>Linen</i> awnings first used in the theatre at the dedication of the temple of Jupiter by Catulus	- - - - -	69 B. C.
<i>Cotton</i> awnings first used in the theatre by Lentulus Spinther, July 6th,		63 B. C.
Linen used to cover the forum and Via Sacra at the gladiatorial show by Julius Cæsar	- - - - -	46 B. C.
Linen awnings extended over the forum by Marcellus, July 31st	-	23 B. C.

Catullus (64.), speaking of the black sail which Ægeus furnished for the ships of his son Theseus, calls it "*Carbasus Ibera*," "an Iberian sail." As, on the one hand, he here uses the proper term for cotton, without intending to describe the sail as cotton, so on the other hand he calls the sail Iberian merely because Iberia was a country adjoining Colchis, and from Colchis (as will be shown in Part IV.) the Greeks and Romans obtained a great supply of flax and sail-cloth.

Tibullus, or Lygdamus, entreats (iii. 2. 17.), in the contemplation of his death and funeral, that after his bones have been washed, first with wine, and then with milk, they may be dried "*carbais velis*," with linen napkins. Although he uses the proper term for cotton, he probably did not intend to denote any preference for cotton rather than linen. His bones, after being wiped, were to be deposited in a marble urn.

Propertius seems to have aimed at a display of knowledge on these subjects (see Part First, chapter II.); and in the following passage (iv. 3.) he probably used *Carbasa* in its proper sense, as he is referring to Eastern habits :

Raptave odorata carbasa lina duci.

Muslins taken among the spoils from a scented general.

In the last Elegy of the same Book he refers to the story of the young Vestal virgin, who, when the flame was extinguished upon the altar committed to her care, and when the scourge appeared to await her for her neglect, threw upon the ashes a fillet of muslin from her head, and saved her life by its ignition, which was supposed to be effected by the favor of the goddess :

Vel cui, commissos cum Vesta reposceret ignes,
Exhibuit vivos carbasus alba focos.

The fire had died, and Vesta urged her claim,
When the white cotton show'd a living flame.

The story is related by Valerius Maximus (i. 7.). Although we are not informed of the date of the event, it appears from his language that the fillet was of fine muslin: "*Cum carbassum, quam optimam habebat, foculo imposuisset, subito ignis emicuit.*" This description is well suited to the nature of cotton, than which nothing was more easily ignited.

The passage in Virgil's *Georgics*, which mentions cotton, has

been already quoted (See Part I. chapter II. p. 24.). By the Æthiopians, whose groves were "white with soft wool," he probably intended those of Arabia; and we may suppose him to have referred to accounts, not so much of the *Gossypium Herbaceum*, to which the word "groves" (*nemora*) would not apply, as to groves of *Gossypium Arboreum* and *Bombyx Ceiba*. In the following passages of Æneid he mentions cotton under its proper name, though probably not intending to distinguish accurately between cotton and linen, and only using the term for the sake of ornament:—

Jamque dies, alterque dies processit, et auræ
Vela vocunt, tumidoque inflatur carbasus austro. iii. 356.

Two days were past, and now the southern gales
Call us aboard, and stretch the swelling sails.

Pitt's Translation.

Vocat jam carbasus auras;
Puppibus et læti nautæ imposuere coronas. iv. 417.

The flapping sail invites the gales; the poops
By the glad seamen are already crown'd.

Eum (*fluvium Tiberim*) tenuis glauco velabat amictu
Carbasus, et crines umbrosa tegebat arundo. viii. 33.

Thin muslin veils him with its sea-green folds;
His head a copious shade of reeds sustains.

Tum croceam chlamydem, sinusque crepantes
Carbaseos fulvo in nodum collegerat auro. xi. 775.

His saffron chlamys, and each rustling fold
Of muslin was confined with glittering gold.

This last passage is part of the description of the attire of Chloereus, the Phrygian, whose muslin chlamys may have rustled in consequence of being interwoven with gold.

OVID.

Totaque malo

Carbasa deducit, venientesque excipit auras.—*Met.* xi. 477.

The active seamen now unfurl the sails,
And spread them wide to catch the coming gales.

Carbasa mota sonant, jubet uti navita ventis. xiii. 420.

The flapping sails resound; the captain bids advance.

Cum dabit aura viam, præbebis carbasa ventis.—*Epist.* vii. 171.

When the gale favors, give the wind your sails.

Sed non, quo dederas a litore carbasa, vento
Utendum, medio cum potiare freto.—*Art. Am.* ii. 357.

The wind to which you give your sails on shore,
In the mid ocean will assist no more.

Dumque parant torto subducere carbasa lino.—*Fast.* iii. 587.

They now with twisted ropes let down the sails.

In all these passages Ovid uses *carbasa* in the improper sense : it was an easy transition from the idea of a cotton awning, with which the Romans had become familiar, to apply the term to the sail of a ship. To these examples we may add the following :

Et sequitur curvus fugienta carbasa delphin.
Seneca, Œd. ii. *prope fin.*

The dolphin curved pursues the flying sails.

Strictaque pendentes deducunt carbasa nautæ.—*Lucan,* ii. 697.

The mariners confine the sails with cords,
And, clinging to the mast, they take them down.

Recto deprendit carbasa malo. ix. 324.

The mast stands upright ; he takes down the sails.

Jamque adeo egressi steterant in littore primo,
Et promotæ, ratis pendentibus arbore nautis,
Aptabant sensim pulsanti carbasa vento.

Silius Italicus. Pun. iii. 128.

They leave the port and reach the shore : aloft
They hang upon the mast, and by degrees
They fit the sails to catch the beating wind.

Festinant trepidi substringere carbasa nautæ.

Martial, l. xii. *ep.* 29.

The trembling seamen haste to reef their sails.

Primæ, carbasa ventilantis, auræ.—*Stattius, Sylv.* iv. 3. 106.

Of the first gale, which breathes upon the sails.

Stattius also mentions “Carbasei sinus,” the folds of cotton in the chlamys of a Bacchanal (*Theb.* vii. 658.).

Æstivos penetrent oneraria carbasa fluctus.—*Rutilius,* i. 221.

Postquam tua carbasa vexit—*Oceanus.*—*Val. Flaccus,* i.

Necdum aliæ viderunt carbasa terræ.—*Ibid.*

Valerius Flaccus also introduces muslin among the elegances in the dress of a Phrygian from the river Rhyndacus.

Tenuai non illum candentis carbasa lini,
 Non auro depicta chlamys, non flava galeri
 Cæsaries, pictoque juvant subtemine braccæ. vi. 228.

No aid to him his chalmys white as snow,
 Muslin with gold enrich'd, his yellow curls
 Of artificial hair, and *figured* pantaloons.

(See Part 1, chap. iii. p. 59.)

Also Prudentius, the Christian poet (See Part 1, chap. iii. p. 59.), in an elaborate account of Pride, depicts her in a garment of the same kind :

Carbasa ex humeris summo collecta coibat
 Palla sinu, teretem nectens a pectore nodum.—*Psychom.* 186.

A muslin kerchief by a knot compress'd,
 Pass'd o'er her shoulders, and adorn'd her breast.

Tantâ tamque multiplici fertilitate abundat rerum omnium Cyprus, ut nullius externi indigens adminiculi, indigenis viribus, a fundamento ipso carinæ ad supremos usque carbosas ædificet onerarium navem, omnibusque armamentis instructam mari committat.—*Amm. Marcellinus*, xiv. 8.

Apuleius mentions *carbasina* in conjunction with *bombycina* and other kinds of cloth*. He may consequently be presumed to use the word in its proper sense, to wit, as denoting calico or muslin. In the same manner cotton is distinguished from silk by Sidonius Apollinaris†. Also we may presume that cotton and not linen sails are to be understood in the following line of Avienus :

Si tamen in Boream flectantur carbasa cymbæ.
Descr. Orbis, 799.

Here the writer not only professes to give geographical information, but he is describing the Indian seas and islands; and as in the present day, so also in ancient times, the sails used in the navigation of those seas were probably made of cotton.

Strabo uses the word *καρπασίνας* in describing the official dress of a certain class of priestesses among the Cimbri‡. Although it

* *Metamorphoseon* l. viii. p. 579, 580. ed. Oudendorpii. (Quoted in Part First, Chapter ii. p. 35.)

† L. ii. *Epist.* 2. (Quoted in Part First, Chapter iii. p. 61.)

‡ L. vii. cap. 2. § 3. p. 336. ed. Siebenkees.

is possible, that muslin may have been conveyed to them to be used on solemn occasions, it appears more probable that fine linen or cambric, which was manufactured at no great distance among the Atrebates, ought here to be understood.

Pliny mentions cotton in four different passages of his Natural History. Two of them are translated with some inaccuracies from the passages of Theophrastus. To his translation of one of these passages Pliny annexes the remark, derived perhaps from some other source, that the inhabitants of Tylos called their Cotton Trees *gossympins*, and that an island which was called the smaller Tylos, distant ten miles, was still more fertile in cotton than the larger island of the same name.

The third passage introduces cotton under its proper name, Carbasa. It would imply that cotton was first grown or manufactured at Tarraco in Spain, than which assertion nothing can be more inaccurate and groundless.

The fourth passage is also contrary to all previous evidence, inasmuch as it represents cotton to be the native growth of Egypt. It calls the Cotton Plant *gossypion*, and hence the name has been given to it by modern botanists. Supposing this last passage to be genuine, still we know not on what authority Pliny depended, or from what source he derived his information, nor can we tell to what extent he allowed himself to be inaccurate in transcribing or translating. Taken by itself, therefore, it appears to us that this passage is no better proof of the growth of cotton anciently in Egypt than the third passage is of its first discovery in Spain.

In Upper Egypt, towards Arabia, there grows a shrub, which some call *gossypium*, and others *xylon*, from which the stuffs are made which we call *xylina*. It is small, and bears a fruit resembling the filbert, within which is a downy wool, which is spun into thread. There is nothing to be preferred to these stuffs for whiteness or softness: beautiful garments are made from them for the priests of Egypt.*

This passage seems however deserving of more consideration, when taken in conjunction with the following from the Onomasticon of Julius Pollux, who wrote 100 years later than Pliny:—

* Plin. Hist. Nat. lib. xix. c. 1. (Delph. Ed. c. 2.)

There are also Byssina ; and Byssus, a kind of flax. But among the Indians, and now also among the Egyptians, a sort of wool is obtained from a tree. The cloth made from this wool may be compared to linen, except that it is thicker. The tree produces a fruit most nearly resembling a walnut, but three-cleft. After the outer covering, which is like a walnut, has divided and become dry, the substance resembling wool is extracted and is used in the manufacture of cloth for woof, the warp being linen.

The description here given of the Cotton Tree or Cotton Plant, whichever was meant, is remarkably correct ; indeed more correct than any account obtained since the time of the expedition of Alexander. The circumstance of the pericarp being three-cleft is agreeable to the fact, *and is not noticed by any earlier writer*. The comparison of it to a walnut in regard to size and form is also accurate. From this account, and from those of Theophrastus, Aristobulus, and Nearchus, we gather the following particulars, which are agreeable to the fact : that the cotton-plants are set in the plains, and in rows like vines ; that the plant is three or four feet high, and is branched, spreading, and flexible, like a dog-rose ; that the leaf is palmated like that of the vine ; that the capsule is three-valved, about the size of a walnut, and, when it bursts, emits the cotton, resembling flocks of wool, in which the seeds are imbedded.

On the other hand, we have had no previous evidence respecting the use of cotton in the manufacture of cloth *for the woof only*, and it is doubtful whether this piece of information is correct, *because we have no reason to suppose that cotton was used for weaving in any country in which flax was also spun and woven*.

Tertullian in the third Chapter of his treatise De Pallio, enumerates nearly all the raw materials which were spun for weaving. He mentions the class of vegetable substances (cotton and flax) in the following terms :

Et arbusta vestiunt, et lini herbida post virorem lavacro nivescunt.

Both thickets supply clothing ; and crops of flax, after being green, are rendered by washing white as snow.

Philostratus, who wrote in the third century, makes distinct mention of cotton in two passages*.

* Vita Appollonii, l. ii. cap. 20. Ibid. l. iii. cap. 15.

Martianus Capella (*l. ii. § 4. p. 99. ed. Goetz.*) makes distinct reference to a tunic and shawl white as milk, and made either of cotton or fine linen.

Theophilus Presbyter, who wrote probably about A. D. 800, describes the use of cotton-paper for making gold-leaf. He calls it "Greek parchment, made of tree-wool, *Pergamena*, or *Parcamena Græca, quæ fit ex lanâ ligni**.

From the travels of the two Arabians who visited China in the ninth century, we learn that at that time the ordinary dress of their countrymen was cotton: for they remark, that "the Chinese dressed, not in cotton, as the Arabians did, but in silk†." Probably the use of imported cotton might by this time have become not uncommon in Egypt, Syria, and other oriental countries; but we apprehend, that it was never generally employed in Europe either for clothing, or for any other purpose, until very lately.

It is unnecessary to further discuss the question as to whether cotton was or was not cultivated in Egypt in ancient times. This vexed question having been lately set at rest, by a discovery which reduces a great deal of the learning that has been expended upon it *to the character of old lumber*. The difficulty of ascertaining whether the mummy-cloths (of which the specimens are exceedingly numerous) were made of linen or cotton, has at length been overcome; and though no chemical test could be found out to settle the question, it has been decided by that important aid to scientific scrutiny, the microscope. (See Chapters I. and II. Part IV.)

The following observations of Dr. Robertson in his "Historical Disquisition concerning the knowledge which the Ancients had of India‡," appear very just and important.

If the use of the cotton manufactures of India had been common among the Romans, the various kinds of them would have been enumerated in the Law *De Publicanis et Vectigalibus*, in the same manner as the different kinds of spices and

* De Omni Scientiâ Picturæ Artis, c. 21. quoted in Lessing's *Schriften*, vol. iv. p. 63. ed. 1825, 12mo., and in Wehr's *vom Papier*, p. 132. (See Appendix B)

† See the *Travels* as published by Renaudot, and translated from his French into English.

‡ *Note xxv. p. 370. Second ed. 1794.*

precious stones. Such a specification would have been equally necessary for the direction both of the merchant and of the tax-gatherer.

In confirmation of these remarks it may be observed, that the passages collected in this chapter represent cotton cloth as an expensive and curious production rather than as an article of common use among the Greeks and Romans. Among the ancients linen must have been far cheaper than cotton, whereas the improvements in navigation, the discovery of the passage to India by the Cape of Good Hope, and still more the discovery of America, have now made cotton the cheaper article among us, and have thus brought it into general use.

India produces several varieties of cotton, both of the herbaceous and the tree kinds. Marco Polo mentions that "cotton is produced in Guzerat in large quantities from a tree that is about six yards in height, and bears during twenty years; but the cotton taken from trees of this age is not adapted for spinning, but only *quilting*. Such, on the contrary, as is taken from trees of twelve years old, is suitable for muslins and other manufactures of extraordinary fineness*." Sir John Mandeville, on the other hand, who travelled in the fourteenth century, fifty years later than Polo, mentions the annual herbaceous cotton as cultivated in India: he says—"In many places the seed of the cotton, (cothon,) which we call tree-wool, is sown every year, and there springs up from its copses of low shrubs, on which this wool growst." Forbes also, in his *Oriental Memoirs*, thus describes the herbaceous cotton of Guzerat:—"The cotton shrub, which grows to the height of three or four feet, and in verdure resembles the currant bush, requires a longer time than rice (which grows up and is reaped in three months) to bring its delicate produce to perfection. The shrubs are planted between the rows of rice, but do not impede its growth, or prevent its being reaped. Soon after the rice harvest is over, the cotton bushes put forth a beautiful yellow flower, with a crimson eye in each petal; this is succeeded by a green pod, filled with a white stringy pulp; the pod turns brown and hard as it ripens, and then separates into two or three divisions

* Book iii. chap. 29.

† Hakluyt's *Voyages*, vol. ii. p. 169.

containing the cotton. A luxuriant field, exhibiting at the same time the expanding blossom, the bursting capsule, and the snowy flakes of ripe cotton, is one of the most beautiful objects in the agriculture of Hindostan*.”

The following general statement concerning the cotton of India, is from the geographical work of Malte Brun:—“The cotton-tree grows on all the Indian mountains, but its produce is coarse in quality: the herbaceous cotton prospers chiefly in Bengal and on the Coromandel coast, and there the best cotton goods are manufactured. Next to these two provinces, Maduré, Marawar, Pescaria, and the coast of Malabar, produce the finest cotton†.” He elsewhere says—“Cotton is cultivated in every part of India: the finest grows in the light rocky soil of Guzerat, Bengal, Oude, and Agra. The cultivation of this plant is very lucrative, an acre producing about nine quintals of cotton in the year‡.”

On the discovery of this continent by Columbus, Cotton formed the principal article of clothing among the Mexicans.

We are informed by the Abbé Clavigero that “of cotton the Mexicans made *large webs*, and as delicate and fine as those of Holland, which were, with much reason, highly esteemed in Europe. They wove their cloths of *different figures* and *colors*, representing *different animals* and *flowers*. Of feathers interwoven with cotton, they made *mantles* and *bed-curtains*, *carpets*, *gowns*, and other things, not less soft than beautiful. With cotton also they *interwove the finest hair of the belly of rabbits and hares, after having spun it into thread*: of this they made most beautiful cloths, and in particular winter waistcoats for their lords§.” Among the presents sent by Cortes, the conqueror of Mexico, to Charles V., were “cotton mantles, some all white, others mixed with white and black, or red, green, yellow, and blue; waistcoats, handkerchiefs, counterpanes, tapestries, and carpets of cotton; and the

* Forbes's Oriental Memoirs, vol. ii. p. 405.

† Malte Brun, vol. iii. p. 30.

‡ Ibid. vol. iii. p. 303.

§ Clavigero's History of Mexico, book vii. sect. 57, 66.

colors of the cotton were extremely fine*." That the Mexicans should have understood the art of dyeing those beautiful colors referred to in the above extract, is not to be wondered at when we consider that they had both *indigo* and *cochineal* among their native productions.

Columbus also found the cotton plant growing wild, and in great abundance, in Hispaniola, and other West India islands, and on the continent of South America, where the inhabitants wore cotton dresses, and made their fishing nets of the same material†; and when Magellan went on his circumnavigation of the globe, in 1519, the Brazilians were accustomed to make their beds of this vegetable down‡.

* Clavigero's History of Mexico, book vii. sect. 58.

† Sommario dell' Indie Occidentali del S. Don Pietro Martire, in Ramusio's Collection, tom. ii. pp. 2, 4, 16, 50. (See Appendix D.)

‡ Vincentino's Viaggio atorno il Mondo, (with Ferd. Magellan,) in Ramusio, tom. i. p. 353.

CHAPTER II.

SPINNING AND WEAVING—MARVELLOUS SKILL DISPLAYED IN THESE ARTS.

Unrivalled excellence of India muslins—Testimony of the two Arabian travellers—Marco Polo, and Odoardo Barbosa's accounts of the beautiful Cotton textures of Bengal—Cæsar Frederick, Tavernier, and Forbes's testimony—Extraordinary fineness and transparency of Dacca muslins—Specimen brought by Sir Charles Wilkins; compared with English muslins—Sir Joseph Banks's experiments—Extraordinary fineness of Cotton yarn spun by machinery in England—Fineness of India Cotton yarn—Cotton textures of Soonergong—Testimony of R. Fitch—Hamilton's account—Decline of the manufactures of Dacca accounted for—Orme's testimony of the universal diffusion of the Cotton manufacture in India—Processes of the manufacture—Rude implements—Roller gin—Bowling. (Eli Whitney inventor of the Cotton gin—Tribute of respect paid to his memory—Immense value of Mr. Whitney's invention to growers and manufacturers of Cotton throughout the world.) Spinning wheel—Spinning without a wheel—Loom—Mode of weaving—Forbes's description—Habits and remuneration of Spinners, Weavers, &c.—Factories of the East India Company—Marvellous skill of the Indian workman accounted for—Mills's testimony—Principal Cotton fabrics of India, and where made—Indian commerce in Cotton goods—Alarm created in the woollen and silk manufacturing districts of Great Britain—Extracts from publications of the day—Testimony of Daniel De Foe (Author of *Robinson Crusoe*.)—Indian fabrics prohibited in England, and most other countries of Europe—Petition from Calcutta merchants—Present condition of the City of Dacca—Mode of spinning fine yarns—Tables showing the comparative prices of Dacca and British manufactured goods of the same quality.

THE antiquity of the cotton manufacture in India having been noticed in the last chapter, the present one will give some account of the remarkable excellence of the Indian fabrics,—the processes and machines by which they are wrought,—the condition of the population engaged in this department of industry,—the extensive commerce formerly carried on in these productions to every quarter of the globe, and the causes that have tended to destroy it.

The Indians have in all ages maintained an unapproached

and almost incredible perfection in their fabrics of cotton. Indeed some of their muslins might be thought the work of fairies or insects, rather than of men ; but these are produced in small quantities, and have seldom been exported. In the same province from which the ancient Greeks obtained the finest muslins then known, namely, the province of Bengal, these astonishing fabrics are manufactured to the present day*.

We learn from two Arabian travellers of the ninth century, that “in this country (India) they make garments of such extraordinary perfection, that nowhere else are the like to be seen. These garments are for the most part round, and wove to that degree of fineness that they may be drawn through a ring of moderate size†.” Marco Polo, in the thirteenth century, mentions the coast of Coromandel, and especially Masulipatam, as producing “the finest and most beautiful cottons that are to be found in any part of the world‡;” and this is still the case as to the flowered and glazed cottons, called chintzes, though the muslins of the Coromandel coast are inferior to those of Bengal.

Odoardo Barbosa, one of the Portuguese adventurers who visited India immediately after the discovery of the passage by the Cape of Good Hope, celebrates “the great quantities of cotton cloths admirably painted, also some white and some striped, held in the highest estimation,” which were made in Bengal§. Cæsar Frederick, a Venetian merchant, who travelled in India in 1563, and whose narrative is translated by Hakluyt, describes the extensive traffic carried on between St. Thomé (a port 150 miles from Negapatam) and Pegu, in “*bumbast* (cotton) cloth of every sort, painted, which is a rare thing, because this kind of cloths show as if they were gilded with divers colors, and the more they are washed, the livelier the colors will become ; and there is made such account of this kind of cloth, that a small bale of it will cost 1000 or 2000 ducats||.”

* Bains's “History of the Cotton Manufacture,” p. 55.

† Anciennes Relations des Indes et de la Chine, de deux Voyageurs Mahométans, qui y allerent dans le neuvième siècle, p. 21.

‡ Travels of Marco Polo, book iii. c. 21, 28.

§ Ramusio's “Raccolto delle Navigazioni et Viaggi,” tom. i. p. 315.

|| Hakluyt's Voyages, vol. ii. p. 366. Edition of 1809.

Tavernier, who, like Marco Polo, Barbosa, and Frederick, was a merchant as well as a traveller, and therefore accustomed to judge of the qualities of goods, and who travelled in the middle of the seventeenth century, says—"The white calicuts," (calicoes, or rather muslins, so called from the great commercial city of Calicut, whence the Portuguese and Dutch first brought them) "are woven in several places in Bengal and Mogulistan, and are carried to Raioxsary and Baroche* to be whitened, because of the large meadows and plenty of lemons that grow thereabouts, for they are never so white as they should be till they are dipped in *lemon-water*. Some calicuts are made so fine, *you can hardly feel them in your hand*, and the thread, when spun, is scarce discernible†." The same writer says, "There is made at Seconge (in the province of Malwa) a sort of calicut so fine that when a man puts it on, *his skin shall appear as plainly through it, as if he was quite naked*; but the merchants are not permitted to transport it, for the governor is obliged to send it all to the Great Mogul's seraglio and the principal lords of the court, to make the sultaneses and noblemen's wives shifts and garments for the hot weather; and the king and the lords take great pleasure to behold them in these shifts, and see them dance with nothing else upon them‡." Speaking of the turbans of the Mohammedan Indians, Tavernier says, "The rich have them of so fine cloth, that twenty-

* "At the town of Baroche, in Guzerat, Forbes describes the manufacture as being now in nearly the same state as when Arrian's Periplus was written (about A. D. 100.). He says—"The cotton trade at Baroche is very considerable, and the manufactures of this valuable plant, from the finest muslin to the coarsest sail-cloth, employ thousands of men, women, and children, in the metropolis and the adjacent villages. The cotton clearers and spinners generally reside in the suburbs, or poorahs, of Baroche, which are very extensive. The weavers' houses are mostly near the shade of tamarind and mango trees, under which, at sun-rise, they fix their looms, and weave a variety of cotton cloth, with very fine baftas and muslins (See Plate V.). Surat is more famous for its colored chintzes and piece goods. The Baroche muslins are inferior to those of Bengal and Madras, nor do the painted chintzes of Guzerat equal those of the Coromandel coast."—Forbes's Oriental Memoirs, vol. ii. p. 222.

† Tavernier's Travels, contained in Dr. Harris's Collection of Voyages and Travels, vol. i. p. 811.

‡ Ibid. vol. i. p. 829.

five or thirty ells of it put into a turban will not weigh four ounces*.”

An English writer, at the end of the seventeenth century, in a remonstrance against the admission of India muslins, for which, he says, the high price of thirty shillings a yard was paid, unintentionally compliments the delicacy of the fabric by stigmatizing it as “only the *shadow* of a commodity†.”

The late Rev. William Ward, a missionary at Serampore, informs us that “at Shantee-pooru and Dhaka, muslins are made which sell at a hundred rupees a piece. The ingenuity of the Hindoos in this branch of manufacture is wonderful. Persons with whom I have conversed on this subject say, that at two places in Bengal, Sonar-ga and Vilkrum-pooru, muslins are made by a few families so exceedingly fine, that four months are required to weave one piece, which sells at five hundred rupees. When this muslin is laid on the grass, and the dew has fallen upon it, *it is no longer discernible*‡.”

After such statements as the above, from sober and creditable witnesses, the Oriental hyperbole which designates the Dacca muslins as “*webs of woven wind*,” seems only moderately poetical.

Sir Charles Wilkins brought a specimen of Dacca muslin from India in the year 1786, which was presented to him by the principal of the East India Company’s factory at Dacca, as the finest then made there. Like all Indian muslins, it has a yellowish hue, caused by imperfect bleaching. Though the worse for many years’ exposure in a glass case, and the handling of visitors, it is of exquisite delicacy, softness, and transparency; yet the yarn of which it is woven, and of which Mr. Wilkins also brought a specimen, is not so fine as some which has been spun by machinery in England. The following minute, made by Sir Joseph Banks on a portion of this yarn, thirty or forty years since, appears at the India House in his own writing, together with a specimen of the muslin:—

* Tavernier’s Travels, Harris’s Collection, vol. i. p. 833.

† The Naked Truth, in an Essay upon Trade, p. 11.

‡ View of the History, Literature, and Mythology of the Hindoos, by William Ward; vol. iii. p. 127. 3d edition.

“The portion of skein which Mr. Wilkins gave to me weighed $34\frac{3}{10}$ grains: its length was 5 yards 7 inches, and it consisted of 196 threads. Consequently, its whole length was 1018 yards and 7 inches. This, with a small allowance for fractions, gives 29 yards to a grain, 203,000 to a pound avoirdupoise of 7000 grains; that is, 115 miles, 2 furlongs, and 60 yards.”

Cotton yarn has been spun in England, making *three hundred and fifty hanks* to the *lb. weight*, each hank measuring 840 yards, and the whole forming a thread of 167 miles in length*. This, however, must be regarded merely as showing how fine the cotton can possibly be spun by machinery, since no such yarn is or could be used in the making of muslins, or for any other purpose. The extreme of fineness to which yarns for muslins are ever spun in Great Britain is 250 hanks to the lb., which would form a thread measuring $119\frac{1}{3}$ miles; but it is very rarely indeed that finer yarn is used than 220 hanks to the lb., which is less fine than the specimen of Dacca muslin above mentioned. The Indian hand-spun yarn is softer than mule-yarn, and the muslins made of the former are much more durable than those made of the latter. In point of appearance, however, the book-muslin of Glasgow is very superior to the Indian muslin, not only because it is better bleached, but because it is more evenly woven, and from yarn of uniform thickness, whereas the threads in the Indian fabric vary considerably.

It is probable that the specimens brought by Wilkins, though the finest then made at the city of Dacca, is not equal to the most delicate muslins made in that neighborhood in former times, or even in the present. The place called by the Rev. Mr. Ward Sonar-ga, and, by Mr. Walter Hamilton, Sooner-gong, a decayed city near Dacca, has been said to be unrivalled in its muslins. Mr. Ward's testimony has been quoted above.

* Pliny, in speaking of linen yarn, gives us an account (L. xix. cap. 2.) of the cuirass of the Egyptian king Amasis, which is preserved in the temple of Minerva in Rhodes. “Each thread,” says he, “is shown to consist of 365 fibres, which fact Mucianus, being a third time Consul, lately asserted at Rome.”—Mucianus was Consul the third time A. D. 75.

Mr. Ralph Fitch, an English traveller, in 1583, spoke of the same place when he said—"Sinnergan is a town six leagues from Serrapore, where there is the best and finest cloth made of cotton that is in all India*." Mr. Hamilton says—"Soonergong is now dwindled down to an inconsiderable village. By Abul Fazel, in 1582, it is celebrated for the manufacture of a beautiful cloth, named *cassas* (cossaes,) and the fabrics it still produces justify to the present generation its ancient renown†". But it seems that there has been a great decline in the manufacture of the finest muslins, which is both stated and accounted for by Mr. Hamilton in the following passage on the district of Dacca Jelulpoor :—

"Plain muslins, are distinguished by different names, according to the fineness or closeness of the texture, as well as *flowered*, *striped*, or *chequered* muslins, are fabricated chiefly in this district, where a species of cotton named the banga grows, necessary, although not of a very superior quality, to form the stripes of the finest muslins, for which the city of Dacca has been so long celebrated. The northern parts of Benares furnish both plain and flowered muslins, which are not ill adapted for common use, though incapable of sustaining any competition with the beautiful and inimitable fabrics of Dacca.

"The export of the above staple articles has much decreased, and the art of manufacturing some of the finest species of muslins is in danger of being lost, the orders for them being so few that many of the families who possess by *hereditary* instruction the art of fabricating them have desisted, on account of the difficulty they afterwards experience in disposing of them. This decline may partly be accounted for from the utter stagnation of demand in the upper provinces since the downfall of the imperial government, prior to which these delicate and beautiful fabrics were in such estimation, not only at the court of Delhi, but among all classes of the high nobility in India, as to render it difficult to supply the demand. Among more re-

* Hakluyt's Voyages, vol. ii. p. 390 ; edit. 1809.

† A Geographical, Statistical, and Historical Description of Hindostan, by Walter Hamilton, Esq. vol. i. p. 187—(1820.)

cent causes also may be adduced the French revolution, the degree of perfection to which this peculiar manufacture has lately been brought in Great Britain, the great diminution in the Company's investment, and the advance in the price of cotton."

With respect to the peculiar species of cotton of which the Dacca muslins are made, the following statement was given to a committee of the House of Commons, in 1830-31, by Mr. John Crawford, for many years in the service of the East India Company, and author of the "History of the Indian Archipelago:"

"There is a fine variety of cotton in the neighborhood of Dacca, from which I have reason to believe the fine muslins of Dacca are produced, and probably to the accidental discovery of it is to be attributed the rise of this singular manufacture; it is cultivated by the natives alone, not at all known in the English market, nor, as far as I am aware, in that of Calcutta. Its growth extends about forty miles along the banks of the Megna, and about three miles inland. I consulted Mr. Colebrook respecting the Dacca cotton, and had an opportunity of perusing the manuscripts of the late Dr. Roxburgh, which contain an account of it; he calls it a variety of the common herbaceous annual cotton of India, and states that it is longer in the staple, and affords the material from which the Dacca muslins have been always made."

The cotton manufacture in India is not carried on in a few large towns, or in one or two districts; it is universal. The growth of cotton is nearly as general as the growth of food; everywhere the women spend a portion of their time in spinning; and almost every village contains its weavers, and supplies its own inhabitants with the scanty clothing they require*. Being a domestic manufacture, and carried on with the rudest and cheapest apparatus, it requires neither capital, mills, or an

* Orme, in his *Historical Fragments of the Mogul Empire*, says, "On the coast of Coromandel and in the province of Bengal, when at some distance from the high road or a principal town, it is difficult to find a village in which every man, woman, and child is not employed in making a piece of cloth. At present, much the greatest part of the whole provinces are employed in this single manufacture." (p. 409.) "The progress of the cotton manufacture includes no less than a description of the lives of half the inhabitants of Indostan." (p. 413.)

assemblage of various trades. The cotton is separated from the seeds by a small rude hand-mill, or gin, turned by women.

The mill consists of two rollers of teak wood, fluted longitudinally with five or six grooves, and revolving nearly in contact. The upper roller is turned by a handle, the lower being carried along with it by means of a perpetual screw at the axis. The cotton is put in at one side, and drawn through by the revolving rollers; but the seeds, being too large to pass through the opening, are torn off and fall down on the opposite side from the cotton*.

* To the efforts of Eli Whitney, America is indebted for the value of her great staple. While the invention of the cotton gin has been the chief source of the prosperity of the Southern planter, the Northern manufacturer comes in for a large share of the benefits derived from this most important offspring of American ingenuity.

Eli Whitney, who may with justice be considered one of the most ingenious and extraordinary men that ever lived, was born in Westborough, Worcester County, Massachusetts, December 8th, 1765. His parents belonged to that respectable class in society, who, by the labors of husbandry, manage, *by uniform industry*, to provide well for a rising family,—a class from whom have risen most of those who, in New England, have attained to high eminence and usefulness.

Although Mr. Whitney's machines have benefited the people of this country, and the world at large, millions upon millions, yet, it is to be lamented that he did not reap that reward which his ingenuity and industry, as well as virtuous course of conduct so richly merited, but died much involved in debt, while thousands who had conspired to defraud him of his just and lawful rights, were enriched by the use of his machines.

“If we should assert,” said Judge William Johnson, “that the benefits of this invention (the Cotton gin) exceed \$100,000,000, we can prove the assertion by correct calculation.”

Who is there that, like him, has given his country and the world a machine—the product of his own skill—which has furnished a large part of its population, from childhood to age, with a lucrative employment; by which their debts have been paid off; their capitals increased; their lands trebled in value?

Mr. Whitney died on the 8th of January 1825, and is buried in the cemetery of New Haven, Connecticut. His tomb is after the model of Scipio's at Rome. It is simple and beautiful, and promises to endure for years. It bears the following inscription.

ELI WHITNEY.

THE INVENTOR OF THE COTTON GIN.

OF USEFUL SCIENCE AND ARTS, THE EFFICIENT PATRON AND IMPROVER.

IN THE SOCIAL RELATIONS OF LIFE, A MODEL OF EXCELLENCE.

WHILE PRIVATE AFFECTION WEEPS AT HIS TOMB, HIS COUNTRY HONORS HIS MEMORY.

BORN DECEMBER 8TH, 1765.—DIED JAN. 8TH, 1825.

The next operation is that of bowing the cotton, to clear it from dirt and knots. A large bow, made elastic by a complication of strings, is used; this being put in contact with a heap of cotton, the workman strikes the string with a heavy wooden mallet, and its vibrations open the knots of the cotton, shake from it the dust and dirt, and raise it to a downy fleece. The hand-mill and bow have been used immemorially throughout all the countries of Asia, and have their appropriate names in the Arabic and other languages: they were formerly used in America, whence the term, still applied in commerce, "*bowed Georgia cotton.*" The hatters of Great Britain still raise their wool by the bow. The cotton being thus prepared, without any carding, it is spun by the women; the coarse yarn is spun on a one-thread wheel, and very much resembling those used at the present day by the peasantry in the west of Ireland.

The finer yarn is spun with a metallic spindle, and sometimes without a distaff; a bit of clay is attached as a weight to one end of the spindle, which is turned round with the left hand, whilst the cotton is supplied with the right; the thread is wound upon a small piece of wood. The spinster keeps her

The convention of American Geologists and Naturalists who met at New Haven in May last (1845.), were invited, together with their ladies, by Mrs. Whitney, the *widow of the inventor of the Cotton gin*, to attend an evening party at her house, which was accepted, where they had an elegant supper and conversation.

"It is melancholy," says Mr. Bains in his *History of the Cotton Manufacture*, p. 114, "to contrast with the sanguine eagerness of inventors, the slowness of mankind to acknowledge and reward their merits,—to observe how, on many occasions, genius, instead of realizing fame and fortune, has been pursued by disaster and opposition,—how trifling difficulties have frustrated the success of splendid discoveries,—and how those discoveries, snatched from the grasp of their broken-hearted authors, have brought princely fortunes to men whose *only* talent was in making money. When inventors fail in their projects, no one pities them; when they succeed, persecution, envy, and jealousy are their reward. Their means are generally exhausted before their discoveries become productive. They plant a vineyard, and either starve, or are driven from their inheritance, before they can gather the fruit."

Would it not be greatly to the credit of the cotton manufacturing interest in this country and in Europe, to present Mrs. Whitney with some token of their respect and veneration for the memory of the inventor of the Cotton gin?

fingers dry by the use of a chalky powder. (See Part First, Chapter I, pp. 17 and 18.)

The yarn, having been reeled and warped in the simplest possible manner, is given to the weaver whose loom is as rude a piece of apparatus as can be imagined. It consists merely of two bamboo rollers, one for the warp and the other for the web, and a pair of headles. The shuttle performs the double office of shuttle and lay, and for this purpose is made like a large netting needle, and of a length rather more than the breadth of the web*. This apparatus the weaver carries to a tree, under which he digs a hole (which may be called the *treadle-hole*) large enough to contain his legs and the lower tackle. He then stretches his warp by fastening his bamboo rollers at a proper distance from each other by means of wooden pins. The headle-jacks he fastens to some convenient branch of the tree over his head (See Plate V.): two loops underneath, *in which he inserts his great toes*, serve instead of treadles; and his long shuttle, which also performs the office of lay, draws the weft through the warp, and afterwards strikes it home to the fell. "There is not so much as an expedient for rolling up the warp: it is stretched out to the full length of the web, which makes the house of the weaver insufficient to contain him. He is therefore obliged to work continually in the open air; and every return of inclement weather interrupts him†."

Forbes describes the weavers in Guzerat, near Baroche, as fixing their looms at sun-rise under the shade of tamarind and mango trees. In some parts of India, however, as on the banks of the Ganges, the weavers work under the cover of their sheds, fixing the geer of their looms to a bamboo in the roof (See Plate V.). They size their warps with a starch made

* The shuttle is not always of this length. Hoole, in his "Mission to India," represents it as requiring to be *thrown*, in which case it must be short; and a drawing of a Candyman weaver, in the Magazine of the Society for the Diffusion of Useful Knowledge, shows the shuttle of the same size as our modern shawl shuttle. Indeed we have abundant evidence that the Indians employed shuttles of this latter description from time immemorial. The Chinese also use shuttles of the same description. (See Chinese loom, Plate I.)

† Mill's History of British India, book ii. ch. 8.

from the root called *kandri*. When chequered muslins are wrought, three persons are employed at each loom.

Some authentic particulars concerning the habits and remuneration of the Hindoos engaged in the making of cotton cloth, are contained in an unpublished account of the districts of Puraniya (Purneah,) Patna, and Dinajpur, by Dr. Francis Hamilton, better known as Dr. F. Buchanan, (he having taken the name of Hamilton,) the author of the "Journey from Madras to Mysore, Canara, and Malabar." This account of the above-named provinces near the Ganges is in several manuscript volumes in the library of the India House, in London. We learn from his elaborate survey that the spinning and weaving of cotton prevails throughout these provinces. The fine yarns are spun with an iron spindle, and without distaff, generally by women of rank; no caste is disgraced here by spinning, as in the south of India; the women do not employ all their time at this work, but only so much as is allowed by their domestic occupations. The coarse yarns are spun on a small wheel turned by the hand. The hand-mill is used to free the cotton from its seeds, and the bow to tease it. The following capital is required for the weaver's business: a loom, $2\frac{1}{2}$ rupees; sticks for warping and a wheel for winding, 2 anas; a shop, 4 rupees; thread for two ready money pieces, worth 6 rupees each, 5 rupees;—total 11 rupees 10 anas; to which must be added a month's subsistence. The man and his wife warp, wind, and weave two pieces of this kind in a month, and he has 7 rupees (14 shillings stg.) profit, deducting, however, the tear and wear of his apparatus, which is a trifle. A person hired to weave can in a month make three pieces of this kind, and is allowed 2 anas in the rupee of their value, which is $2\frac{1}{4}$ rupees (4s. 6d.) a month. The finest goods cost 2 rupees a piece for weaving. Dr. Hamilton, in his observations on another district, states the average profit of a loom engaged in weaving coarse goods to be 28 rupees (£2. 16s.) a year, or something less than 13d. a week. At Puraniya and Dinajpur the journeymen cotton-weavers usually made from 2 to $2\frac{1}{2}$ rupees (from 4s. to 5s.) a month. At Patna a man and his wife made from 3 to 4 rupees (from 6s. to 8s.) a month by beating

and cleaning cotton ; and each loom employed in making chequered muslins, has a profit of 108½ rupees a year (£10. 16s.), that is, 1s. 4d. a week for each of the three persons who work the loom. The average earnings of a journeyman weaver, therefore, appear to be from 1s. to 1s. 4d. per week. At Bangalore, and in some other parts of southern India, this author states that weavers earn from 3d. to 8d. a day, according as they are employed on coarse or fine goods* ; but this is so much above the usual remuneration for labor in India, that, if the statement is not erroneous, it must be of extremely limited application. On the same authority, a woman spinning coarse yarn can earn 1½d. per day†.

A fact is mentioned by Dr. Hamilton, in his unpublished account of Patna, which affords a striking indication as to the national character of the Hindoos—"All Indian weavers, who work for the common market, make the woof of one end of the cloth coarser than that of the other, and attempt to sell to the unwary by the fine end, although every one almost, who deals with them, is perfectly aware of the circumstance, and although in the course of his life any weaver may not ever have an opportunity of gaining by this means, yet he continues the practice, with the hope of being able at some time or other to take advantage of the purchaser of his goods."

The East India Company has a factory at Dacca, and also in other parts of India,—not, as the American use of the word "factory" might seem to imply, a mill, for the manufacture is entirely domestic—but a commercial establishment in a manufacturing district, where the spinners, weavers, and other workmen are chiefly employed in providing the goods which the Company export to Europe. This establishment is under the management of a commercial resident, who agrees for the kinds of goods that may be required, and superintends the execution of the orders received from the presidencies. Such is the poverty of the workmen, and even of the manufacturers who employ them, that the resident has to advance beforehand

* Buchanan's Journey through Mysore, vol. i. pp. 216-218.

† Ibid. vol. iii. p. 317.

the funds necessary in order to produce the goods. The consequence of this system is, that the manufacturers and their men are in a state of dependence almost amounting to servitude. The resident obtains their labor at his own price, and, being supported by the civil and military power, he establishes a monopoly of the worst kind, and productive of the most prejudicial effects to industry. The Act of 1833, which put an end to the commercial character of the Company, will of course abolish all the absurd and oppressive monopolies it exercised.

It cannot but seem astonishing, that in a department of industry, where the raw material has been so grossly neglected, where the machinery is so rude, and where there is so little division of labor, the results should be fabrics of the most exquisite delicacy and beauty, *unrivalled by the products of any other nation, even those best skilled in the mechanic arts.* This anomaly is explained by the remarkably fine sense of touch possessed by that effeminate people, by their patience and gentleness, and by the hereditary continuance of a particular species of manufacture in families through many generations, which leads to the training of children from their very infancy in the processes of the art. Mr. Orme observes—"The women spin the thread destined for the cloth, and then deliver it to the men, who have fingers to model it as exquisitely as these have prepared it. The rigid, clumsy fingers of a European would scarcely be able to make a piece of canvass with the instruments which are all that an Indian employs in making a piece of cambric (muslin). It is further remarkable, that every distinct kind of cloth is the production of a particular district, in which the fabric has been transmitted perhaps for centuries from father to son,—*a custom which must have conduced to the perfection of the manufacture*.*" The last mentioned fact may be considered as a kind of division of labor.

Mr. Mill thus explains the unequalled manual skill of the Indian weaver:—"It is a sedentary occupation, and thus in harmony with his predominant inclination. It requires patience, of which he has an inexhaustible fund. It requires little

* Ormes's Historical Fragments of the Mogul Empire, p. 413.

bodily exertion, of which he is always exceedingly sparing ; and the finer the production, the more slender the force which he is called upon to apply. But this is not all. The weak and delicate frame of the Hindu is accompanied with an acuteness of external sense, particularly of touch, which is altogether unrivalled ; and the flexibility of his fingers is equally remarkable. The hand of the Hindu, therefore, constitutes an organ adapted to the finest operations of the loom, in a degree which is almost or altogether peculiar to himself*.”

It is, then, to a physical organization in the natives, admirably suited to the processes of spinning and weaving ; to the possession of the raw material in the greatest abundance ; to the possession also of the *most brilliant dyes* for *staining* and *printing* the cloth ; to a climate which renders the colors lively and durable ; and to the hereditary practice, by particular castes, classes, and families, both of the manual operations and chemical processes required in the manufacture ;—it is to these causes, with very little aid from science, and in an almost barbarous state of the mechanical arts, that India owes her long supremacy in the manufacture of cotton.

Bengal is celebrated for the production of the finest muslins ; the Coromandel coast, for the best chintzes and calicoes ; and Surat, for strong and inferior goods of every kind. The cottons of Bengal go under the names of *casses*, *amâns*, and *garats* ; and the handkerchiefs are called Burgoses and Steinkirkes. *Table cloths* of superior quality are made at *Patna*. The *basins*, or *basinets*, come from the Northern Circars. Condaver furnishes the beautiful handkerchiefs of Masulipatam, the fine colors of which are partly obtained from a plant called *chage*, which grows on the banks of the Krishna, and on the coast of the Bay of Bengal. The chintzes and ginghamms are chiefly made at Masulipatam, Madras, St. Thomé, and Paliamcotta. The long cloths and fine pullicats are produced in the presidency of Madras. The coarse piece-goods, under the name of baftas, doutis, and pullicats, as well as common muslins and chintzes, are extensively manufactured in the district of which

* Mill's History of British India, book ii. c. 8.

Surat is the port. Besides all these, there is an endless variety of fabrics, many of which are known in the markets of Europe, Asia, and Africa.

The commerce of the Indians in these fabrics has been extensive, from the Christian era to the end of the last century. For many hundred years, Persia, Arabia, Syria, Egypt, Abyssinia, and all the eastern parts of Africa, were supplied with a considerable portion of their cottons and muslins, and with all which they consumed of the finest qualities, from the marts of India. This commerce existed in the last age, and is described by the Abbé Raynal* and Legoux de Flaix. The blue calicoes of Guzerat were long bought by the English and Dutch for their trade with Guinea. The great marts of this commerce on the west coast of India were Surat and Calicut, the former of which is near to Baroche, the manufacturing capital of Guzerat, in which province a considerable part of the exported cottons of India were made; and on the east coast, Masulipatam, Madras, and St. Thomé, whence the varied and extensive products of the Coromandel coast are exported.

Owing to the beauty and cheapness of Indian muslins, chintzes, and calicoes, there was a period when the manufacturers of all the countries of Europe were apprehensive of being ruined by their competition. In the seventeenth century, the Dutch and English East India Companies imported these goods in large quantities; they became highly fashionable for ladies' and children's dresses, as well as for drapery and furniture, and the coarse calicoes were used to line garments. To such an extent did this proceed, that as early as 1678 a loud outcry was made in England against the admission of Indian goods, which, it was maintained, were ruining the woollen manufacture,—a branch of industry which for centuries was regarded with an almost superstitious veneration, as a kind of palladium of the national prosperity, and which was incomparably the most extensive branch of manufactures till the close of the eighteenth century. A few extracts from pamphlets

* *Histoire Philosophique et Politique des Etablissements du Commerce des Européens dans les deux Indes*, tom. ii. liv. iv. ch. 4.

published in the seventeenth and at the beginning of the eighteenth century, will not only afford amusement, but will show the wonderful commercial revolution which has since been effected by machinery. In the year 1678, a pamphlet was issued under the title—"The Ancient Trades Decayed and Repaired again," in which the author thus bewails the interference of cotton with woollen fabrics.

"This trade (the woollen) is very much hindered by our own people, who do wear many foreign commodities instead of our own; as may be instanced in many particulars; viz. instead of green *sey*, that was wont to be used for children's frocks, is now used painted and Indian-stained and striped calico; and instead of a perpetuana or shalloon to line men's coats with, is used sometimes a glazed calico, which in the whole is not above 12*d.* cheaper, and abundantly worse. And sometimes is used a *Bangale* that is brought from India, both for linings to coats, and for petticoats too; yet our English ware is better and cheaper than this, only it is thinner for the summer. To remedy this, it would be necessary to lay a very high impost upon all such commodities as these are, and that no calicoes or other sort of linen be suffered to be glazed."—pp. 16, 17.

The writer, with equal wisdom, recommends the prohibition of *stage coaches*, on account of their injuring the proprietors of the inns on the road, by conveying the passengers too quickly, and at too little expense to themselves. A pamphlet entitled "The Naked Truth, in an Essay upon Trade," published in 1696, informs us that—

"The commodities that we chiefly receive from the East Indies are calicoes, muslins, Indian wrought silks, pepper, salt-petre, indigo, &c. The advantage of the Company is chiefly in their muslins and Indian silks, (a great value in these commodities being comprehended in a small bulk,) and these becoming the general wear in England."—p. 4. "Fashion is truly termed a witch; the dearer and scarcer any commodity, the more the mode; 30*s.* a yard for muslins, and only the shadow of a commodity when procured."—p. 11.

So sagacious and far-sighted an author as Daniel de Foe (Author of *Robinson Crusoe*) did not escape the general notion,

that it was not merely injurious to the woollen and silk manufactures, but also a national evil, TO HAVE CLOTHING CHEAP FROM ABROAD RATHER THAN TO MANUFACTURE IT DEAR AT HOME. In his *Weekly Review*, which contains so many opinions on trade, credit, and currency far beyond the age, he thus laments the large importations of Indian goods.

“The general fancy of the people runs upon East India goods to that degree, that the *chintz* and *painted calicoes*, which before were only made use of for carpets, quilts, &c., and to clothe children and ordinary people, become now the dress of our ladies; and such is the power of a mode as we saw our persons of quality dressed in stuffs which but a few years before their chambermaids would have thought too ordinary for them: the chintz was advanced from lying upon their floors to their backs, from the foot-cloth to the petticoat; and even the queen herself at this time was pleased to appear in China silks and calico. Nor was this all, but it crept into our houses, closets, and bed-chambers; curtains, cushions, chairs, and at last beds themselves, were nothing but calicoes or Indian stuffs; and in short, almost everything that used to be made of wool or silk, relating either to the dress of the women or the furniture of our houses, was supplied by the Indian trade.”

“Above half of the (woollen) manufacture was entirely lost, half of the people scattered and ruined, and all this by the intercourse of the East India trade.”—*Weekly Review*, *January 31st*, 1708.

However exaggerated and absurd De Foe's estimate of the injury caused to the woollen manufacture, as manifested by the small value of the whole importations of Indian fabrics, at that time, as well as (much more decisively) by the experience of recent times, when the woollen manufacture has sustained the incomparably more formidable competition of the English cotton manufacture, it is evident from his testimony, and that of other writers, that Indian calicoes, muslins, and chintzes, had become common in England at the close of the seventeenth century. De Foe's complaint was not of an evil existing in 1708, when he wrote, but of one a few years earlier; for he says in another place, that the “PROHIBITION OF INDIAN GOODS” had “AVERT-

ED THE RUIN OF ENGLISH MANUFACTURES, AND REVIVED THEIR PROSPERITY." This prohibition took place by the Act 11 and 12 William III. cap. 10., (1700,) which forbid the introduction of Indian silks and printed calicoes for domestic use, either as apparel or furniture, under a penalty of £200 on the wearer or seller, and as this Act did not prevent the continued use of the goods, which were probably smuggled from the continent of Europe, other Acts for the same purpose were passed at a later date.

A volume published in the year 1728, entitled "A Plan of the English Commerce," shows that the evil of a consumption of Indian manufactures still prevailed, and that it was ascribed to a cause for which the writer saw no remedy, namely, the *will of the ladies*, or, in his own words, their "*passion for their fashion*." The other countries of Europe are represented as equally suffering from Indian competition and *female perverseness*, and as attempting in the same way to find a remedy in legislative prohibition. Holland was an honorable exception. The author says—

"The calicoes are sent from the Indies by land into Turkey, by land and inland seas into Muscovy and Tartary, and about by long-sea into Europe and America, till in general they are become a grievance, and almost all the European nations but the Dutch restrain and prohibit them."—p. 180.

"Two things," says the writer, "among us are too ungovernable, viz. our *passions* and our *fashions*."

"Should I ask the ladies whether they would dress by law, or clothe by act of parliament, they would ask me *whether they were to be statute fools*, and to be made pageants and pictures of?—whether the sex was to be set up for our jest, and the parliament had nothing to do but make Indian queens of them?—that they claim liberty as well as the men, and as they expect to do what they please, and say what they please, so they will wear what they please, and dress how they please.

"It is true that the liberty of the ladies, their *passion* for their *fashion*, has been frequently injurious to the manufactures of Great Britain, and is so still in some cases; but I do not see so easy a remedy for that, as for some other things of

the like nature. The ladies have suffered some little restraint that way, as in the wearing East India silks, instead of English; and calicoes and other things instead of worsted stuffs and the like; and we do not see they are pleased with it.”—p. 253.

It appears, then, that not more than a century ago, the cotton fabrics of India were so beautiful and cheap, that nearly all the governments of Europe thought it necessary to prohibit them, or to load them with heavy duties, IN ORDER TO PROTECT THEIR OWN MANUFACTURES. How surprising a revolution has since taken place! The Indians have not lost their former skill; but a power has arisen, which has robbed them of their ancient ascendancy. The following document furnishes superabundant proof how a manufacture which has existed without a rival for thousands of years, is withering under the competition of a power which is as it were but of yesterday: it would be well if it did not also illustrate the very different measure of protection and justice which governments usually afford to their subjects at home, and to those of their remote dependencies.

PETITION OF NATIVES OF BENGAL, RELATIVE TO DUTIES ON COTTON AND SILK.

“Calcutta, 1st. Sept. 1831.

“*To the Right Honorable the Lords of His Majesty's Privy Council for Trade, &c.*

“The humble Petition of the undersigned Manufacturers and Dealers in *Cotton* and *Silk Piece-goods*, the fabrics of Bengal;

“Sheweth—That of late years your Petitioners have found their business nearly superseded by the introduction of the fabrics of Great Britain into Bengal, the importation of which augments every year, to the great prejudice of the native manufactures.

“That the fabrics of Great Britain are consumed in Bengal, without any duties being levied thereon to protect the native fabrics.

“That the fabrics of Bengal are charged with the following duties when they are used in Great Britain—

“ On manufactured cottons, 10 per cent.

“ On manufactured silks, 24 per cent.

“Your Petitioners most humbly implore your Lordships’ consideration of these circumstances, and they feel confident that no disposition exists in England to shut the door against the industry of any part of the inhabitants of this great empire.

“They therefore pray to be admitted to the privilege of British subjects, and humbly entreat your Lordships to allow the cotton and silk fabrics of Bengal to be used in Great Britain free of duty, *or at the same rate which may be charged on British fabrics consumed in Bengal**.

“Your Lordships must be aware of the immense advantages the British manufacturers derive from their skill in constructing and using machinery, which enables them to undersell the unscientific manufacturers of Bengal in their own country: and, although your Petitioners are not sanguine in expecting to derive any great advantage from having their prayer granted, their minds would feel gratified by such a manifestation of your Lordships’ good will towards them; and such an instance of justice to the natives of India would not fail to endear the British government to them.

“They therefore confidently trust, that your Lordships’ righteous consideration will be extended to them as British subjects, without exception of *sect, country, or color*.

“And your Petitioners, as in duty bound, will ever pray.”

[Signed by 117 natives of high respectability.]

Dacca, notwithstanding its present insignificance as compared with its former grandeur, may nevertheless still be classed among second rate cities. It has a population of 150,000 inhabitants, which is nearly a third more than the city of Balti-

* This reasonable request was not complied with, the duty on India cotton being still 10 per cent. The extra duty of $3\frac{1}{2}d.$ per yard on printed cottons was taken off when the excise duty on English prints was repealed, in 1831. English cottons imported into India only pay a duty of $2\frac{1}{2}$ per cent.

more contains. Some new brick dwellings have silently sprung up here and there, it may also be observed, within the last few years; and this city can now boast an Oil Mill driven by steam, and an Iron Suspension Bridge. Three more steam engines are in the course of erection*. On the whole, an increase may be looked for, rather than the contrary, in the wealth, population, and importance of the city of Dacca.

It would be curious to compare the gradual decrease of the population, with the falling off of the manufacture of those beautiful cotton fabrics, for which this city was once without a rival in the world†. The first falling off in the Dacca trade, took place so far back as 1801, previous to which the yearly advances made by the East India Company, and private traders, for Dacca muslins, were estimated at upwards of twenty-five lacs of rupees‡. In 1807, the Company's investment had fallen to 595,900, and the private trade to about 560,200. In 1813, the private trade did not exceed 205,950, and that of the Company was scarcely more considerable. And in 1817, the English commercial residency was altogether discontinued. The French and Dutch factories had been abandoned many years before. The division of labor was carried to a great extent in the manufacture of fine muslins. In spinning the very fine thread, more especially, a great degree of skill was attained. It was spun with the fingers on a "*Takwa*," or fine steel spindle, by young women, who could only work during the early part of the morning, while the dew was on the ground; for such was the extreme tenuity of the fibre, that it would not bear manipulation after the sun had risen. One retti of cotton could thus be spun into a thread eighty cubits long; which was sold by the spinners at one rupee, eight annas, per sicca weight. The "*Raffugars*," or *Darners*, were also particularly skilful. They could *remove an entire thread from a piece of muslin*, and

* Asiatic Researches, vol. xvii.

† If Providence should continue to bless the work of our hands, and our life and health be preserved, we indulge the hope of being able, at no very distant period, to investigate this subject more fully.

‡ *Lac of rupees* is one hundred thousand rupees, which at 55 cents each amount to fifty-five thousand dollars, or at 2s. 6d. sterling, to £12,500.

replace it by one of a finer texture. The cotton used for the finest thread, was grown in the immediate neighborhood of Dacca, more especially about Sunergong. Its fibre is too short, however, to admit of its being worked up by any except that most wonderful of all machines—the human hand. The art of making the very fine muslin fabrics is now lost—and a pity it is that it should be so.

In 1820, a resident of Dacca, on a special order received from China, procured the manufacture of two pieces of muslin, each ten yards long by one wide, and weighing ten and a half sicca rupees.—The price of each piece was 100 sicca rupees. In 1822, the same individual received a second commission for two similar pieces, from the same quarter; but the parties who had supplied him on the former occasion had died in the mean time, and he was unable to execute the commission.

The annual investment, called the “Malbus Khás,” for the royal wardrobe at Delhi, absorbed a great part of the finest fabrics in former times: the extreme beauty of some of these muslins, was sufficiently indicated by the names they bore: such as, “*Abrowan*,” running water; “*Siebнем*,” evening dew, &c. The cotton manufacture has not yet arrived at anything like this perfection with us, and probably never will.*

* The manufacture of fine muslin, was attempted both in Lancashire and at Glasgow, about the year 1780, with weft spun by the jenny. The attempt failed, owing to the coarseness of the yarn. Even with Indian weft, muslins could not be made to compete with those of the East. But when the mule was brought into general use, in 1785, both weft and warp were produced sufficiently fine for muslins; and so quickly did the weaver avail himself of the improvement in the yarn, that no less than 500,000 pieces of muslin were manufactured in Great Britain in the year 1787. In a “Report of the Select Committee of the Court of Directors of the East India Company upon the subject of the Cotton Manufacture of this Country,” made in the year 1793, it is said, that “*every shop offers British muslins for sale equal in appearance, and of more elegant patterns than those of India, for one-fourth, or perhaps more than one-third, less in price.*” “Muslin began to be made nearly at the same time at Bolton, at Glasgow, and at Paisley, each place adopting the peculiar description of fabric which resembled most those goods it had been accustomed to manufacture; and, in consequence of this judicious distribution at first, each place has continued to maintain a superiority in the production of its own article. Jaconets, both coarse and fine, but of a stout fabric, checked and striped muslins, and other articles of the heavier description of this branch, are manufactured in Bolton, and its neigh-

Coarse cotton piece goods still continue to be manufactured at Dacca, though from the extreme cheapness of English cloths, it is not improbable that the native manufacture will be altogether superseded ere long.

In 1823-4, cotton piece goods, mostly coarse, passed the Dacca Custom House, to the value of 1,442,101. In 1829-30, the value of the same export was 969,952 only. There was a similar falling off in *silk* and *embroidered* goods during the same period.

In the export of the articles of cotton yarn again, there has been an increase. In 1813, the value was 4,480 rupees only; whereas in 1821-22, it amounted to 39,319 rupees. From that period it has, however, decreased; and in 1829-30, the value of the native cotton yarn exported from Dacca, amounted to 29,475 rupees only.

Annexed are two statements—one showing the comparative prices of muslins now manufactured at Dacca, and of the same description of cloth, the produce of British looms.—The other, the comparative prices of Dacca cloths, manufactured from yarn spun in the country, and from British cotton yarn. These cannot fail to be interesting at the present moment, and their general accuracy may be relied on.

COMPARATIVE STATEMENT OF THE PRICES OF MUSLINS MANUFACTURED AT DACCA, AND THE PRODUCE OF THE BRITISH LOOMS.

ASSORTMENTS.	Manufactured at Dacca.	Produce of the British Looms.
Jamdaní, with small spot, 1st sort	25	8
“ “ 2nd ditto	16	5
Jamdaní, Mabíposh,	27 to 28	6
“ Diagonal pattern,	12 to 13	4 to 4½
Jaconet Muslin, 40½, corresponding } . 1st ditto	38 to 40	20 to 22
with Jungle Cossas, } . 2nd ditto	24 to 25	9 to 10
Nyansook, 40 to 2¼,	8 to 9	5 to 6
Cambric, corresponding with Camiz Cossas, . . .	13 to 14	6 to 9½
Jamdaní blue or red sprigs,	15 to 16	4 to 5
Jamdaní Saris,	12 to 13	5 to 5½
Book Muslin, corresponding with Mulmulls, . . .	10 to 11	7 to 8
Sahun, 48 by 3,	28 to 30	14 to 15

borhood. Book, mull, and leno muslins, and jaconets of a lighter fabric than those made in Lancashire, are manufactured in Glasgow. Sewed and tambored muslins are almost exclusively made there and in Paisley.”—*Encyclopædia Britannica*.

COMPARATIVE STATEMENT OF THE PRICES OF DACCA CLOTHS, MANUFACTURED WITH COTTON YARN SPUN IN THE COUNTRY, AND FROM BRITISH COTTON YARN.

ASSORTMENTS.	DACCA MUSLINS.		
	Manufactured with Country Cotton Thread.	Manufactured with Europe Cotton Yarn.	
Mulmuls, 40 by 2,	1st sort . .	8 to 9	3 to 4
	2nd ditto . .	10 to 12	5 to 6
	3rd ditto . .	14 to 15	9 to 10
Sablams, 40 by 2,	1st ditto . .	4 to 4½	2½
	2nd ditto . .	5½ to 6	3
	3rd ditto . .	11 to 12	6
	4th ditto . .	14 to 15	8
	5th ditto . .	17 to 18	10 to 11
Sarbars, 40 cubits,	1st ditto . .	3	1½
	2nd ditto . .	3½ to 3¾	1¾
Allabalís Adí,	1st ditto . .	5 to 5½	3
	2nd ditto . .	7 to 7½	4
	3rd ditto . .	8 to 9	5 to 5½
	4th ditto . .	9 to 10	6 to 6½
Tarindans, 40 cubits,	1st ditto . .	4½ to 5	3
	2nd ditto . .	6½ to 7	4
	3rd ditto . .	11 to 12	7 to 8
	4th ditto . .	13 to 14	10 to 11
Sarí, per pair,	1st ditto . .	5	3
	2nd ditto . .	5 to 5½	3½ to 4
	3rd ditto . .	9 to 10	5½ to 6
Dhotis, per pair,	1st ditto . .	5	3
	2nd ditto . .	6 to 6½	3½
	3rd ditto . .	7 to 7½	5
	4th ditto . .	8 to 8½	6
	5th ditto . .	10 10½ to 11	8 to 8½
	6th ditto . .	9 to 11	7 to 7½
Sheraganj Cossas, 40 cubits, . . .	1st ditto . .	4	2¾
	2nd ditto . .	5	3¼
	3rd ditto . .	5½ to 6	4
	4th ditto . .	7 to 7½	5
	5th ditto . .	8 to 8½	6
Sheraganj Hamam, 40 by 3, . . .	1st ditto . .	5	3½
	2nd ditto . .	6 to 6½	4
	3rd ditto . .	7½ to 8	5
	4th ditto . .	9 to 9½	6 to 7
	5th ditto . .	11 to 12	8 to 9
	6th ditto . .	14 to 15	10 to 11
Jamdan Dhotis, 10 cubits, . . .	1st ditto . .	5½ to 6	4
	2nd ditto . .	6½ to 7	4½
	3rd ditto . .	7½ to 8	5

The manufacture of cotton, as we have seen, was general in India and had attained high excellence in the age of the first Greek historian, *that is, in the fifth century before Christ*, at

which time it had already existed for an unknown period ; yet eighteen centuries more elapsed before it was introduced into Italy or Constantinople, or even secured a footing in the neighboring empire of China. Though so well suited to hot climates, we have seen that cottons were known rather as a curiosity than as a common article of dress in Egypt and Persia, five centuries after the Greeks had heard of the "wool-bearing trees" of India : in Egypt, as has been shown, the manufacture never reached any considerable degree of excellence, and the muslins worn by the higher classes have always been imported from India*. In Spain the manufacture, after flourishing to some degree, became nearly extinct. In Italy, Germany, and Flanders, it had also a lingering and ignoble existence.

* In Arabia and the neighboring countries, cottons and muslins came gradually into use ; and the manufacture was spread, by the commercial activity and enterprise of the early followers of Mohammed, throughout the extended territories subdued by their arms. "It is recorded of the fanatical Omar, the immediate successor of the Arabian impostor, that he preached in a tattered cotton gown, torn in *twelve* places ; and of Ali, his contemporary, who assumed the caliphate after him, that on the day of his inauguration, he went to the mosque dressed in a thin cotton gown, tied round him with a girdle, a coarse turban on his head, his slippers in one hand, and his bow in the other, instead of a walking staff."—*Crichton's History of Arabia*, vol. i. pp. 397, 403.

PART FOURTH.

ANCIENT HISTORY OF THE LINEN MANUFACTURE.

CHAPTER I.

FLAX.

CULTIVATION AND MANUFACTURE OF FLAX BY THE ANCIENTS — ILLUSTRATIONS OF THE SCRIPTURES, ETC.

Earliest mention of Flax—Linen manufactures of the Egyptians—Linen worn by the priests of Isis—Flax grown extensively in Egypt—Flax gathering—Envelopes of Linen found on Egyptian mummies—Examination of mummy-cloth—Proved to be Linen—Flax still grown in Egypt—Explanation of terms—Bysus—Reply to J. R. Forster—Hebrew and Egyptian terms—Flax in North Africa, Colchis, Babylonia—Flax cultivated in Palestine—Terms for flax and tow—Cultivation of Flax in Palestine and Asia Minor—In Elis, Etruria, Cisalpine Gaul, Campania, Spain—Flax of Germany, of the Atrebatas, and of the Franks—Progressive use of linen among the Greeks and Romans.

THE earliest mention of flax by any author occurs in the account of the plague of hail, which devastated Lower Egypt, Ex. ix. 31. The Hebrew term for flax in this and various other passages of the old Testament is פשתה ; the corresponding word in the Chaldee, Syriac, and Arabic versions is כחנה *Λίνον*, LXX. *Linum*, *Jerome*.

In Isaiah xix. 9, according to King James's Translators and Bishop Lowth, mention is made of those "*that work in fine flax*," and which was one of the chief employments of the Egyptians. According to Herodotus (ii. 37, 81.) the Egyptians universally wore linen shirts, which were fringed at the bottom. The fringe consisted of the *thrums*, or ends of the webs. Thrums used for this purpose may be seen in the cloths which are found in Egyptian mummies.

Besides the linen shirt the priests wore an upper garment of linen, more especially when they officiated in the temples. This garment was probably of the exact form of a modern linen sheet. The distinction between the shirt and the sheet worn over it, as well as the reason why linen was used for all sacred purposes, is clearly expressed in the two following passages from Apuleius and Jerome.

Etiamnè cuiquam mirum videri potest, cui sit ulla memoria religionis, hominem tot mysteriis Deum conscium, quædam sacrorum crepundia domi adversare, atque ea lineo texto involvere, quod purissimum est rebus divinis velamentum? Quippe lana, segnissimi corporis excrementum, pecori detracta, jam inde Orphei et Pythagoræ scitis, profanus vestitus est. Sed enim mundissima lini seges, inter optimas fruges terrâ exorta, non modò indutui et amictui sanctissimis Ægyptiorum sacerdotibus, sed opertui quoque in rebus sacris usurpatur.

Apuleii Apolog. p. 64. ed. Pricæi.

Can any one impressed with a sense of religion wonder, that a man who has been made acquainted with so many mysteries of the gods, should keep at home certain sacred emblems and wrap them in a linen cloth, the purest covering for divine objects? For wool, the excretion of a sluggish body, taken from sheep, was deemed a profane attire even according to the early tenets of Orpheus and Pythagoras. But flax, that cleanest and best production of the field, is used, not only for the inner and outer clothing of the most holy priests of the Egyptians, but also for covering sacred objects.—*Yates's Translation.*

Indutus was the putting on of the *inner*, amictus of the *outer* garment.

Vestibus lineis utuntur Ægyptii sacerdotes non solum extrinsecus, sed et intrinsecus.—*Hieron. in Ezek. 44. folio 257.*

The Egyptian priests use linen garments, not only without, but also within.

Plutarch says*, that the priests of Isis wore linen on account of its purity, and he remarks how absurd and inconsistent would have been their conduct, if they had carefully plucked the hairs from their own bodies, and yet clothed themselves in wool, which is the hair of sheep. He also mentions the opinion of some who thought that flax was used for clothing, because the *color of its blossom resembles the ethereal blue which surrounds the world*; and he states, that the priests of Isis were also buried in their sacred vestments. According to

* De Iside et Osiride, prope init. Opp. ed. H. Stephani, Par. 1572, tom. i p. 627, 628.

Strabo, Panopolis was an ancient seat of the linen manufacture*.

Celsius in his Hierobotanicon (*vol. ii. p. 287–291.*), and Forster in his treatise *De Bysso Antiquorum* (*p. 65–68.*) have quoted other passages from ancient authors, which concur to show the abundance and excellence of the flax grown anciently in Lower Egypt, and more particularly in the vicinity of Pelusium, the general employment of it among the inhabitants for clothing, and the exclusive use of linen cloth for the garments of the priesthood and for other sacred purposes, and especially for the worship of Isis and Osiris. From the same authorities we learn, that the Egyptian flax and the cloth woven from it were shipped in great quantities to all the ports of the Mediterranean†.

In connection with these statements the reader is referred to what has already been advanced (See Part Second, Chap. I.) on the use of wool for clothing by the Egyptians; and it may be also observed, that when we find it stated by ancient authors, that the priests wore linen only, the term ought not to be so strictly understood as to exclude the use of cotton, which would probably be considered equally pure and equally adapted for sacred purposes with linen, and which was brought in ancient times from India to Egypt; and the term *linum* was undoubtedly often employed in so general a sense as to include cotton.

These testimonies of ancient authors are confirmed in a very remarkable manner by existing monuments. The paintings in the Grotto of El Kab represent among other scenes a field of corn and a crop of flax, the latter distinguished by its inferior height, by its round capsules, and by being pulled up by the roots instead of being reaped. The mode of binding the flax in bundles is also exhibited, and the separation of the “bolls,” or capsules, containing the lin-seed, from the stalk, by the use of a comb, or “ripple.” (*See Description de*

* L. xvii. § 41. p. 586. ed. Siebenkees.

† “Solomon had horses brought out of Egypt, and linen yarn” (שׁוֹרֵי מִצְרַיִם): 1 Kings x. 28. 2 Chron. i. 16.

l'Egypte: Antiquités; Planches, tome i. pl. 68. and the Plates to Hamilton's Ægyptiaca, xxiii.)

In Plate VI. is inserted so much of the painting as relates to our present subject. Five persons are employed in plucking up the flax by the roots, viz., four men and one woman. The woman wears a shift reaching to her ancles, but *transparent**. The four men wear shirts which reach to their knees, and are not transparent. Another man binds the flax into sheaves: a sixth carries it to a distance: and a seventh separates the seed from the stem by means of a four-toothed ripple. The back of the ripple rests on the ground; its teeth being raised to the proper elevation by a prop, as shown in the drawing. The man sets his foot upon the back to keep the instrument firm, and, taking hold of a bunch of flax near the root, draws it through the comb. This method is now employed in Europe. At the left-hand corner of the Plate lies a bundle of flax stript of its capsules, and underneath the ripple is the heap of seed which has been separated from the stem.

Evidence equally decisive is presented in the innumerable mummies, the fabrication of successive ages through a period of more than two thousand years, which are found in the catacombs of Egypt. It is indeed disputed, whether the cloth in which they are enveloped is linen or cotton.

It was believed to be linen by all writers previous to Rouelle. More especially, this opinion was advanced by the learned traveller and antiquary, Professor John Greaves, in his *Pyramidographia*, published A. D. 1646. He speaks of the "linen shroud" of a mummy, which he opened, and he says, "The ribbands" (*or fillets*) "by what I observed, were of linen, which was the habit also of the Egyptian priests." He adds, "of these ribbands I have seen some so *strong* and *perfect* as if they had been made but yesterday."

Rouelle's dissertation on Mummies is published in the *Mémoires de l'Académie R. des Sciences* for the year 1750. He there asserts (*p.* 150), that the cloth of every mummy which

* This circumstance is adapted to illustrate the mention of "transparent garments" in Isaiah iii. 23. Lowth's Translation.

he had an opportunity of examining, even that of embalmed birds, was cotton.

Dr. Hadley, however, who wrote a few years after Rouelle (*Phil. Transactions for 1764, vol. 54.*), seems to adhere to the old opinion. He calls the cloth of the mummy, which he examined, "linen." He says, it was in fillets of different breadths, but the greater part $1\frac{1}{2}$ inches broad. "They were torn longitudinally; those few that had a selvage, having it on one side only."

But the opinion of Rouelle received a strong support from Dr. John Reinhold Forster, to whom it appeared at first almost incredible, although he afterwards supported it in the most decided manner. He determined to take the first opportunity of settling the question by the inspection of mummies, and examined those in the British Museum, accompanied by Dr. Solander. Both of these learned and acute inquirers were convinced, that the cloth was cotton, deriving this opinion from the inspection of all those specimens, which were sufficiently free from gum, paint, and resins, to enable them to judge*. Larcher informs us, that he remarked the same thing in these mummies in 1752, when he was accompanied by Dr. Maty†. It is to be observed, however, that neither Larcher, Rouelle, nor Forster mentions the criterion which he employed to distinguish linen from cotton. They probably formed their opinion only from its apparent softness, its want of lustre, or some other quality, which might belong to linen no less than to cotton, and which therefore could be no certain mark of distinction.

The opinion of Larcher, Rouelle, and Forster appears to have been generally adopted. In particular we find it embraced by Blumenbach, who in the *Philosophical Transactions for 1794* speaks of the "cotton bandages" of two of the small mummies, which he opened in London‡. In his *Beiträge (i. e. Contributions to Natural History, 2nd part, p. 73, Göttingen,*

* Forster, *De Bysso Antiquorum*, London 1776, p. 70, 71.

† Herodote, par Larcher. Ed. 2nde, Par. 1802, livre ii. p. 357.

‡ On the authority of this paper the mummy-cloth is supposed to be cotton by Heeren, *Ideen*, i. 1. p. 128.

1811) he says, he is more firmly convinced than ever, that the cloth is universally cotton. He assigns also his reasons in the following terms. "I ground this my conviction far less on my own views than on the assurance of such persons as I have questioned on the subject, and whose judgment in this matter I deem incomparably superior to my own or to that of any other scholar, namely, of ladies, dealers in cotton and linen cloth, weavers and the like." He also refers to the cultivation of cotton in Egypt, which he assumes probably on the authority of Forster; and to the fable of Isis enveloping in "cotton" cloth the collected limbs of her husband Osiris, who had been torn in pieces by Typhon. The latter arguments are founded on the supposition, that the ancient term *Byssus* meant cotton, and not linen. But the question as to its meaning must in part be decided, as we shall see hereafter, by previously settling the present question as to the materials of the mummy cloth. The opinion of ladies, tradesmen, and manufacturers, though it may be better than that of the most learned man, if derived from mere touch and inspection, is quite insufficient to decide the question. If those whom Blumenbach consulted thought that the cloth was always cotton, many others of equal experience and discernment have given an opposite judgment; and the fact is, that linen cloth, which has been long worn and often washed, as is the case with a great proportion of the mummy cloth, and which is either ragged or loose in its texture, cannot be distinguished from cotton by the unassisted use of the external senses.

Relying, however, on the same evidence of ocular inspection, another distinguished author, who travelled in Egypt and published his remarks about the same time, says, "As to the circumstance of cotton cloths having been exclusively used in the above process, an inspection of the mummies is sufficient evidence of the fact*."

M. Jomard, one of the authors of the great French work on Egypt, published about 1811, paid great attention to this subject. He concluded, that both linen and cotton were employed

* *Ægyptiaca*, by William Hamilton, Esq. F. R. S. London, 1809. p. 320.

in the bandages of mummies, grounding his opinion partly on their appearance and touch, and partly on the testimony of Herodotus, whom he misinterpreted in the manner, which will hereafter be mentioned*.

Another of these authors, M. Costaz, who contributed the memoir on the grotto of El Kab, asserts that the mummy cloth is found on examination to be cotton†.

An important paper on the same subject appeared in the Philosophical Transactions for 1825. In this Dr. A. B. Granville describes a mummy, which he opened. He dwells more particularly on the circumstances, which have reference to anatomical and surgical considerations, and expresses very strongly his admiration of the skill and neatness employed in folding the cloth, so as to present an example of every kind of bandage used by modern surgeons, and to exhibit it in the most perfect manner.

The passages which are connected with the present inquiry, will be quoted at length. Dr. Granville observes (*p.* 272.),

The principal rollers appear to be made of a very compact, yet elastic linen, some of them from four to five yards in length, without any stitch or seam in any part of them. There were also some large square pieces thrown around the head, thorax, and abdomen, of a less elastic texture. These pieces were found to alternate with the complete swathing of the whole body. They occurred four distinct times; while the bandaging, with rollers and other fasciæ, was repeated, at least, twenty times. The numerous bandages, by which the mummy was thus enveloped, were themselves wholly covered by a roller $3\frac{1}{2}$ inches wide and 11 yards long, which after making a few turns around both feet, ascended in graceful spirals to the head, whence descending again as far as the breast, it was fixed there. The termination of this outer roller is remarkable for the loose threads hanging from it in the shape of a fringe and for certain traces of characters imprinted on it similar to those described and delineated by Jomard in the *Déscription de l'Égypte*. One or two of these characters have corroded the linen, leaving the perforated traces of their form.

Dr. Granville gives a fac-simile of these characters, and in the same Plate he represents the exact appearance of the external rolls of cloth on the mummy. He then says (*p.* 274.),

I have satisfied myself, that both cotton and linen have been employed in the preparation of our mummy, although Herodotus mentions only cotton (*byssus*)

* *Déscription de l'Égypte*. Mémoires.—Sur les Hypogées, p. 35.

† *Ibid.* tom. i. p. 60.

as the material used for the purpose. Most mummies have been described as wholly enveloped in linen cloth, and some persons are disposed to doubt the existence of cotton cloth in any, not excepting in the one now under consideration.

But with respect to the last point, a simple experiment has, I think, set the question at rest. If the surface of old linen, and of old cotton cloth be rubbed briskly and for some minutes with a rounded piece of glass or ivory, after being washed and freed from all extraneous matter, the former will be found to have acquired considerable lustre; while the latter will present no other difference than that of having the threads flattened by the operation. By means of this test I selected several pieces of cotton cloth from among the many bandages of our mummy, which I submitted to the inspection of an experienced manufacturer, who declared them to be of that material.

Besides the appeal to the senses of "an experienced manufacturer," Dr. Granville here proposes a new test, that of rubbing in the manner described. But, although cotton cloth in all circumstances has less lustre than linen, still this cannot be considered a satisfactory criterion.

The ingenious John Howell of Edinburgh* paid some attention to this question, having a few years since obtained and opened a valuable mummy. He and the friends, whom he consulted, and who were *weavers* and other persons of *practical* experience, most of them thought that the cloth was altogether linen: some however thought that certain specimens of it were cotton.

This curious and important question was at length decisively settled by means of microscopic observations instituted by James Thomson, Esq. F. R. S. of Clitheroe, one of the most observant and experienced cotton-manufacturers in Great Britain. He obtained about 400 specimens of mummy cloth, and employed Mr. Bauer of Kew to examine them with his microscopes. By the same method the structure and appearance of the ultimate fibres of modern cotton and flax were ascertained; and were found to be so distinct that there was no difficulty in deciding upon the ancient specimens, and it was also found that they were universally linen. About twelve years after Mr. Thomson had commenced his researches he published the results of them in the *Philosophical Magazine*†, and he has ac-

* Author of an *Essay on the War Gallies of the Ancients*, Edinburgh 1826, 8vo.

† Third Series, vol. v. No. 29, November 1834

accompanied them with a Plate exhibiting the obvious difference between the two classes of objects. The ultimate fibre of cotton is a transparent tube without joints, flattened so that its inward surfaces are in contact along its axis, and also twisted spirally round its axis (See A. Plate VI.): that of flax is a transparent tube jointed like a cane, and not flattened nor spirally twisted (See B. Plate VI.). To show the difference two specimens of the fibres of cotton, and two of the fibres of mummy cloth are exhibited, all of the specimens being one hundredth of an inch long, and magnified 400 times in each dimension. Any person, even with a microscope of moderate power, may discern the difference between the two kinds of fibres, though not so minutely and exactly as in the figures of Mr. Bauer.

The difference, here pointed out, will explain why linen has greater lustre than cotton: it is no doubt because in linen the lucid surfaces are much larger. The same circumstance may also explain the different effect of linen and cotton upon the health and feelings of those who wear them (See Part Third, Chap. I.). Every linen thread presents only the sides of cylinders: that of cotton, on the other hand, is surrounded by an innumerable multitude of exceedingly minute edges.

Mr. Pettigrew, in his "History of Egyptian Mummies" (*London* 1834, *p.* 95.), expresses the opinion that the bandages are principally of cotton, though occasionally of linen. He has since arrived at the conclusion that they are all of linen: and his opinion appears to be established on the following evidence, which he gives in a note to the above mentioned work (*p.* 91.).

Dr. Ure has been so good as to make known to me that which I conceive to be the most satisfactory test of the absolute nature of flax and cotton, and in the course of his microscopic researches on the structure of textile fibres he has succeeded in determining their distinctive characters. From a most precise and accurate examination of these substances he has been able to draw the following statement:—The filaments of flax have a glassy lustre when viewed by day-light in a good microscope, and a cylindrical form, which is very rarely flattened. Their diameter is about the two-thousandth part of an inch. They break transversely with a smooth surface, like a tube of glass cut with a file. A line of light distinguishes their axis, with a deep shading on one side only, or on both sides, according to the direction in which the incident rays fall on the filaments.

The filaments of cotton are almost never true cylinders, but are more or less flattened and tortuous; so that when viewed under the microscope they appear

in one part like a riband from the one-thousandth to the twelve-hundredth part of an inch broad, and in another like a sharp edge or narrow line. They have a pearly translucency in the middle space, with a dark narrow border at each side, like a hem. When broken across, the fracture is fibrous or pointed. Mummy cloth, tried by these criteria in the microscope, appears to be composed both in its warp and woof-yarns of flax, and not of cotton. A great variety of the swathing fillets have been examined with an excellent achromatic microscope, and they have all evinced the absence of cotton filaments.

Mr. Wilkinson considers the observations of Dr. Ure, and Mr. Bauer as decisive of the question*.

With regard to the evidence from mummies it should be further remarked, that, as they are partly wrapped in old linen (shirts, napkins, and other articles of clothing and domestic furniture being found with the long fillets and the entire webs), they prove the general application of linen in Egypt to all the purposes of ordinary life.

Even to the present day flax continues to be a most important article of cultivation and trade in Egypt†. The climate and soil are so favorable, that it there grows to a height, which it never reaches in Europe. It must no doubt, become coarser in proportion to its size, and this circumstance may account for the use of it in ancient times for all those purposes, for which we employ hemp, as for making nets, ropes, and sail-cloth. The fine linen of the ancient Egyptians must have been made from flax of lower growth and with thinner stems; and the mummies testify, that they made cloth of the finest as well as of the coarsest texture.

The following remark of Hasselquist respecting the *soft* and *loose* texture of the linen made in Egypt in his time agrees remarkably with the appearance of that found in mummies. "The Egyptian linen is not so thick," says he, "as the European, being softer and of a looser texture; for which reason it lasts longer and does not wear out so soon as ours, which frequently wears out the faster on account of its stiffness." He also observes, "The common people in Egypt are clothed in

* Manners and Customs of the Ancient Egyptians, London 1837, vol. iii. p. 115.

† Browne's Travels in Africa, p. 83.

linen only, dyed blue with *indigo*; but those of better fortune have a black cloak over their linen shirt."

The coarse linen of the Ancient Egyptians was called $\Phi\acute{\omega}\sigma\omega\nu$. It was made of thick flax, and was used for towels ($\sigma\omicron\upsilon\delta\acute{\alpha}\rho\iota\alpha$, *Julius Pollux*, vii. c. 16.), and for sails ($\Phi\acute{\omega}\sigma\omega\nu\alpha\varsigma$, *Lycophron*, v. 26.)*. $\Phi\acute{\omega}\sigma\omega\nu$ may be translated *canvass*, or sail-cloth.

Fine linen, on the other hand, was called $\Theta\theta\acute{\omicron}\nu\eta$. This term, as well as the preceding, was in all probability an Egyptian word, adopted by the Greeks to denote the commodity, to which the Egyptians themselves applied it. It seems to correspond, as Salmasius†, Celsius‡, Forster§, and Jablonski|| have observed, to the אֶטְוֵן מִצְרַיִם , "Fine linen of Egypt," in Proverbs vii. 16. For אֶטְוֵן , put into Greek letters and with Greek terminations, becomes $\theta\theta\acute{\omicron}\nu\eta$ and $\theta\theta\acute{\omicron}\nu\iota\omicron\nu$. Hesychius states, no doubt correctly, that $\theta\theta\acute{\omicron}\nu\eta$ was applied by the Greeks to any fine and thin cloth, though not of linen¶. But this was in later times and by a general and secondary application of the term.

It appears also that in later times $\theta\theta\acute{\omicron}\nu\eta$ was not restricted to fine linen. It is used for *a sail* by Achilles Tatius in describing a storm (l. iii.), and by the Scholiast on Homer, *Il.* σ .

Agreeably to the preceding remarks, the $\theta\theta\acute{\omicron}\nu\alpha\iota$ mentioned in the two passages of the *Iliad* may be supposed to have been procured from Egypt. Helen, when she goes to meet the senators of Ilium at the Scæan Gate, wraps herself in a white sheet of fine linen (*Il.* γ . 141.). The women, dancing on the shield of Achilles (*Il.* σ . 595.), wear *thin sheets*. These thin sheets must be supposed to have been worn as shawls, or girt about the bodies of the dancers. Helen would wear hers so as to veil her whole person agreeably to the representation of the

* Jablonski *Glossarium Vorum Ægyptiarum*, in Valpy's edition of Steph. *The-saur.* tom. i. p. ccxcv.

† Salmasius in *Achill. Tat.* l. viii. c. 13, $\theta\theta\acute{\omicron}\nu\eta\varsigma$ $\chi\iota\tau\acute{\omega}\nu$.

‡ Celsii *Hierobotanicon*, t. ii. p. 90.

§ Forster, *De Byssu*, p. 74.

|| *Ubi supra*, p. ccxvii.

¶ The ancient Scholia (published by Mai and Butmann) on *Od.* η . 107, state that $\theta\theta\acute{\omicron}\nu\alpha\iota$ were made both of flax and of wool. The silks of India are called $\Theta\theta\acute{\omicron}\nu\alpha\iota$ $\sigma\eta\rho\iota\kappa\acute{\alpha}$.

lady, whom Paulus Silentarius addresses in the following line, written evidently with Homer's Helen before his mind :

You conceal your flowing locks with a snow-white sheet.—*Brunck, Analecta, vol. iii. p. 81.*

Perhaps even the sheets, spread for Phœnix to lie upon in the tent of Achilles, and for Ulysses on his return to Ithica from the country of the Phæacians*, though not called by the Egyptian name, should be supposed to have been made in Egypt. In the time of Homer (900 B. C.) the use of linen cloth was certainly rare among the Greeks; the manufacture of it was perhaps as yet unknown to them.

The term *Σινδών* (*Sindon*), was used to denote linen cloth still more extensively than *ὀθόνη*, inasmuch as it occurs both in Greek and Latin authors†. According to Julius Pollux this also was a word of Egyptian origin, and Coptic scholars inform us that it is found in the modern *Shento*, which has the same signification‡.

Serapion was called Sindonites, because he always wore linen (*Palladii Hist. Lausiaca, p. 172*). He was an Egyptian, and retained the custom of his native country.

Although *Σινδών* originally denoted linen, we find it applied, like *ὀθόνη*, to cotton cloth likewise; and although both of these terms probably denoted at first those linen cloths only, and especially the finer kinds of them, which were made in Egypt, yet as the manufacture of linen extends itself into other countries, and the exports of India were added to those of Egypt, all varieties either of linen or cotton cloth, wherever woven, were designated by the Egyptian names *ὀθόνη* and *Σινδών*.

Another term, which is probably of Egyptian origin, and therefore requires explanation here, is the term *Βύσσοσ* or *Byssus*. Vossius (*Etymol. L. Lat. v. Byssus*) thinks it was, as Pollux and Isidore assert, a fine, white, soft flax, and that the cloth made from it was like the modern cambric: "Similis fuisse videtur lino isti, quod vulgo *Cameracense* appellamus." Celsius, in his *Hierobotanicon* (*vol. ii. p. 173.*), gives the same ex-

* Il. i. 657. Od. v. 73. 118.

† E. g. Martial.

‡ Jablonski, ubi supra, p. cclxxiv.

planation. This was indeed the general opinion of learned men, until J. R. Forster advanced the position, that *Byssus was cotton*. A careful examination of the question confirms the correctness of the old opinions, and for the following reasons.

I. The earliest author, who uses the term, is Æschylus. He represents Antigone wearing a shawl or sheet of fine flax*. In the *Bacchæ* of Euripides (*l.* 776.) the same garment, which was distinctive of the female sex, is introduced under the same denomination. We cannot suppose, that dramatic writers would mention in plays addressed to a general audience clothing of any material with which they were not familiarly acquainted. But the Greeks in the time of Æschylus and Euripides knew little or nothing of cotton. They had, however, been long supplied with fine linen from Egypt and Phœnice; and the *βυσσινον πέπλωμα* of Antigone is the same article of female attire with the *ἀργυρναι ὀθόνας* of Helen, described by Homer. Indeed Æschylus himself in two other passages calls the same garment linen. In the *Coephoræ* (*l.* 25, 26.) the expressions, *Λινοφθόροι δ' ὑφασμάτων λακίδες* and *Πρόσπερνοι στολμοὶ πέπλων*, describe the rents, expressive of sorrow, which were made in the linen veil or shawl (*πέπλος*) of an Oriental woman. In the *Supplices* (*l.* 120.) the leader of the chorus says, she often tears her linen, or her *Sidonian veil*.

II. The next author in point of time, and one of the first in point of importance, is Herodotus. In his account of the mode of making mummies, he says (*l.* ii. *c.* 86.) the embalmed body was enveloped in cotton. But the fillets or bandages of the mummies are proved by microscopic observations to be universally linen; at least all the specimens have been found to be linen, which have been submitted to this, the only decisive test.

III. Herodotus also states (*vii.* 181.), that a man, wounded in an engagement, had his torn limbs bound *σινδόνος βυσσίνης τελαμῶσι*. Now, supposing that the persons concerned had their choice between linen and cotton, there can be no doubt that they would choose linen as most suitable for such a purpose. Cotton, when applied to wounds, irritates them. Julius Pollux men-

* Septem contra Thebas, l. 1041. See also Persæ, l. 129.

tions (*l. iv. c. 20. 181. ; l. vii. c. 16. and 25. 72.*) these bandages as used in surgery. The same fillets, which were used to swathe dead bodies, were also adapted for surgical purposes. Hence a Greek Epigram (*Brunck, An. iii. 169.*) represents a surgeon and an undertaker AS LEAGUING TO ASSIST EACH OTHER IN BUSINESS. The undertaker supplies the surgeon with bandages stolen from the dead bodies, and the surgeon in return sends his patients to the undertaker !

IV. Diodorus Siculus (*l. i. § 85. tom. i. p. 96.*) records a tradition, that Isis put the limbs of Osiris into a wooden cow, covered with Byssina. No reason can be imagined, why cotton should have been used for such a purpose ; whereas the use of fine linen to cover the hallowed remains was in perfect accordance with all the ideas and practices of the Egyptians.

V. Plutarch, in his Treatise de Iside et Osiride (*Opp. ed. Stephani, 1572, vol. iv. p. 653.*) says, that the priests enveloped the gilded bull, which represented Osiris, in a black sheet of Byssus. Now nothing can appear more probable, than that the Egyptians would employ for this purpose the same kind of cloth, which they always applied to sacred uses ; and in addition to all the other evidence before referred to, we find Plutarch in this same treatise expressly mentioning the linen garments of the priesthood, and stating, that the priests were entombed in them after death, a fact verified at the present day by the examination of the bodies of priests found in the catacombs.

VI. The magnificent ship, constructed for Ptolemy Philopator, which is described at length in Athenæus, had a sail of the fine linen of Egypt*. It is not probable, that in a vessel, every part of which was made of the best and most suitable materials, the sail would be of cotton. Moreover Hermippus describes Egypt as affording the chief supply of sails for all parts of the world† : and Ezekiel represents the Tyrians as obtaining cloth from Egypt for the sails and pendants of their ships‡.

VII. It is recorded in the Rosetta Inscription (*l. 17, 18.*), that

* Deipnos. l. v. p. 206 C. ed. Casaubon.

† Apud. Athenæum, Deipnos. l. i. p. 27 F.

‡ Ez. xxvii. 7. שש נרקמה ממצרים.

Ptolemy Epiphanes remitted two parts of the fine linen cloths, which were manufactured in the temples for the king's palace; and (*l.* 29.) that he also remitted a tax on those, which were not made for the king's palace. Thus in an original and contemporary monument we read, that Ὀθόνια βύσσινα were at a particular time manufactured in Egypt. But we have no reason to believe, that cotton was then manufactured in Egypt at all, whereas linen cloth was made in immense quantities.

VIII. Philo, who lived at Alexandria, and could not be ignorant upon the subject, plainly uses Βύσσος to mean flax. He says, the Jewish High-Priest wore a linen garment, made of the purest *Byssus*, which was a symbol of firmness, incorruption, and of the clearest splendor, since *fine linen* is most difficult to tear, is made of nothing mortal, and becomes brighter and more resembling light, the more it is cleansed by washing*.

Here we may notice the tenacity of the cloth found in Egyptian mummies. A great part of it is quite rotten; and its tender and fragile state is to be accounted for, not only from its great antiquity and exposure to moisture, but from the circumstance, that much of it was old and worn, when first applied to the purpose of swathing dead bodies. Nevertheless pieces are found of great strength and durability.

Hans Jac. Amman, who visited the catacombs of Sakara in 1613, found the bandages so strong, that he was obliged to cut them with scissors†. Professor Greaves‡ and Lord Sandwich found them as firm *as if they were just taken from the loom*. Abdollatiph, who visited Egypt A. D. 1200, mentions that the Arabs employed the mummy cloth to make garments§. Much more recently the same practice has been attested as coming under his observation by Seetzen||. Caillaud discovered in the mummy, which he opened, several *napkins* in such a state of preservation, that he took a fancy to use one. He had it washed eight times without any perceptible injury. "With a sort

* De Somniis, vol. i. p. 653. Mangey.

† Blumenbach's Beiträge, Th. 2. p. 74.

‡ Pyramidographia.

§ P. 221 of the German translation; p. 198 of Silvestre de Lacy's. See App. A.

|| See his letter to Von Hammer in the Fundgruben des Orients, 1 St. p. 72. as quoted by Blumenbach, l. c.

of veneration," says he, "I unfolded every day this venerable linen, which had been woven more than 1700 years." (*Voyage à Meroe et au Fleuve Blanc.*)

IX. According to Josephus the Jewish priests wore drawers of spun flax, and over the drawers a shirt. He calls a garment made of Βύσσος a *linen* garment. It had *flowers woven into it, which were of three different substances**. He soon after mentions the same materials *as used for making the curtains of the tabernacle*. In all these instances the figures or ornaments *were of splendid colors upon a ground of white linen*. We have no reason to believe, that either the Egyptians or the Israelites in the time of Moses knew anything of cotton: so that, if Josephus gives a true account, Βύσσος must have denoted a kind of flax.

X. Jerome on Ezekiel xxvii. says, "Byssus grows principally in Egypt" (*Byssus in Ægypto quàm maximè nascitur*). Of the celebrity of the Egyptian flax we have the most abundant proofs; but, if by *Byssus* Jerome meant cotton, he here committed a strange mistake; for, supposing cotton to have grown at all in Egypt, it certainly grew far more abundantly in other countries, and of this fact he could scarcely be ignorant.

XI. Martianus Capella plainly distinguishes between that substance and *Byssus*†. He seems to have considered cotton as an Indian, *Byssus* as an Egyptian product. He certainly supposed, that they were not the same thing.

XII. Isidorus Hispalensis expressly states, that *Byssus* was a kind of flax, very white and soft.

Byssus genus est quoddam lini nimium candidi et mollissimi, quod Græci papatem vocant.—*Orig. l. xix. 27.*

Byssina (vestis) candida, confecta ex quodam genere lini grossioris Sunt et qui genus quoddam lini byssum esse existiment.—*Ibid. c. 22.*

Forster conjectures (*p. 4.*) that for *genus quoddam lini* we should read *genus quoddam lanæ*, and conceives *tree-wool* (as

* Ant. Jud. iii. 7. 1, 2. p. 112. ed. Hudson.

The shirt of the High Priest of the Jews was probably like that worn in the worship of Isis, which was of *Byssus*, but adorned with flowers, "Byssina, sed floridè depicta." Apuleius, Met. l. xi.

† Etym. L. Lat. v. *Byssus*.

Pollux and some others call it), i. e. cotton, to be intended. His conjecture seems probable. The remark of Isidore intimates, that in his time it had already been a matter of dispute whether Byssus was a kind of flax or something else.

XIII. Paulinus, Bishop of Nola, testifies to the great strength of the threads of Byssus.

Cloth made of Byssus indicates firm faith:
For threads of Byssus, it is said, surpass
E'en ropes of broom in firmness and in strength*.

Ad Cytherium in Max. Biblioth. Patrum, vol. vi. p. 264.

Vossius also quotes the authority of Jerome and Eucherius to prove the great tenacity of Byssus. But, if Byssus were cotton, it certainly would not have been celebrated on that account.

The arguments of Dr. J. R. Forster on the other side of the question will now be considered. See his *Liber Singularis de Byssu Antiquorum*, Lon. 1776, p. 11. 50.

I. His first argument is as follows. Julius Pollux says (*l. vii. c. 17.*), that Βύσσος was "a kind of flax among the Indians." The Jewish rabbis indeed all explain the Hebrew שש (Shesh), which in the Septuagint is always translated Βύσσος, as signifying *flax*. But they use the term for flax in so loose and general a way, that they may very properly be supposed to have included cotton under it. In the same general sense we must suppose λίνον to be used by Julius Pollux; and it is clear, that he must have meant cotton, because cotton grows abundantly in India, whereas flax was never known to grow in India at all.

In proof of this last assertion Forster refers to Osbeck's Journal, vol i. p. 383. He also appeals to a passage of Philostratus (*Vita Apollonii, l. ii. c. 20. p. 70, 71.*), which has been quoted in Part Third, p. 328., where that author certainly applies the term in question to the cotton of India.

An answer to this argument, so far as it depends on the testimony of Julius Pollux, was furnished by Olaus Celsius in his Hierobotanicon, published in 1747, a work which Forster had better have consulted, when he was writing a treatise expressly

* See Part First, Chapters XII. and XIII.

intended to ascertain the meaning of one of the botanical terms employed in the *Scriptures*. The learned and accurate Swede gives on good authority an emendation of the text of Pollux, which entirely destroys the argument founded upon it by Forster and those who agree with him. According to this reading Pollux only asserts that Βύσσος is a kind of flax, without adding that it grew among the Indians*. In a separate Appendix (E.), will be examined distinctly and fully the critical evidence for the correct state of the passages of Pollux, which it may be found necessary to cite. Pollux, in asserting that Byssus was a kind of flax, coincides with all the other witnesses who have been produced.

Forster is also exceedingly incorrect in his mode of reasoning upon the passage of Pollux, supposing it to be accurate and genuine. He argues, that Pollux must have meant cotton by "*a kind of flax among the Indians*," because real flax does not grow in India at all; "In Indiâ verò linum non erat, nec quidem nostrâ ætate linum reperitur in Indiâ, quod jam Osbeckius in Itinerario ostendit, p. 383. vol. i. edit. Anglicæ." The "*English edition*" of Osbeck's Voyage is a translation from the German by Forster himself. In the page referred to we find the following passage relative to flax, and no other:— "*Flax is so rare a commodity in the East*, that many have judged with great probability that the fine linen of the rich man, Luke xvi. 19, was no more than our common linen." This sentence implies that flax grew in the East, though rarely. Whether it grew in India, Osbeck does not inform us. Dr. Wallich, who travelled in India, states that flax grows in India, and that he remembered having seen there a whole field blue with its flowers. It is cultivated principally for its seed, from which oil is extracted, the stalks being thrown aside as useless.

With respect to the passage from Philostratus, it is admitted, that he uses Βύσσος to denote cotton. Besides its proper and original sense, this word was occasionally used, as λίνον, δόδονη, *Sindon*, *Carbasus*, and many others were, in a looser and more

* Celsii Hierobot. vol. ii. p. 171

general application. But the use of the term in this manner by a single writer, or even, if they could be produced, by several writers of so late an age as Philostratus, would be of little weight in opposition to the evidence, which has been brought forward to prove, that *Βύσσος* properly meant flax only.

II. Forster produces a passage from the *Eliaca* of Pausanias* from which he argues, that *βύσσος* was not flax, because Pausanias here distinguishes it from flax as well as from hemp.

But we know, that all plants undergo great changes by cultivation and in consequence of the varieties of soil and climate. What can be more striking than the innumerable tulips derived from the original yellow tulip of Turkey, or all the varieties of pinks and carnations from a single species? To make all the descriptions of cloth from the coarsest canvass or sail-cloth to the most beautiful lawn or cambric, there must have been, as there now are, great differences in the living plant. The best explanation therefore of the language of Pausanias seems to be, that he used *λίνον* to denote the common kind of flax, and *βύσσος* to signify a finer variety†. In another passage, where he speaks of the Elean Byssus, his language shows, that its peculiar excellence consisted both in its fineness and in its beautiful yellow color; for after expressing the admiration, to which this substance was entitled, as growing nowhere else in Greece, he says, that “in fineness it was not inferior to that of the Hebrews, but was not equally yellow‡.”

It may further be remarked in opposition to the idea, that *βύσσος* meant cotton in these passages, that there is not the slightest ground for supposing, that cotton was cultivated either

* Paus. l. vi. cap. § 4.

† Pausanias also distinguishes between *λίνον* and *βύσσος* in his account of the clothing of a reputed statue of Neptune, l. vi. c. 25. § 5. When flax is raised to be manufactured into cambric and fine lawn, twice as much seed is sown in the same space of ground. The plants then grow closer together; the stalks are more delicate and slender; and the fibres of each plant are finer in proportion.

‡ L. v. 5. § 2.

Others commend Byssus on account of its whiteness. See Philo. Apoc. xix. 14. Themistius (Orat. p. 57. ed. Paris, 1684. p. 68. ed. Dindorfii, Lips. 1832.) saw at Antioch “ancient letters wrapt in *white Byssus*.” These, he says, were brought from Susa and Ecbatana.

in Elis or in any other part of Europe so early as the time of Pausanias, nor indeed until a comparatively recent age.

III. Forster (*p.* 69–71.) considers the testimony of Herodotus, that the embalmed bodies of the dead were wrapt in fillets of Byssus, as decisive in favor of his opinion, because those fillets are found on examination to be all cotton. It is presumed that the preceding testimony, proves that so far as they have been examined, in the only way which can settle the dispute, they are found universally to be linen.

Of Forster's *celebrated* work it may be observed in general, *that he rather from the very beginning assumes his point, than endeavors to prove it.* He continually speaks of it as *demonstrated.* Nevertheless the only arguments which can be found in his book, are those already stated. Little as these arguments amount to in opposition to the evidence, which has now been brought forward on the other side of the question, we find that the most learned authors since Forster's time, and especially since the same opinion was embraced by Blumenbach, have generally been content to adopt it. But, although such eminent names as those of Porson*, Dr. Thomas Young†, Mr. Hamilton‡, Dr. T. M. Harris§, Mr. Wellbeloved||, E. H. Barker¶, Dr. A. Granville**, Jomard††, Wehrs‡‡, J. H. Voss§§, Heeren|||, Sprengel¶¶, Billerbeck***, Gesenius†††, E. F. K. Rosenmuller‡‡‡, and Rosellini§§§, stand arrayed against the evidence now

* In his translation of the Rosetta Inscription, Clarke's Greek Marbles, p. 63

† Account of Discoveries in Hieroglyphic Literature, p. 101. 114.

‡ Ægyptiaca, p. 321.

§ Natural History of the Bible, 2nd edition, p. 447.

|| Translation of the Bible, Gen. xi. 42.

¶ Classical Recreations.

** As quoted at p. 364.

†† Description des Hypogées, p. 35.

‡‡ Vom Papier, p. 201.

§§ Virgil's Ländliche Gedichte, iii. p. 313.

||| Ideen über die Politik, &c.

¶¶ Historia Rei Herbariæ, tom. i. c. i. p. 15.

*** Flora Classica, p. 177.

††† Thesaurus Philologico-Criticus, v. גרצ.

‡‡‡ Biblische Alterthumskunde, 4. l. p. 175.

§§§ Monumenti dell' Egitto. Mon. Civili, tomo. i. Pisa, 1834, capo. iv. § 6.

produced, i. e. to prove that *βύσσοσ* meant *flax* and *not* cotton, as those authors have supposed. Yet their evidence may be considered as going all for nothing, because they express not their own opinion formed by independent inquiry and investigation, but merely the opinion which they have adopted from Forster and Blumenbach.

There is, however, no reason to doubt, that Forster is right in considering *Βύσσοσ*, or *Byssus*, as an Egyptian word with a Greek or Latin termination. In the Septuagint version it is always used as equivalent to the Hebrew שש (*Shesh* or *Ses*), which according to the Hebrew Rabbis was a kind of flax, that grew in Egypt only and was of the finest quality*. Another term, used in the Pentateuch for linen cloth is בר (*bad*), which seems to be nearly the same as שש. The Egyptian term בצ or בוצ (*buts*) is very seldom found in the Hebrew Scriptures, and not until the intercourse became frequent between the Jews and other oriental nations. But it is continually employed by the Arabic, Persic, and Chaldee Translators, as equivalent to the Hebrew terms שש and בר.

The distinction between *Βύσσοσ* and the Egyptian terms formerly explained is very obvious. Φάσων, 'Οθόνη, and Σινδών denoted linen cloth; *Βύσσοσ* the plant, from which it was made. Hence we so commonly find the adjective form *Βύσσινοσ* or *Byssinus*, i. e. made of *Byssus*, as in Σινδων βύσσινη, 'Οθονη βύσσινη, 'Οθόνια βύσσινα, Σιρόλη βύσσινη, &c., and this is agreeable to the remark of the Patriarch Photius in his 192nd Epistle, Φυτον δὲ ἡ βύσσοσ, "Byssus is a plant."

Herodotus (ii. 105.), pointing out resemblances between the Egyptians and the Colchians, says, they prepare their flax in the same manner, and in a manner which is practiced by no other nation. Xenophon directs, that nets should be made of flax from the Phasis, or from Carthage†. Pollux (*l. v. cap. 4. § 26.*) says,

* Forster De Byssos, p. 5.

† De Venat. ii. 4. Grätius Faliscus, in his directions on the same subject, recommends the flax from the rich moist plains about the river Cinyps, not very far from Carthage.

Optima Cinyphiæ, ne quid contere, paludes
Lina dabunt.—*Cynegeticon*, 34, 35.

that the flax for the same purpose should be either from those countries, or from Egypt or Sardes. Callimachus (*Frag.* 265.) mentions the flax of Colchis under the name of "the Colchian halm." Strabo (*l. xi. § 17. vol. iv. p. 402.* Tschuz.) testifies to the celebrity of Colchis for the growth and manufacture of flax, and says, that the linen of this country was exported to distant places.

It seems still to maintain its ancient pre-eminence: Larcher refers to Chardin (*tom. i. p. 115.*), as saying, that the Prince of Mingrelia, a part of the ancient Colchis, paid in his time an annual tribute of linen to the Turks.

That flax was extensively cultivated in Babylonia appears from the testimony of Herodotus, who says (*i. 195.*), that the Babylonians wore a linen shirt reaching to the feet; over that a woollen shirt; and over that a white shawl. Strabo (*l. xvi. cap. 1. p. 739. ed. Casaub.*) shows where these linen shirts were chiefly made; for he informs us that *Borsippa*, a city of Babylonia, sacred to Apollo and Diana, was a great place for the manufacture of linen.

The cultivation of flax in the region of the Euphrates may also be inferred from the use of the linen thorax, as attested by Xenophon (*Cyropedia*, vi. 4. 2.).

From Joshua ii. 6. we have evidence, that flax was cultivated in Palestine near the Jordan. Rahab concealed the two Hebrew spies (according to the common English version) "with the stalks of flax, which she had laid in order upon the roof." According to the Septuagint translation, "the stalks of flax" were not merely "laid in order," but "stacked." Josephus says, *she was drying the bundles.* The Chaldee Paraphrast Onkelos also uses the expression מְעוֹנֵי כֹחַנָּה, *bundles of flax.* Agreeably to these explanations, the history must be understood as implying, that the stalks of flax, tied into bundles, as represented in the painting at El Kab*, were stacked, probably cross-ways, upon the flat roof of Ahab's house, so as to allow the wind to blow through and dry them.

Other passages, referring to the use of flax for weaving in

* See Plate vi. p. 358.

Palestine, are Levit. xiii. 47, 48. 52. 59, where linen garments are four times mentioned in opposition to woollen.

Proverbs xxi. 13. The virtuous woman, so admirably described in this chapter, "seeketh wool and flax, and worketh willingly with her hands." (See Part First, Chapter I. p. 13.). This proves, that flax was still an important article of cultivation in Palestine.

In 1 Chron. iv. 21. there is an allusion to a great establishment for dressing the fine flax, called *Butz*, or *Byssus*. It was conducted by certain families of the tribe of Judah*.

Jeremiah (xiii. 1.) mentions אזור פשתים, "*a linen girdle*;" Lumbare lineum, *Vulgate*; περιζωμα λινοῦν LXX. זרו רכתו *Jonathan*; כזורא רכהנא (sudarium) *Syriac*.

Hosea (ii. 5. 9.) mentions wool and flax as the two chief articles of clothing for the Jews in his time.

Ezekiel (xliv. 17, 18.), in his description of the temple which he saw in vision, says, the priests on entering the inner court would put on linen garments, including a turban and drawers of linent. The use of wool is here prohibited and linen prescribed for those who were to be engaged in sacred services, on account of its superior cleanliness and purity. They were not to "*gird themselves with anything that causeth sweat.*" On returning to the outer court, so as to be in contact with the people, they were to put on the common dress, which was at least in part woollen.

In the Old Testament we also find flax used for *making cords*, Judges xv. xvi.; for the *wicks of lamps*, Is. xlii. 17.; and for a *measuring line*, Ezek. xl. 3†.

According to Herodotus vii. 25, 34, 36, the Phœnicians furnished Xerxes with *ropes of flax* for constructing his bridge,

* *Hebr.* בית-עבודת הבס, i. e. "the families, or perhaps the partnerships, of the manufactory of Byssus;" *Vulg.* "Cognationes domus operantium byssum."

† It is remarkable that the Chaldee Paraphrast Jonathan here uses בוצ (byssus) for the Hebrew פשתים.

‡ The use of the cord of flax (*linea*) for measuring, &c. is the origin of the word *line*. "*Linea genere suo appellata, quia ex lino fit.*" *Isidori Hisp. Etymol.* l. xix. c. 18. De instrumentis ædificiorum.

while the Egyptians supplied ropes of Papyrus, which were inferior to the others in strength.

Whilst פשה, derived probably from פשט, to strip or peel, is used for flax in every state, we find another term, געריה, used for tow. This term therefore corresponds to *Stuppa* in Latin* ; Etoupe in French ; Στύπη, στύππιον or στιππίον in Greek ; בַּרְקָהָא, from בַּרְקָא, to comb, in Syriac ; *Werg* in modern German.

Eccles. xl. 4. represents poor persons as clothed in coarse linen, ὠμολίνον (*Lino crudo*, *Jerome*), meaning probably flax dressed and spun without having been steeped†.

In Rev. xv. 6. the seven angels come out of the temple clothed "*in pure and white linen.*" This is to be explained by what has been already said of the use of linen for the temple service among the Egyptians and the Jews. On three other occasions mentioned in the New Testament, viz. the case of the young man, who had "a linen cloth cast about his naked body" (*Mark* xiv. 51, 52.); the entombment of Christ (*Matt.* xxvii. 59. *Mark* xv. 46. *Luke* xxiii. 53. xxiv. 12. *John* xix. 40. xx. 5, 6, 7.); and the case of the "sheet" let down in vision from heaven (*Acts* x. 11. xi. 5.), the sacred writers employ the equivalent Egyptian terms, Εινδών, and Ὁθόνη or Ὁθόνιον.

The "Byssus of the Hebrews," mentioned by Pausanias may have been so called, because it was imported into Greece by the Hebrews, not because it grew in Palestine, as many critics have concluded.

Herodotus (*l. c.*) observes, that the Greeks called the Colchian flax Εαρδονικόν. The epithet must be understood as referring to Sardes, from the vicinity of which city flax was obtained according to the testimony of Julius Pollux (*l. c.*). In another passage Herodotus remarks (*v. 87.*), that the linen shift worn by the Athenian women, was originally Carian. The Milesian Sindones, mentioned by Jonathan, the Chaldee Paraphrast, on

* The origin of *Stuppa*, the Latin term, was from its use in *stopping* chinks (*stopfer*, German). It was either of hemp or flax.

"*Stuppa cannabi est sive lini. Hæc secundum antiquam orthographiam stuppa (stipa?) dicitur, quod ex eâ rimæ navium stipentur: unde et stipatores dicuntur, qui in vallibus eam componunt.*" *Isid. Hisp. Orig.* xix. 27.

† See Bodæusa Stapel on Theophrasti *Hist. Plant.* l. viii. p. 944.

Lam. ii. 20, were, no doubt, made of the flax of this country, although Forster (*De Byssu*, p. 92.), on account of the celebrity of the Milesian wool, supposes them to have been woollen. It is probable, that the Milesian net caps, worn by ladies, were made of linen thread.

Jerome, describing the change from an austere to a luxurious mode of life, mentions shirts from *Laodicea*. Some commentators have supposed linen shirts to be meant.

According to Julius Pollux (vii. c. 16.) the Athenians and Ionians wore a linen shirt reaching to the feet. But the use of it among the Athenians must have come in much later than among the Ionians, who would adopt the practice in consequence of the cultivation of flax in their own country as well as in their colonies on the Euxine Sea, and also in consequence of the general elegance and refinement of their manners. Indeed it appears probable, that the linen used by the Athenians was imported.

The only part of Greece, where flax is recorded to have been grown, was Elis. That it was produced in that country is affirmed by Pliny (*l. xix. c. 4.*), and by Pausanias in three passages already quoted.

When Colonel Leake was at Gastūni near the mouth of the Peneus in Elis, he made the following observations.

For flax (one of the chief things produced there) the land is once ploughed in the spring, and two or three times in the ensuing autumn, with a pair of oxen, when the seed is thrown in and covered with the plough. The plant does not require and hardly admits of weeding, as it grows very thick. When ripe, it is pulled up by the roots, and laid in bundles in the sun. It is then threshed to separate the seed. The bundles are laid in the river for five days, then dried in the sun, and pressed in a wooden machine. Contrary to its ancient reputation, the flax of Gastuni is not very fine. It is chiefly used in the neighboring islands by the peasants, who weave it into cloths for their own use*.

In one of the Pseudo-Platonic Epistles (No. xiii. p. 363.) mention occurs of linen shifts for ladies, made in Sicily, which certainly implies nothing more than that linen was woven in Sicily. The material for making it may have been imported. In like manner the linen of Malta was exceedingly admired

* Journal of a Tour in the Morea, vol. i. p. 12.

for its fineness and softness* ; but the raw material was in all probability imported.

“Flax,” observes Professor Müller, “was grown and manufactured in Southern Etruria from ancient times, and thus the Tarquinii were enabled to furnish *sail-cloth for the fleet of Scipio*: yarn for making nets was produced on the banks of the Tiber, and fine linen for clothing in Falerii†.” This account agrees remarkably with the views of Micali, and those historians who maintain the Egyptian origin of the Etrurians.

Pliny (xix. 1, 2.) mentions various kinds of flax of superior excellence, which were produced in the plains of the Po and Ticino ; in the country of the Peligni (in Picenum) ; and about Cumæ in Campania‡. No flax, he says, was whiter or more like wool than that of the Peligni.

In the next chapter Pliny gives an account of the mode of preparing flax ; plucking it up by the roots, tying it into bundles, drying it in the sun, steeping, drying again, beating it with a mallet on a stone, and lastly hackling it, or, as he says, “*combing it with iron hooks*.” This may be compared with the preceding extract from Colonel Leake’s Journal, and with chapter 97 of Bartholomæus Anglicus, *De Proprietabus Rerum*, which is perhaps partly copied from Pliny and treats of the manufacture of flax, steeping it in water, &c., and of its use for clothes, nets, sails, thread, and curtains.

In Spain there was a manufacture of linen at Emporium, which lay on the Mediterranean not far from the Pyrenees§. According to Pliny (*l. c.*) remarkably beautiful flax was produced in Hispania Citerior near Tarraco. He ascribes its splendor to the virtues of the river-water flowing near Tarraco, in which the flax was steeped and prepared. Still further southward on the same coast we find Setabis, the modern Xativa, which is celebrated by various authors for the beauty of its linen, and especially for linen *sudaria*, or handkerchiefs :

* Diod. Sic. l. v. 12. tom. i. p. 339. ed. Wesseling.

† Etrusker. vol. i. p. 235, 236.

‡ Probably Cumæ is intended by Gratius Faliscus in the expression “*Æoliæ de valle Sibyllæ*.”—*Cyneg.* 35.

§ Strabo, l. iii. cap. 4. vol. i. p. 428. ed. Siebenkees.

Setabis et telas Arabum sprevisse superba
Et Pelusiaco filum componere lino.

Silius Ital. iii. 373.

Nam sudaria Setaba ex Hiberis
Miserunt mihi muneri Fabullus
Et Veranius.—*Catullus*, xx. 14.

Hispanæque alio spectantur Setabis usu.

Gratius Faliscus, l. 41.

Pliny also mentions a kind of flax, called Zoelicum, from a place in Galicia.

Strabo (iv. 2. 2. p. 41. ed. Sieb.) particularly mentions the linen manufacture of the Cadurci: and from them the Romans obtained the best *tickings* for beds, which was on this account called Cadurcum.

Flax, as we are told by Pliny (xix. 1.), was *woven into sail-cloth in all parts of Gaul*; and, in some of the countries beyond the Rhine, the most beautiful apparel of the ladies was linen. Tacitus states that the women of Germany wore linen sheets over their other clothing*.

Jerome mentions the shirts of the Atrebates as one of the luxuries of his day, and his notice of them seems to show, that they were conveyed as an article of merchandize even into Asia.

Whether the manufactures of the Atrebates were equal to the modern Cambric we cannot say; but, supposing the garments in question to have been linen, it is remarkable that this manufacture should have flourished in Artois for 1800 years†.

The following translation of a passage from Eginhart's Life

* Fœminæ sæpius lineis amictibus velantur.—*Germania*, xvii. 5. The use of the same term for Flax in so many European languages, and especially in those of the North of Europe, is an evidence of the extensive use of this substance in very early times; e. g. Greek, Λίνον Latin, Linum; Slavonian, Len; Lithuanian, Linnai; Lettish, Linni; German, Lein; French, Suio; Gothic, and Anglo-Saxon, Lin; Welsh, Llin.

† Erasmus makes the following remarks on the words "Atrebatum et Laodiœæ:"

"Apparet ex his regionibus candidissima ac subtilissima linea mitti solere. Nunç hujus laudis principatus, si tamen ea laus, penes meos Hollandos est. Quanquam et Atrebates in Belgis haud ita procul a nobis absunt."

See also Mannert, Geogr. 2. l. p. 196.

of Charlemagne (c. 23.) shows, that during several succeeding centuries the Franks wore linen for their under garments.

Vestitu patrio, hoc est Francisco utebatur: ad corpus camiseam lineam, et feminalibus lineis induebatur: deinde tunicam, quæ limbo serico ambiebatur, et tibialia. Sago Veneto amictus. In festivitibus veste auro textâ, et calceamentis gemmatis, et fibulâ aureâ sagum astringente, diademate quoque ex auro et gemmis ornatus incedebat. Aliis autem diebus habitus ejus parum a communi et plebeio abhorrebat.

Charles drest after the manner of his countrymen, the Franks. Next to the skin he wore a shirt and drawers of linen: over these a tunic bordered with silk, and breeches. His outer garment was the sagum, manufactured by the Veneti. On occasion of festivals he wore a garment *interwoven with gold*, shoes adorned with gems, a golden fibula to fasten his sagum, and a diadem of gold and gems. On other days his dress differed little from that of the common people*.

The Veneti here mentioned were, no doubt, the people who lived in the country near Vannes in Britany. We have formerly seen (Part Second, pp. 282 and 283. Chapter III.), that the Sagum was the principal article of dress manufactured in the north of Gaul.

According to Paulus Diaconus, as quoted in the notes on this passage of Eginhart†, the Lombards and the Anglo-Saxons used principally linen garments.

Linen, which appears to have been originally characteristic of the Egyptian and Germanic nations, came by degrees into more and more general use among the Greeks and Romans, and was employed not only for articles of dress, especially those worn by women, and for sheets to lie upon, but also for *table-covers* and for *napkins* to wipe the hands, an application of them which was the more necessary on account of the want of knives, forks, and spoons. Also those who waited at table, were girt with towels. At the baths persons used towels to dry themselves. A man wore a similar piece of cloth under the hands of the tonsor. Plutarch (*On Garrulity*) tells the following anecdote of Archelaus. When a loquacious hair-dresser was throwing the *ὠμόλινον* about him in order to shear him, he asked as usual, "How shall I cut your majesty's hair?" "*In*

* The trowsers worn by the Franks were sometimes linen, sometimes made of skins.—Agathias ii. 5.

† Ed. Schmincke, Trajecti 1711, p. 110.

silence," replied the king. Alciphron tells of the barber putting on him a linen cloth (*σιιδών*) in order to shave him (*l. iii. Ep. 66.*); and Phaneas, in an Epigram, calls the cloth used in shaving by the same name, *Σιδών*. Diogenes Laertius also (*vi. 90.*) tells a story respecting the philosopher Crates, which shows that at Athens it was not deemed proper for a man to wear linen as an outer garment, but that persons were enveloped in it under the hands of the hair-dresser. "The Athenian police-officers (*οἱ ἀστυνομοὶ*) having charged him with wearing a linen sheet for his outer garment, he said, 'I will show you Theophrastus himself habited in that manner;' and when they doubted the fact, he took them to see Theophrastus at the hair-dresser's."

Coarser linen was used in great quantity both for sails, and for awnings to keep off the heat of the sun from the Roman theatres, the Forum, and other places of public resort*.

The Emperor Alexander Severus, as we learn from the following passage of his Life written by Ælius Lampridius, was a great admirer of good linen, and preferred that which was plain to such as had *flowers* or *feathers* interwoven as practised in Egypt and the neighboring countries.

Bōni linteaminis appetitor fuit, et quidem puri, dicens, 'Si linteī idcirco sunt, ut nihil asperum habeant, quid opus est purpurā?' In lineā autem aurum mitti, etiam dementiam iudicabat, quum asperitati adderetur rigor.

He took great delight in good linen, and preferred it plain. "If," said he, "linen cloths are made of that material in order that they may not be at all rough, *why mix purple with them?*" But to *interweave gold in linen*, he considered madness, because this made it rigid in addition to its roughness.

The following passage of the Life of the Emperor Carinus by Flavius Vopiscus is remarkable as proving the value attached by the Romans of that age to the linen imported from Egypt and Phœnice, especially to the *transparent* and *flowered* varieties.

Jam quid lineas petitas Ægypto loquar? Quid Tyro et Sidone tenuitate per-lucidas, micantes purpurā, plumandi difficultate pernobiles?

Why should I mention the linen cloths brought from Egypt, or those imported from Tyre and Sidon, which are so thin as to be *transparent*, which *glow with purple*, or are prized on account of their *labored embroidery*?

* See p. 321.

CHAPTER II.

HEMP*.

CULTIVATION AND USES OF HEMP BY THE ANCIENTS—ITS USE LIMITED
—THRACE—COLCHIS—CARIA—ETYMOLOGY OF HEMP.

THE use of Hemp among the ancients was very limited. It is never mentioned in the Scriptures, and not often by the heathen writers of antiquity. It is remarkable, that no notice is taken of it by Theophrastus. It was however used among the Greeks and Romans for making ropes and nets, but not for sacks, these being made of goats'-hair†.

The only reason for introducing hemp in this enumeration is, that, according to Herodotus (iv. 74.) *garments were made of it by the Thracians*. "They were so like linen," says he, "that none but a very experienced person could tell whether they were of hemp or flax; one, who had never seen hemp, would certainly suppose them to be linen." The coarser kinds of linen would, it is certain, be scarcely, if at all distinguishable from the finer kinds of hempen cloth.

Hesychius (*v. Κάπνα βίς*) quotes the preceding remark of Herodotus, only saying that the Thracian *women* made *sheets* of hemp (*ιμάτια*). In substituting these expressions he puts upon the words of Herodotus an explanation derived from his familiar knowledge of Grecian customs. To the present day hemp is produced abundantly in the vicinity of the countries which were occupied by the ancient Thracians. A traveller who has lately visited them, informs us, that "the men who drive the

* According to a statement in the Western (Missouri) Journal, about 7,000 bales of hemp, the crop of 1844, was shipped from that place last spring. It is thought that 20,000 bales will be raised in that neighborhood this year (1845).

† See Chap. IV. p. 299, 301.

horses, which drag the boats upon the Danube between Pest and Vienna, *now wear coarse tunics of hemp**.

Ammianus Marcellinus (xxx. 2. p. 474.), speaking of the Huns, who lived beyond the Palus Mæotis, says,

They cover themselves with tunics made of linen, or of the skins of *wild mice* sewed together.

These *tunics*, though called "lintea," may have been the hempen garments, which, according to Herodotus, were scarce to be distinguished from linen.

The next writer, who mentions hemp after Herodotus, is Moschion, rather more than 200 years B. C. He states†, that the magnificent ship *Syracusia*, built by the command of Hiero II., was provided with hemp from the Rhone for making ropes. The common materials for such purposes were *the Egyptian Papyrus, the bark of the Lime-tree, of the Hemp-leaved Mallow, and of the Spanish and Portugal Broom*, and probably also the *Stipa Tenacissima* of Linnæus.

Hemp, as well as flax, was grown abundantly in Colchis‡. It was brought to the ports of the Ægean Sea by the Ionian merchants, who were intimately connected with the northern and eastern coasts of the Euxine through the medium of the Milesian colonies. This fact may account for the cultivation of hemp in Caria. The best was obtained in the time of Pliny (*l. xix. c. 9.*) from Alabanda and Mylasa in that country. Pliny also mentions a kind, which grew in the country of the Sabines, and which was remarkable for its height.

Automedon, who lived a little before Pliny, complains in an Epigram of a bad dinner given him by one of his acquaintances, and compares the tall stringy cabbages to hemp§. As this author was a native of Cyzicus, he would probably have abundant opportunities of becoming familiar with the plant.

In the time of Pausanias hemp was grown in Elis. See his *Eliaca*, c. 26. § 4.

* *Travels in Circassia, &c.*, by Edmund Spencer, 1837, vol. i. p. 13.

† *Apud Athenæum*, l. v. p. 206. Casaub.

‡ *Strabo*, l. xi. § 17. vol. iv. p. 402, ed. Siebenkees.

§ *Kappa βίση*. *Brunck's Analecta*, ii. 209.

Dioscorides (*l. iii. c. 141.*) gives an account of hemp, in which he distinguishes between the *cultivated* and the *wild*. By *Wild Hemp* he means the *Althœæ Cannabina*, *Linn.** He observes respecting the Cultivated Hemp, by which he meant proper hemp, the *Cannabis Sativa*, *Linn.*, that it was "of great use for twisting the strongest ropes."

On the whole we may conclude, that hemp was not the natural growth either of Italy, Greece, or Asia Minor, but was confined, as it still is in a great degree, to countries lying further north and having a more rigid climate. The intimate connexion of the Romans with the Greek colony of Marseilles may have brought it among the Sabines, as the active trade between the Euxine and Miletus may have introduced it into Caria. With the material its name was also imported, and this is substantially the same in all the languages of Europe, as well as in many Asiatic tongues†.

* See Chap. XII. p. 194.

† Sanscrit, GONI, SANA, or SHANAPU; Persic, CANNA; Arabic, KANNEH, or KINNUB; Greek, KANNABIS; Latin, CANNABIS; Italian, CANNAPA; French, CHANVRE, or CHANBRE; Danish and Flamand, KAMP, or KENNEP; Lettish and Lithuanian, KANNAPES; Slavonian, KONOP; Erse, CANAIB; Scandinavian, HAMPR; Swedish, HAMP; German, HANF; Anglo-Saxon, HAENEP; English, HEMP. Our English word CANVASS (French, CANEVAS,) has the same origin, meaning cloth made of hemp (CANAV).

Hemp is comparatively rare in India, as well as flax; and, as flax is there only used for obtaining oil, so hemp is never used for making cordage or for weaving, *but only for smoking on account of the narcotic qualities of its leaves.* (Wissett on Hemp, p. 20, 25.) Its name SANA, SUNU, or GONU, is given also to the *Crotalaria Juncea*, which is principally applied by the Indians to the same uses as hemp in Europe. See Chap. XIII. p. 202.

If we compare flax with other spinning materials, such as wool and cotton, we shall find it to possess several characteristic properties. While cotton and wool are presented by nature in the form of insulated fibres, the former requiring merely to be separated from its seeds, and the latter to be purified from dirt and grease before being delivered to the spinner, flax must have its filaments separated from each other by tedious and painful treatment. In reference to the spinning and the subsequent operations, the following properties of flax are influential and important:—

1. The considerable length of the fibres, which renders it difficult, on the one hand, to form a fine, level, regular thread, on the other, gives the yarn a considerably greater tenacity, so that it cannot be broken by pulling out the threads from each other, but by tearing them across.

2. The smooth and slim structure of the filaments, which gives to linen its peculiar polished aspect, and feel so different from cotton, and especially from woollen stuffs, unless when disguised by dressing. The fibres of flax have no mutual entanglement, whereby one can draw out another as with wool, and they must therefore be made adhesive by moisture. This wetting of the fibres renders them more pliant and easier to twist together.

3. The small degree of elasticity, by which the simple fibres can be stretched only one twenty-fifth of their natural length before they break, while sheep's wool will stretch from one fourth to one half before it gives way.

Good flax should have a bright silver gray or yellowish color (inclining neither to green nor black); it should be long, fine, soft, and glistening, somewhat like silk, and contain no broad tape-like portions, from undis severed filaments. Tow differs from flax in having shorter fibres, of very unequal length, and more or less entangled. Hemp agrees in its properties essentially with flax, and must be similarly treated in the spinning processes.

The manufacture of linen and hemp yarn, and the tow of either, may be effected by different processes; by the distaff, the hand-wheel, and spinning machinery. It will be unnecessary to occupy the pages of this volume with a description of the first two well known domestic employments. Spinning of flax by *machinery* has been much more recently brought to a practical state than the spinning of cotton and wool by machines, of which the cause must be sought for in the nature of flax as above described. The first attempts at the machine spinning of flax, went upon the principle of cutting the filaments into short fragments before beginning the operation. But in this way the most valuable property of linen yarn, its cohesive force, was greatly impaired; or these attempts were restricted to the spinning of tow, which on account of its short and somewhat tortuous fibres, could be treated like cotton, especially after it had been further torn by the carding engine. The first tolerably good results with machinery seem to have been obtained by the brothers Girard at Paris, about the year 1810. But the French have never carried the apparatus to any great practical perfection. The towns of Leeds in Yorkshire, of Dundee in Scotland, and Belfast in Ireland, have the merit of bringing the spinning of flax by machines into a state of perfection little short of that for which the cotton trade has been so long celebrated.

For machine spinning, the flax is sometimes heckled by hand, and sometimes by machinery. The series of operations is the following:—

1. The heckling.
2. The conversion of the flax into a band of parallel rectilinear filaments, which forms the foundation of the future yarn.
3. The formation of a sliver from the riband, by drawing it out into a narrower range of filaments.
4. The coarse spinning, by twisting the sliver into a coarse and loose thread.
5. The fine spinning, by the simultaneous extension and twisting of that coarse thread.

All heckle machines have this common property, that the flax is not drawn through them, as in working by hand, but, on the contrary, the system of heckles is moved through the flax properly suspended or laid. Differences exist in the shape, arrangement, and movements of the heckles, as also in regard to the means

by which the adhering tow is removed from them. The simplest and most common construction is to place the heckles upon the surface of a horizontal cylinder, while the flax is held either by mechanical means or by the hand during its exposure to the heckle points. Many machines have been made upon this principle. It is proper in this case to set the heckle teeth obliquely in the direction in which the cylinder turns, whereby they penetrate the fibres in a more parallel line, effect their separation more easily, and cause less waste in torn filaments. To conduct the flax upon the cylinders, two horizontal fluted rollers of iron are employed, which can be so modified in a moment by a lever as to present the flax more or less to the heckling mechanism. The operator seizes a tress lock of flax with her hand and introduces it between the fluted rollers, so that the tips on which the operation must begin, reach the heckles first, and by degrees the advancing flax gets heckled through two thirds or three fourths of its length, after which the tress or strick is turned, and its other end is subjected to the same process. By its somewhat rapid revolution the heckle cylinder creates a current of air which not only carries away the boomy particles, but also spreads out the flax like a sheaf of corn upon the spikes, effecting the same object as is done by the dexterous swing of the hand. The tow collects betwixt the teeth of the heckle, and may, when its quantity has become considerable, be removed in the form of a flock of parallel layers.

Flax has been for a long period spun wet in the mills; a method no doubt copied from the practice of housewives moistening their yarn with their saliva at the domestic wheel. Within a few years the important improvement has been introduced of substituting hot for cold water, in the troughs through which the fibres in the act of spinning pass. By this means a much finer, smoother, and more uniform thread can be spun than in the old way. The flax formerly spun to twelve pounds a bundle is, with hot water, spun to six. The inconvenience of the spray thrown from the yarn on the fliers remains, aggravated by increased heat and dampness of the room where this hot process goes on. Being a new expedient, it receives daily changes and ameliorations. When first employed, the troughs of hot water were quite open; they are now usually covered in, so as almost entirely to obviate the objections to which they were previously liable. With the covers has been also introduced a new method of piecing or joining on any end, which may have been run down, namely, by splicing it to the adjoining roving, whereby it is carried through the water without imposing a necessity on the spinner to put her hand into the water at all. In some places she uses a wire, for the purpose of drawing through the end of the roving to mend a broken yarn.

This may be considered the inherent evil of flax-spinning,—the spray thrown off by the wet yarn, as it whirls about with the flier of the spindles. A working dress, indeed, is generally worn by the spinners; but, unless it be made of stuff impermeable to water, like Mackintosh's cloth, it will soon become uncomfortable, and cause injury to health by keeping the body continually in a hot bath. In some mills, water-proof cloth and leather aprons have actually been introduced, which are the only practicable remedy; for the free space which must be left round the spindles for the spinner to see them play, is incompatible with any kind of fixed guard or *parapluie*.

CHAPTER III.

ASBESTOS.

Uses of Asbestos—Carpasian flax—Still found in Cyprus—Used in funerals—Asbestine-cloth—How manufactured—Asbestos used for fraud and superstition by the Romish monks—Relic at Monte Casino—Further impostures of the monks—Remarks thereon.

VARRO mentions the name *Asbestos* as a proof, that the cloth so called was a Greek invention*. His argument is obviously correct. The term (ἄσβεστος) means *inextinguishable*, and was most properly applied to the wicks of lamps, which were made of this substance and were never consumed.

The fullest account of the properties and uses of Asbestos is contained in the following passage from Sotacus, a Greek author who wrote on Stones†. The passage occurs in the *Historiæ Commentitiæ*, attributed to Apollonius Dyscolus (*cap.* 36).

The Carystian stone has woolly and colored appendages, which are *spun* and woven into *napkins*. This substance is also twisted into wicks, which, when burnt, are bright, but do not consume. The napkins, when dirty, are not washed with water, but a fire is made of sticks, and then the napkin is put into it. The dirt disappears, and the napkin is rendered white and pure by the fire, and is applicable to the same purposes as before. The wicks remain burning with oil continually without being consumed. This stone is produced in Carystus, from which it has its name, and in great abundance in Cyprus under rocks to the left of Elmæum, as you go from Gerandros to Soli.—*Yates's Translation.*

“At Carystus,” says Strabo, “under Mount Ocha in Eubœa is produced the stone, which is combed and woven so as to make *napkins* (χειρόμακτρα) or *handkerchiefs*. When these have become dirty, instead of being washed, they are thrown into a flame and thus purified‡.”

* De Lingua Lat. L. v. p. 134. ed. Spengel.

† Sotacus is several times quoted by Pliny (L. xxxvi., xxxvii.) as a foreign writer on Stones.

‡ Lib. x. p. 19. ed. Sieb.

Plutarch speaks in similar terms of napkins, nets, and *head-dresses*, made of the Carystian stone, but says, that it was no longer found in his time, only thin veins of it, like hairs, being discoverable in the rock*.

Mr. Hawkins ascertained, that the rock, which was quarried in Mount Ocha, now called St. Elias, above Carystus, is the Cipolino of the Roman antiquaries†. Further north in the same island Dr. Sibthorp observed “rocks of *Serpentine* in beds of saline marble, forming the Verdantique of the ancients‡:” and he states, that on the shore to the north of Negropont “the rocks are composed of serpentine stone with veins of asbestos and soapstone intermixed§.” Tournefort speaks of Amiantus as brought from Carysto in his time, but of inferior quality||.

Pausanias (i. 26. 7.) says, the wick of the golden lamp which was kept burning night and day in the temple of Minerva Polias at Athens, was “of *Carpasian flax*, the only kind of flax which is indestructible by fire.” This “Carpasian flax” was asbestos from the vicinity of Carpasus, a town near the north-east corner of Cyprus, which retains its ancient name, *Carpas*.

Dioscorides (L. v. c. 93.) gives a similar account of the qualities and uses of Amiantus, and says it was produced in Cyprus¶.

Majolus says**, that in the year 1566 he saw at Venice Podocattarus, a knight of Cyprus, and a writer on the history of that island, who exhibited at Venice cloth made of the asbestos of his country, which he threw into the fire, and took it out uninjured and made quite clean.

Referring to Cyprus, Sonnini (*Voyage en Grèce*, i. p. 66.) says,

L'amiante, *asbestos*, ou lin incombustible des anciens, est encore aussi abon-

* De Oraculorum Defectu, p. 770. ed. H. Stephani, Par. 1572.

† Travels in various Countries of the East, edited by Walpole, p. 288.

‡ Ibid. p. 37.

§ Ibid. p. 38.—N. B. Asbestos is always found in rocks of Serpentine.

|| Voyage, English Translation, vol. i. p. 129.

¶ See p. 392.

** Dier. Canicular. Part I. Collog. xx. p. 453.

dant qu'il le fut autrefois ; la carrière qui le fournit est dans la montagne d'Akamantide, près du cap Chromachiti.

Le talc est commun, surtout près de Larnaca, où on l'emploie à blanchir les maisons ; et le plâtre a de nombreuses carrières.

The "talc" may be the same with the "Lapis specularis," which was found in Cyprus, according to Pliny (xxxvi. 45.). The testimony of Sonnini so far agrees with those of the ancients, that all the places mentioned were on the northern side of the island, so that the asbestos seems to have been found between Solæ towards the West and Carpas towards the East.

Pietro della Valle, when he was at Larnaca, was presented with a piece of the amiantus of the country, but says that it was no longer spun and woven.

Pliny, if we can rely upon his testimony as given in the existing editions of his works, states, that Asbestos was obtained in Arcadia (H. N. xxxvii. 54.) and in India.

"A kind of flax has been discovered which is incombustible by fire. It is called *live flax*; and we have seen napkins of it burning upon the hearth at entertainments, and, when thus deprived of their dirt, more resplendent through the agency of fire than they could have been by the use of water. The funeral shirts made of it for kings preserve the ashes of the body separate from those of the rest of the pile. It is produced in deserts and in tracts scorched by the Indian sun, where there are no showers, and among dire serpents, and thus it is inured to live even when it is burnt. It is rare, and woven with difficulty on account of the shortness of its fibres. That variety which is of a red color becomes resplendent in the fire. When it has been found it equals the prices of excellent pearls. It is called by the Greeks Asbestine Flax, on account of its nature. Anaxilaus relates, that if a tree surrounded with cloth made of it be beaten, the strokes are not heard. On account of these properties this flax is the first in the world. The next in value is that made of byssus, which is produced about Elis in Achaia, and used principally for fine female ornaments. I find that a scruple of this flax, as also of gold, was formerly sold for four denarii*. The nap of linen cloths, obtained chiefly from the sails of ships, is of great use in surgery, and their ashes have the same effect as spodium. There is a certain kind of poppy the use of which imparts the highest degree of whiteness to linen cloths."—Pliny, Lib. xix. ch. 4.

Besides the manufacture of napkins, this description exactly agrees with the accounts of Strabo, Sotacus, Dioscorides, and

* i. e. eighteen grains of this flax were worth 2s. 10d. stg., being equal in value to its weight in gold.

city with himself. For there can be scarcely a doubt, but that Leo, who wrote the MS., was the same who was the author of the Chronicon. The author of the Chronicon, at the commencement of his history, calls himself "Frater Leo, cognomine Marsicanus*". He was made Bishop of Ostia A. D. 1101, so that we may suppose him to have been twenty or thirty years of age, when the MS. was made. Of his aptitude for such an employment we cannot doubt, when we consider his future labors as Librarian and author of the Chronicle. But if these facts be evident, it is equally manifest, that these two accomplished Benedictines could not have expressed their veneration towards their founder in any way better suited to their ideas and belief than by exhibiting in the manner described that relic, WHICH WAS SOLEMNLY DISPLAYED ONCE A YEAR WITH BURNING CANDLES AND ATTENDING ACOLYTHES TO THE ADMIRING AND ADORING CROWD OF DEVOTEES.

On inquiry it is found that this relic exists no longer at Monte Casino, although the original copy of the Chronicon of Leo Ostiensis is still preserved in the Library†. It appears that the relic has long been lost, since there is no mention either of it, or of the casket which contained it in the "Descrizione Istorica del Monastero di Monte Casino, Napoli, 1775."

A large glove of this substance is in the Hunterian Museum at Glasgow. An English traveller states that he has lately seen at Parma a *table-cloth*, made of Amiantus from Corsica, for the use of the ex-Empress Maria Louisa, who resided there after the fall of Napoleon.

In modern times cloth of asbestos is scarcely made. Indeed it is not probable that this material will ever be obtained in much abundance, or that it will cease to be a rarity except in the places of its production. It is never seen in Great Britain, or on the continent, save in the cabinets of the curious.

* Marsicana (civitas) was in Marsica, the territory of the ancient Marsi.

† Excursions in the Abruzzi, by the Hon. Keppel Craven, vol. i. p. 54.

The annexed Map (Plate VII.) is designed to indicate the divisions of the Ancient World as determined by the Raw Materials principally produced and employed in them for weaving.

The Red division produced Sheeps'-Wool and Goats'-Hair : also Beavers'-Wool in the portion of this division, which lies to the North of the Mediterranean Sea, and of the rivers Padus and Ister : and Camels'-Wool and Camels'-Hair in the portion lying South-East of a line drawn through the coast of Syria. The nations to the North of this division clothed themselves in skins, furs, and felt.

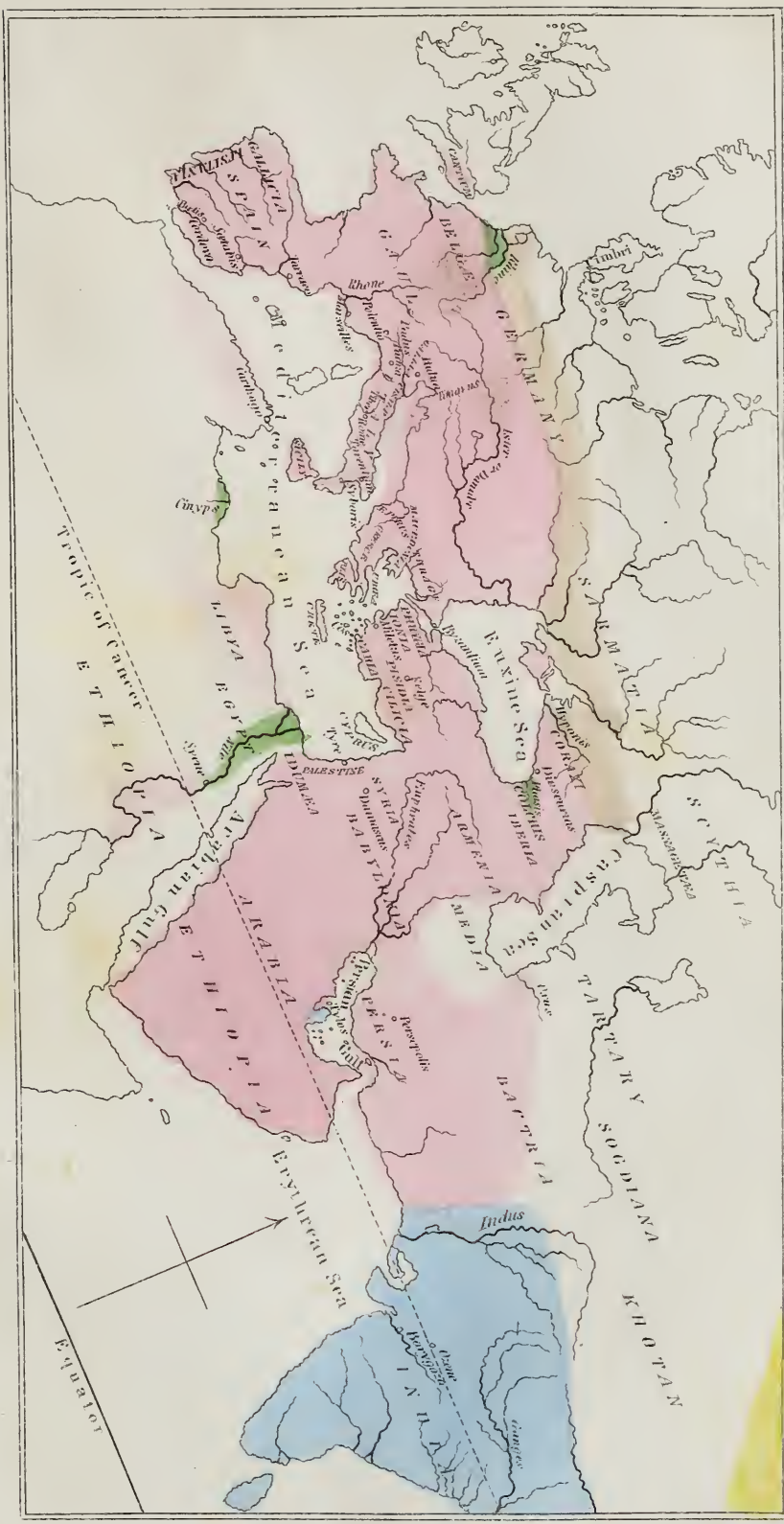
The Yellow at the Eastern corner indicates the commencement of the vast Region, unknown to the Ancients, the inhabitants of which clothed themselves in Silk.

The Green indicates the countries, all low and bordering on rivers, in which the cloth manufactured was chiefly Linen.

The Brown is designed to show the cultivation of Hemp in the low country to the North of the Euxine Sea, and probably in other places, North of the Red division, which were adapted for its growth.

Lastly, the Blue, which is the colour of the Baharein Isles and of India, shows that the inhabitants of these countries have from time immemorial clothed themselves in Cotton.

MAP showing the Divisions of the ANCIENT WORLD according to the Raw Materials principally produced in them for Weaving.



APPENDICES.

APPENDIX A.

ON PLINY'S NATURAL HISTORY.

Sheep and wool—Price of wool in Pliny's time—Varieties of wool and where produced—Coarse wool used for the manufacture of carpets—Woollen cloth of Egypt—Embroidery—Felting—Manner of cleansing—Distaff of Tanaquil—Varro—Tunic—Toga—Undulate or waved cloth—Nature of this fabric—Figured cloths in use in the days of Homer (900 B. C.)—Cloth of gold—Figured cloths of Babylon—Damask first woven at Alexandria—Plaided textures first woven in Gaul—\$150,000 paid for a Babylonish coverlet—Dyeing of wool in the fleece—Observations on sheep and goats—Dioscurias a city of the Colchians—Manner of transacting business.

LIB. VIII. c. 47s. 72. 50s. 76.*

“We are also much indebted to sheep both in sacrifices to propitiate the gods, and in the use of their fleeces. As oxen produce by cultivation the food of men, so we owe to sheep the protection of our bodies. . . . There are two principal kinds of sheep, the *covered* and the *common*. The former is softer, the latter more delicate in feeding, inasmuch as the covered feeds on brambles. Its coverings are chiefly of Arabic materials.

“The most approved wool is the Apulian, and that which is called *the wool of Greek sheep* in Italy, and *the Italic wool* in other places. The third kind in value is that obtained from Milesian sheep. The Apulian wools have a short staple, and are only celebrated for making pænulas. They attain the highest degree of excellence about Tarentum and Canusium. In Asia wools of the same kind are obtained at Laodicea. No white wool is preferred to those which are produced about the Po, nor has a pound ever yet exceeded a hundred sesterces (about \$3,60.). Sheep are not shorn everywhere: in certain places the practice of pulling off the wool continues. There are various colors of wool, so that we want terms to denote all. Spain produces some of those varieties which we call *native*; Pollentia, near the Alps, furnishes the chief kinds of black wool; Asia

* The edition here followed is that of Sillig, Lipsiæ, 1831-6, 5 vols., 12mo.

and Bætica those ruddy varieties called *Erythrean*; Canusium a sandy-colored* wool; and Tarentum one of a dark shade peculiar to that locality. New-shorn greasy wools have all a medicinal virtue. The wool of Istria and Liburnia being more like hair than wool, is unsuitable for making the cloths which have a *long nap*. This is also the case with the wool of Salacia in Lusitania; but the cloth made from it is recommended by its *plaided pattern*. A similar kind is produced about Piscenæ (i. e. *Pezenas*), in the province of Narbonne, and likewise in Egypt, the woollen cloth of which country, having been worn by use, is *embroidered* and lasts some time longer. The *coarse wool with a thick staple was used in very ancient times for carpets*: at least Homer (900 B. C.) speaks of the use of it. *The Gauls have one method of embroidering these carpets, and the Parthians another*. Portions of wool also make cloth *by being forced together by themselves*†. With the addition of vinegar these also resist iron, nay even fires, which are the last expedient for purging them; for, having been taken out of the caldrons of the polishers, they are sold for the stuffing of beds, an invention made, I believe, in Gaul, certainly in the present day distinguished by Gallic names: for in what age it commenced I could not easily say, since the ancients used beds of straw, such as are now employed in camps. The cloths called *gausapa* began to be used within the memory of my father; those called *amphimalla* within my own, (See Part First, p. 30,) as well as the shaggy coverings for the stomach, called *ventralia*. For the tunic with the laticlave is now first beginning to be woven after the manner of the *gausapa*. The black wools are never dyed. Concerning the dyeing of the others we shall speak in their proper places, in treating of sea-shells or the nature of herbs.

“M. Varro says, that the wool continued to his time upon the distaff and spindle of Tanaquil, also called Caia Cæcilia, in the temple of Sangus; and that there remained in the temple of Fortune a royal undulate toga made by her, which Servius Tullius had worn. Hence arose the practice of carrying a distaff with wool upon it, and a spindle with its thread, after virgins who were going to be married. She first wove the straight tunic, such as is worn by tiros together with the *toga pura*, and by newly-married women. The *undulate* or waved cloth was originally one of the most admired; from it was derived the *soriculate*‡. Fenestrella writes, that *scraped* and *Phryxian* togas came into favor about the end of the

* This term is adopted as the best translation of the Latin *fulvus*, which, as well as the corresponding Greek adjective ξαυθός, denoted a light yellowish-brown. Hence it was so commonly applied to the light hair, which accompanies a light complexion and often indicates mental vivacity, and which has consequently been always considered beautiful. Hence also it was used to denote the appearance of the Tiber and other rivers, when they were rendered turbid by the quantity of sand suspended in their waters.—See Fellows's *Discoveries in Lycia*.

† See Appendix C.

‡ It is probable that *soriculate* cloth was a kind of velvet, or plush, so called from its resemblance to the coat of the field-mouse, *sorex*, dim. *soricula*. *Soriculata* may have been changed into *sororiculata* by repeating *or* at the beginning of the word.

reign of the Divine Augustus. The *thick popped togas* are of remoter origin, being noticed even so far back as by the poet Lucilius in his Torquatus. The *toga prætexta* was invented among the Etruscans. I find evidence that kings wore the *striped toga**, that figured cloths were in use even in the days of Homer; and that these gave rise to the *triumphal*. To produce this effect with the needle was the invention of the Phrygians, on which account cloths so embroidered have been called *Phrygionic*. In the same part of Asia king Attalus (see Part I. p. 88.) discovered the art of inserting a woof of gold: from which circumstance the *Attalic* cloths received their name. Babylon first obtained celebrity by its method of *diversifying the picture with different colors*, and gave its name to textures of this description. But to weave with a great number of leashes, so as to produce the cloths called *polymita* (i. e. damask cloths), was first taught in Alexandria; to divide by squares (i. e. plaids) in Gaul. Metellus Scipio brought it as an accusation against Cato, that even in his time Babylonian coverlets for triclinia were sold for 800,000 sesterces (\$30,000), although the emperor Nero lately gave for them no less than 4,000,000 sesterces (about \$150,000). The *prætexta* of Servius Tullius, covering the statue of Fortune which he dedicated, remained until the death of Sejanus, and it is wonderful that they had neither decayed of themselves nor been injured by the worms of moths through the space of 560 years. We have, moreover, seen the fleeces of living sheep dyed with purple, with the coccus, or the murex, in pieces of bark *a foot and a half long*, luxury appearing to force this upon them as if it were their nature.

“In the sheep itself the excellence of the breed is sufficiently shown by the shortness of the legs and the clothing of the belly. Those which have naked bellies used to be called *apicæ*, and were condemned. The tails of the Syrian sheep are a cubit broad, and in that part they bear a great quantity of wool. It is thought premature to castrate lambs before they are five months old. In Spain, but especially in Corsica, there is a race of animals called musmons, resembling sheep, except that their covering is more like goats'-hair. The ancients called the mixed breed of sheep and musmons *Umbri*. *Sheep have a very weak head*, on which account they are obliged to turn from the sun in feeding. *They are most foolish animals*. Where they have been afraid to enter, they follow one dragged along by the horn. They live ten years at the longest, but in Æthiopia thirteen years. Goats live there eleven years, and in other countries eight at the most. . . . In Cilicia and about the Syrtes, goats have a shaggy coat, which admits of being shorn.”

LIB. VI. c. 5.

“The remaining shores are occupied by savage nations, as the Melanchlæni and Coraxi, Dioscurias, a city of the Colchians, near the river Anthemus, being now deserted, although formerly so illustrious, that Timosthenes has recorded that three hundred nations used to resort to it, speaking different languages; and that business was afterwards transacted on our part through the medium of one hundred and thirty interpreters.”

* The toga worn by the kings and other supreme magistrates among the Romans was called *trabea* from the stripes, which were compared to the joists or rafters of a building (*trabes*).

APPENDIX B.

ON THE ORIGIN AND MANUFACTURE OF LINEN AND COTTON PAPER.

THE INVENTION OF LINEN PAPER PROVEN TO BE OF EGYPTIAN ORIGIN,
—COTTON PAPER MANUFACTURED BY THE BUCHARIANS AND ARABI-
ANS, A. D. 704.

Wehrs gives the invention of Linen paper to Germany—Schönemann to Italy—Opinion of various writers, ancient and modern—Linen paper produced in Egypt from mummy-cloth, A.D. 1200—Testimony of Abdollatiph—Europe indebted to Egypt for linen paper until the eleventh century—Cotton paper—The knowledge of manufacturing, how procured, and by whom—Advantages of Egyptian paper manufacturers—Clugny's testimony—Egyptian manuscript of linen paper bearing date A. D. 1100—Ancient water-marks on linen paper—Linen paper first introduced into Europe by the Saracens of Spain—The Wasp a paper-maker—Manufacture of paper from shavings of wood, and from the stalks or leaves of Indian-corn.

No part of the *Res Diplomatica* has been more frequently discussed than the question respecting the origin of paper made from linen rags. The inquiry is interesting on account of the unspeakable importance of this material in connection with the progress of knowledge and all the means of civilization, and it also claims attention from the philologist as an aid in determining the age of manuscripts.

Wehrs refers to a document written A. D. 1308 as the oldest known specimen of linen paper; and, as the invention must have been at least a little previous to the preparation of this document, he fixes upon 1300 as its probable date*. Various writers on the subject, as Von Murr, Breitkopf, Schönemann, &c., concur in this opinion.

Gotthelf Fischer, in his Essay on Paper-marks†, cites an

* Vom Papier, p. 309, 343.

† This Essay, translated into French, is published by Jansen, in his *Essai sur l'origine de la gravure en bois et en taille-douce*, Paris 1808, tome i. p. 357-385.

extract from an account written in 1301 on linen paper. In this specimen the mark is a circle surmounted by a sprig, at the end of which is a star. The paper is thick, firm, and well grained; and its water-lines and water-marks (*vergures et pontuseaux*) may readily be distinguished.

The date was carried considerably higher by Schwandner, Principal Keeper of the Imperial Library at Vienna, who found among the charters of the Monastery of Göss in Upper Stiria one in a state of decay, only seven inches long and three wide. So highly did he estimate the value of this curious relic as to publish in 1788 a full account of his discovery in a thin quarto volume, which bears the following title, "*Chartam linteam antiquissimam, omnia hactenus producta specimina ætate suâ superantem, ex cimeliis Bibliothecæ Augustæ Vindobonensis exponit Jo. Ge. Schwandner,*" &c. The document is a mandate of Frederick II. Emperor of the Romans, entrusting to the Archbishop of Saltzburg and the Duke of Austria the determination of a dispute between the Duke of Carinthia and the Monastery of Göss respecting the property of the latter in Carinthia. Schwandner proves the date of it to be 1243. He does not say whether it has any lines or water-mark, but is quite satisfied from its flexibility and other qualities, that it is linen. Although on the first discovery of this document some doubt was expressed as to its genuineness, it appears to have risen in estimation with succeeding writers; and we apprehend it is rather from inadvertence than from any deficiency in the evidence, that it is not noticed at all by Schönemann, Ebert, Delandine, or by Horne. Due attention is, however, bestowed upon it by August Friedrich Pfeiffer *Über Bücher-Handschriften*, Erlangen 1810, p. 39, 40.

With regard to the circumstances which led to the invention of the paper *now in common use*, or the country in which it took place, we find in the writers on the subject from Polydore Virgil to the present day nothing but conjectures or confessions of ignorance. Wehrs supposes, and others follow him, that in making paper linen rags were either by accident or through design at first mixed with cotton rags, so as to produce a paper, which was partly linen and partly cotton, and that this led by

degrees to the manufacture of paper from linen only*. Wehrs also endeavors to claim the honor of the invention for Germany, his own country; but Schönemann gives that distinction to Italy, because there, in the district of Ancona, a considerable manufacture of cotton paper was carried on before the fourteenth century†. All however admit, that they have no satisfactory evidence on the subject.

A clear light is thrown upon these questions by a remark of the Arabian physician, Abdollatiph, who visited Egypt A. D. 1200. He informs us‡, “*that the cloth found in the catacombs, and used to envelope the mummies, was made into garments, or sold to the scribes to make paper for shop-keepers.*” Having shown (See Part IV. Chapter I.) that this cloth was linen, the passage of Abdollatiph, therefore, may be considered as a decisive proof, which, however, has never been produced as such, of the manufacture of linen paper as early as the year 1200.

This account coincides remarkably with what we know from various other sources. Professor Tychsen, in his learned and curious dissertation on the use of paper from Papyrus (published in the *Commentationes Reg. Soc. Gottingensis Recentiores*, vol. iv. A. D. 1820), has brought abundant testimonies to prove *that Egypt supplied all Europe with this kind of paper until towards the end of the eleventh century.* The use of it was then abandoned, cotton paper being employed instead. The Arabs in consequence of their conquests in Bucharia had learnt the art of making *cotton paper* about the year 704, and through them or the Saracens it was introduced

* Vom Papier, p. 183.

† Diplomantik, vol. i. p. 494.

‡ Chapter iv. p. 188 of Silvestre de Sacy's French translation, p. 221 of Wahl's German translation. This interesting passage was translated as follows by Edward Pococke, the younger:—“*Et qui ex Arabibus, incolisve Rifæ, aliisve, has arcas indagant, hæc integumenta diripiunt, quodque in iis rapiendum invenitur; et conficiunt sibi vestes, aut ea chartariis vendunt ad conficiendam chartam empireaticam.*”

Silvestre de Sacy (Notice, &c.), animadverting on White's version which is entirely different, expresses his approbation of Pococke's, from which Wahl's does not materially differ.

into Europe in the eleventh century*. We may therefore consider it as in the highest degree probable, that the mode of making cotton paper was known to the paper-makers of Egypt. At the same time endless quantities of linen cloth, the best of all materials for the manufacture of paper, were to be obtained from the catacombs.

If we put together these circumstances, we cannot but perceive how they conspire to illustrate and justify the statement of Abdollatiph. We perceive the interest which the great Egyptian paper-manufacturers had in the improvement of their article, and the unrivalled facilities which they possessed for this purpose; and thus, we apprehend, the direct testimony of an eye-witness of the highest reputation for veracity and intelligence, supported as it is by collateral probabilities, clears a great measure the long-agitated question respecting the origin of paper such as we *now* commonly use.

The evidence being carried thus far, the question is, whether it is not sufficient to establish the truth of the statement with it the following

Sed cojusmodi libri
 que ex pellibus
 talium paludum
 ore materia
 tinctum
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curate. The expression "*scrapings of old cloths*" agrees exactly with the mode of making paper from linen rags, but is not in accordance with any facts known to us respecting the use of woollen or cotton cloth. The only objection against this view of the subject is, that, as Peter of Clugny had not when he wrote this passage travelled eastward of France, we can scarcely suppose him to have been sufficiently acquainted with the manners and productions of Egypt to introduce any allusion to their newly invented mode of making paper. But we know that the Abbey of Clugny had more than 300 churches, colleges, and monasteries dependent on it, and that at least two of these were in Palestine and one at Constantinople. The intercourse which must have subsisted in this way between the Abbey of Clugny and the Levant, may account for the Abbot's allusion with the fact. It is therefore probable that the mode of making paper in Egypt from the scrapings of old cloths had been invented

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known how to make paper. We are still behind in our arts and sciences, because we have not always been observers. If we had watched the operations of insects, and the structure of insects in general, with more care, we might have been far advanced in the knowledge of many arts which are yet in their infancy, for nature has given us abundance of patterns. We have learnt to perfect some instruments of sound by examining the structure of the human ear; and the mechanism of an eye has suggested some valuable improvements in achromatic glasses.

Réaumur has given a very interesting account of the wasps of Cayenne (*Chartergus nidulans*), which hang their nests in trees*. Like the bird of Africa called the social grosbeak (*Loxia socia*), they fabricate a perfect house, capable of containing many hundreds of their community, and suspend it on high out of the reach of attack. But the Cayenne wasp is a more expert artist than the bird. He is a *pasteboard-maker*;—and the card with which he forms the exterior covering of his abode is so smooth, so strong, so uniform in its texture, and so white that the most skilful manufacturer of this substance might be proud of the work. It takes ink admirably!

The nest of the pasteboard-making wasp is impervious to water. It hangs upon the branch of a tree, and those rain-drops which penetrate through the leaves never rest upon its hard and polished surface. A small opening for the entrance of the insects terminates its funnel-shaped bottom. It is impossible to unite more perfectly the qualities of lightness and strength.

Mr. J. Rennie, speaking of wasps' nests, gives us the following interesting account of one lately examined by him:—"The length," says he, "is about nine inches, six stout circular platforms stretch internally across, like so many floors, and fixed all round to the walls of the nest. They are smooth above, with hexagonal cells on the under surface. These platforms are not quite flat, but rather concave above, like a watch-glass reversed;

* Mémoires sur les Insectes, tom. vi., mem. vii. See also Bonnet, vol. ix.

the centre of each platform is perforated for the admission of the wasps, at the extremity of a short funnel-like projection, and through this access is gained from story to story. On each platform, therefore, can the wasps walk leisurely about, attending to the pupæ secured in the cells, which, with the mouths downward, cover the ceiling above their heads—the height of the latter being just convenient for their work.”

Pendent wasps'-nests of enormous size are found in Ceylon, suspended often in the talipot-tree at the height of seventy feet. The appearance of these nests thus elevated, with the larger leaves of the tree, used by the natives as umbrellas and tents, waving over them, is very singular. Though no species of European wasp is a storer of honey, yet this rule does not apply to certain species of South America. In the “Annals and Magazine of Natural History” for June, 1841, will be found a detailed account, with a figure of the pendent nest of a species termed by Mr. A. White *Myraptera scutellaris*. The external case consists of stout cardboard covered with conical knobs of various sizes. The entrances are artfully protected by pent-roofs from the weather and heavy rains; and are tortuous, so as to render the ingress of a moth or other large insect difficult. Internally are fourteen combs, exclusive of a globular mass, the nucleus of several circular combs, which are succeeded by others of an arched form—that is, constituting segments of circles.

Good writing, printing and wrapping paper, may be procured from the shavings of common wood. The wood must be reduced to shavings by the ordinary jack-plain shaving size. The shavings are then placed in a cistern or boiler sufficiently large, and covered with water, which should be raised to the boiling-point. To every one hundred pounds of the wood so reduced, from twelve to eighteen pounds of alkali, either vegetable or mineral, is to be added, in proportion to its quality for strength. If salts are used they should be reduced before coming in contact with the wood. The salts may, however, be put in with the water and wood before reduction, but the first method is the most preferable. Should lime be used, there must

be a sufficient, in all cases, to equal twelve pounds of pure black salts. One hundred pounds of wood will, if well attended to, make from five to seven reams of paper*.

* Mr. Edmund Shaw, of Fenchurch Street, London, obtained a patent in England bearing date September 14, 1837, for a method of manufacturing paper from the leaves which cover the ears of Indian-corn.

According to this patent the envelopes or leaves which cover the corn are in the first instance put into a vessel containing water. The water may be pure or slightly alkaline; the water is then boiled in the vessel into which the aforesaid envelopes or fellicular leaves are thrown, after being macerated. When they have imbibed water and become thickened and swollen, so that the matter interposed between the fibres is reduced to a state of pulp or jelly, a slight beating by fulling, mallet, or other mechanical means will effect a separation of the fibre from the adherent glutinous matter, and washing or rinsing with water during the beating, will cleanse it entirely from the glutinous matter.

The fibre is then bleached, by immersing, or immersing and beating or stirring it about in a solution of chloride of lime, or with beating engines, as at present practised for the bleaching of rags in paper mills, and the fibre is in like manner reduced to pulp, and paper manufactured therefrom, or the quality of the paper may be varied by the admixture of a portion of rags or other filamentous substance.

It may be well to remark, that some attempts to produce paper from the above mentioned material, have been made, but were abandoned from the incapability of producing good white paper.

The patentee claims the mode, or process, above described of making white paper by the application of bleached pulp, produced from the stalks or leaves of Indian-corn.

APPENDIX C.

ON FELT.

MANUFACTURE AND USE OF FELTING BY THE ANCIENTS.

Felting more ancient than weaving—Felt used in the East—Use of it by the Tartars—Felt made of goats'-hair by the Circassians—Use of felt in Italy and Greece—Cap worn by the Cynics, Fishermen, Mariners, Artificers, &c.—Cleanthes compares the moon to a skull-cap—Desultores—Vulcan—Ulysses—Phrygian bonnet—Cap worn by the Asiatics—Phrygian felt of Camels'-hair—Its great stiffness—Scarlet and purple felt used by Babylonish decorators—Mode of manufacturing Felt—Northern nations of Europe—Cap of liberty—Petasus—Statue of Endymion—Petasus in works of ancient art—Hats of Thesaly and Macedonia—Laconian or Arcadian hats—The Greeks manufacture Felt 900 B. C.—Mercury with the pileus and petasus—Miscellaneous uses of Felt.

THERE seems no reason to question the correctness of Professor Beckmann's observation*, that the making of felt was invented *before* weaving†. The middle and northern regions of Asia are occupied by Tartars and other populous nations, whose manners and customs appear to have continued unchanged from the most remote antiquity‡, and to whose simple and uniform mode of existence this article seems to be as necessary as food. Felt is the principal substance both of their clothing and of their habitations. Carpini, who in the year 1246 went as ambassador to the great Khan of the Moguls, Mongals, or Tartars, says, "Their houses are round, and artificially made like tents, of rods and twigs interwoven, having a round hole in the middle of the roof for the admission of light and the passage of smoke, *the whole being covered with felt, of which*

* *Anleitung zur Technologie*, p. 117, Note.

† See Gilroy's *Treatise on the Art of Weaving*, p. 14.

‡ Malcolm's *Hist. of Persia*, ch. vi. vol. i. pp. 123, 124.



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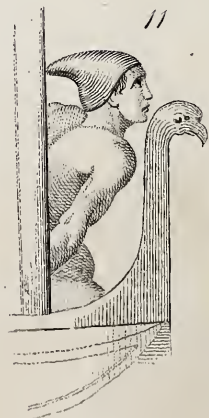
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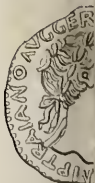
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likewise the doors are made.*” Very recently the same account of these “portable tents of felt” has been given by Julius von Klaproth†. Kupffer says of the Caratchai, “Leurs larges manteaux de feutre leur servent en même tems de matelas et de couverture‡.” The large mantle of felt, here mentioned, is used for the same purpose in the neighboring country of Circassia§. One of these mantles now in the possession of Mr. Urquhart was made of black goats’-hair, and had on the outside a long shaggy villus. The Circassians sleep under this mantle by night, and wear it, when required, over their other dress by day. A similar article is thus described by Colonel Leake||: the postillions in Phrygia “wear a cloak of white camels’-hair, *half an inch thick*, and so stiff that the cloak stands without support, when set upright on the ground. There are neither sleeves nor hood; but only holes to pass the hands through, and projections like wings upon the shoulders for the purpose of turning off the rain. It is the manufacture of the country.” The Chinese traveller, Chy Fa Hian, who visited India at the end of the fourth century, says, that the people of Chen Chen, a kingdom in a mountainous district situated about the Lake of Lob, wore dresses like those of the Chinese, except that they made use of felt and stuffs (*du feutre et des étoffes¶*).

In conformity with the prevailing use of this manufacture in

* Kerr’s *Collection of Voyages and Travels*, vol. i. p. 128. See also p. 167, where the same facts are related by William de Rubruquis.

The account which Herodotus gives (iv. 23) of the habitations of the Argippæi evidently alludes to customs similar to those of the modern Tartars. He says, “They live under trees, covering the tree in winter with strong and thick undyed felt (πίλω στεγνῶ λευκῶ), and removing the felt in summer.” Among the ceremonies observed by the Scythians in burying the dead, Herodotus also mentions the erection of three stakes of wood, which were surrounded with a close covering of woollen felt (iv. 73). Also, in the next section but one (iv. 75.) there is an evident allusion to the practice of living under tents made of felt (ὑποδύουσι ὑπὸ τοῦς πίλους).

† *Reise in dem Caucasus und nach Georgien*, ch. vi. p. 161.

‡ *Voyage dans les Environs du Mont Elbrouz*. St. Petersburg, 1829, 4to, p. 20.

§ *Travels in Circassia*, by Edmund Spencer.

|| *Journal of a Tour in Asia Minor*, p. 38.

¶ Ch. ii. p. 7, of Remusat’s Translation, Par. 1836, 4to.

the colder regions of Asia, scarlet or purple felt (such as that lately *re-invented* at Leeds, in England), was used by the Babylonish decorators for the drapery of the funeral pile, when Alexander celebrated the splendid obsequies of Hephæstion : for so we must understand the expression φοινικίδες πιληταί (Diod. Sic. xvii. 115. p. 251, Wess.). Xenophon (*Cycrop.* v. 5. § 7.) mentions the use of felt manufactured in Media, *as a covering for chairs and couches*. The Medes also used bags and sacks of felt (Athenæus, l. xii. p. 540 c. Casaub.).

The process, by which wool is converted into felt, was called by the Greeks πίλησις (Plato *de Leg.* l. viii. p. 115. ed. Bekker), literally a compression, from πιλέω, to compress*. The ancient Greek scholion on the passage of Plato here referred to thus explains the term: Πιλήσεως· τῆς διὰ τῆς τῶν ἐρίων πυκνώσεως γινομένης ἐσθῆτος, *i. e.* “cloth made by the thickening of wool.” With this definition of felt agrees the following description of a πέτασος in a Greek epigram, which records the dedication of it to Mercury :—

Σοὶ τὸν πιληθέντα δι' εὐξάντου τριχῶς ἀμνοῦ,
Ἐρμᾶ, Καλλιτέλης ἐκρέμασε πέτασον.

Brunck, *Anal.* ii. 41.

The art of felting was called ἡ πιλητικὴ (Plato, *Polit.* ii. 2. p. 296, ed. Bekker). According to the ancient Greek and Latin glossaries, and to Julius Pollux (vii. 30), a felt-maker, or hatter, was πιλοποιὸς or πιλωτοποιός, in Latin *coactiliarius*. From πῖλος (*dim.* πῖλιον, *second dim.* πιλίδιον), the proper term for *felt* in general, derived from the root of πιλέω, came the verb πιλόω, signifying *to felt*, or *to make felt*, and from this latter verb was formed the ancient participle πιλωτὸς, *felted*, which again gave origin to πιλωτοποιός.

It may be observed, that our English word *felt* is evidently a participle or a derivative, and that its verb or root FEL appears to be the same with the root of πιλέω.

The Latin *cogo*, which was used, like the Greek πιλέω, to de-

* Xenophanes thought that *the moon was a compressed cloud* (νέφος πεπιλημένον, Stobæi *Eclog.* i. 27. p. 550, ed. Heeren); and that *the air was emitted from the earth by its compression* (πίλησις, i. 23. p. 484).

note the act of compressing, or forcing the separate hairs together, gave origin to the participle *coactus*, and its derivative *coactilis*. Pliny (H. N. viii. 48. s. 73.), after speaking of woven stuffs, mentions in the following terms the use of wool for making felt: “*Lanæ et per se coactæ (al. coactam) vestem faciunt,*” *i. e.* “Parcels of wool, driven together by themselves, make cloth.” This is a very exact, though brief description of the process of felting. The following monumental inscription (Gruter, p. 648, n. 4.) contains the title *Lanarius coactiliarius*, meaning *a manufacturer of woollen felt* :—

M. BALLORIUS M. L. LARISEUS, LANARIUS COACTILIARIUS,
CONJUGA CARISSIMÆ B. M. FEC.

Helvius Successus, the son of a freed man, and the father of the Roman emperor Pertinax, was a hatter in Liguria (*tabernam coactiliariam in Liguria exercuerat*, Jul. Cap. *Pertinax*, c. 3.). Pertinax himself, being fond of money, having the perseverance expressed by his agnomen, and having doubtless, in the course of his expeditions into the East, made valuable observations respecting the manufacture which he had known from his boyhood, continued and extended the same business, carrying it on and conveying his goods to a distance by the agency of slaves. The Romans originally received the use of felt together with its name* from the Greeks (Plutarch, *Numa*, p. 117, ed. Steph.). The Greeks were acquainted with it as early as the age of Homer, who lived about 900 B. C. (*Il. x. 265*), and Hesiod (*Op. et Dies*, 542, 546).

The principal use of felt among the Greeks and Romans was to make coverings of the head for the male sex, and the most common cover made of this manufacture was a simple skull-cap, *i. e.* a cap exactly fitted to the shape of the head, as is shown in Plate VIII. fig. 1. taken from a sepulchral bas-relief which was found by Mr. Dodwell in Bœotia†. The original is as large as life. The person represented appears to have been a Cynic philosopher. He leans upon the staff (*baculus*,

* *Pileus* or *Pileum* (Non. Marc. iii., *pilea virorum sunt*, Servius in *Virg. Æn.* ix. 616.), dim. *Pileolus* or *Pileolum* (Colum. *de Arbor.* 25).

† *Tour through Greece*, vol. i. pp. 242, 243.

βάκτρον, ακήπτρον); he is clothed in the blanket (*pallium*, χλαῖνα, τριβων) with one end, which is covered, over his left breast, and another hanging behind over his left shoulder; he wears the beard (*barba*, πώγων); his head is protected by the simple skull-cap (*pileus*, πῖλος). All these were distinct characteristics of the philosopher, and more especially of the Cynic*. The dog also probably marked his sect. Leonidas of Tarentum, in his enumeration of the goods belonging to the Cynic Posochares†, including a dog-collar (κυνουχον), mentions, καὶ πῖλον κεφαλᾶς οὐχ ὁσίας σκεπανόν, *i. e.* "The cap of felt, which covered his unholy head." This passage may be regarded as a proof, that among the Greeks, though not among the Romans, the cap of felt was worn by very poor men. It also proves that this cap, which was the *fess* of the modern Greeks, was worn by philosophers, and therefore throws light on a passage of Antiphanes (*ap. Athen.* xii. 63. p. 545 a) describing a philosopher of a different character, who was very elegantly dressed, having a small cap of fine felt (πιλίδιον ἀπαλόν), also a small white blanket, a beautiful tunic, and a neat stick. When Cleanthes advanced the doctrine, *that the moon had the shape of a skull-cap* (πυλοειδῆ τῷ σχήματι, Stobæi *Ecl. Phys.* 1. 27. p. 554, ed. Heeren), he probably intended to account for its phases from its supposed hemispherical form. A cap of a similar form and appearance, though perhaps larger and not so closely fitted to the crown of the head, was worn by fishermen‡. In an epigram of Philippus§, describing the apparatus of a fisherman, the author mentions πῖλον ἀμφίκρηνον ὕδασι σσεγῆ, "the cap encompassing his head and protecting it from wet." Figure 2. in Plate VIII. represents a small statue of a fisherman belonging to the Townley Collection in the British Museum. His cap is slightly pointed and in a degree, which was probably favorable to the discharge of water from its surface. Hesiod recommends, that agricultural laborers should wear the same defence from cold and showers (*Op. et*

* See the articles *Baculus*, *Barba*, *Pallium*, p. 703, in Smith's *Dict. of Greek and Roman Antiquities*.

† Brunck, *Anal.* i. p. 223. Nos. x. xi.

‡ Theocrit. xxi. 13.

§ Brunck, *Anal.* ii. p. 212. No. v.

Dies, 545-547). The use of this cap by seamen was no doubt the ground, on which the painter Nicomachus represented Ulysses wearing one. "Hic primus," says Pliny (H. N. xxxv. 36. s. 22.), "Ulyssi addidit pileum*." For the same reason the cap is an attribute of the Dioscuri; and hence two caps with stars above them are often shown on the coins of maritime cities and of others where Castor and Pollux were worshipped. Figure 3. of Plate VIII. is taken from a brass coin of Dioscurias in Colchis, preserved in the British Museum. On the reverse is the name ΔΙΟΣΚΟΥΡΙΑΔΟΣ. Figure 4. represents both sides of a silver coin in the same collection, with the legend ΒΡΕΤΤΙΩΝ. It belongs to Bruttium in South Italy. On the one side Castor and Pollux are mounted on horseback. They wear the chlamys and carry palm branches in their hands. Their caps have a narrow brim. The reverse shows their heads only, and their caps, without brims, are surrounded by wreaths of myrtle. The cornucopia is added as an emblem of prosperity. Figure 5. is from a brass coin of Amasia (ΑΜΑΣΣΕΙΑΣ) in Pontus. It shows the cornucopia between the two skull-caps. Charon also was represented with the mariner's or fishermen's cap, as, for example, in the bas-relief in the *Museo Pio-Clementino*, tom. iv. tav. 35, and the painted vase in Stackelberg's *Grüber der Hellenen*, t. 47, 48, which is copied in Becker's *Charicles*, vol. ii. taf. i. fig. 1, and in Smith's *Dictionary of Greek and Roman Antiquities*, p. 404.

A pileus of the same general form was worn by artificers; and on this account it was attributed to Vulcan and to Dædalus, who, as well as Ulysses and Charon, are commonly found wearing it in works of ancient art. Arnobius says, that Vulcan was represented "cum pileo et malleo"—"fabrili expeditione succinctus;" and that on the other hand Mercury was represented with the petasus, or "petasunculus," on his head†.

* Compare Eustathius in *Hom. Il.* x. 265, as quoted below.

† *Adv. Gentes*, lib. vi. p. 674, ed. Erasmi. When Lucian ludicrously represents Jupiter wearing a skull-cap, which we may suppose to have been like that of the philosopher in Plate VIII. figure 1. he must have intended to describe the "Father of gods and men" as a weak old man; Διεΐλε την κεφαλὴν κατενεγκών' καὶ εἴ γεμὴ ὁ πῖλος ἀντέσχε, καὶ τὸ πολὺ τῆς πληγῆς ἀπέδεξατο, &c. *Dial. Deor.*, vol. ii. p. 314. ed. Hemster

This observation is confirmed by numerous figures of these two divinities, if we suppose the term *petasus*, which will be more fully illustrated hereafter, to have meant a hat with a brim, and *pileus* to have denoted properly a fessor cap without a brim.

Fig. 6. Plate VIII. is taken from a small bronze statue of Vulcan in the Royal Collection at Berlin. He wears the *exomis*, and holds his hammer in the right hand and his tongs in the left. For other specimens of the head-dress of Vulcan the reader is referred to the *Museo Pio-Clementino*, t. iv. tav. xi., and to Smith's *Dictionary of Greek and Roman Antiquities*, p. 589.

Plate VIII. is intended still further to illustrate some of the most common varieties in the form of the ancient skull-cap. Figure 7. is a head of Vulcan from a medal of the Aurelian family*. Figure 8. is the head of Dædalus from a bas-relief, formerly belonging to the Villa Borghese, and representing the story of the wooden cow, which he made for Pasiphaet. Fig. 10. is from a cameo in the Florentine collection. Fig. 9. is the head of a small bronze statue, wearing boots and the *exomis*, which belonged to Mr. R. P. Knight, and is now in the British Museum. It is engraved in the "Specimens of Ancient Sculpture published by the Society of Dilettanti," vol. i. pl. 47. The editors express a doubt whether this statue was meant for Vulcan or Ulysses, merely because the god and the hero were commonly represented wearing the same kind of cap. Not only does the expression of counte-

* Montfaucon, *Ant. Expl.* t. i. pl. 46. No. 4.

† Winckelmann, *Mon. Ined.* ii. 93. The skull-cap, here represented as worn by Dædalus, is remarkably like that which is still worn by shepherd boys in Asia Minor. Fig. 12, in Plate VIII. is copied from an original drawing of such a Grecian youth, procured by Mr. George Scharf who accompanied Mr. Fellows on his second tour into that country.

According to Herodotus the Scythians had felted coverings for their tents, a custom still found among their successors, the Tartars. Felting appears to have preceded weaving. It is certainly a much ruder and simpler process: and, when we consider both the long prevalence of the art among the pastoral inhabitants of the ancient Scythia, and the extensive use of its products among them so as to be employed even for their habitations, perhaps we shall be right in considering felting as the appropriate invention of this people.

nance decide the question; but also the small bronze of Mr. Knight's collection agrees in attitude and costume with many small statues of Vulcan, who is represented in all of them wearing the exomis, holding the hammer and tongs, and having the felt cap on his head*. Fig. 11. is another representation of Ulysses from an ancient lamp†. It exhibits him tied to the mast, while he listens to the song of the Sirens. The cap in this figure is much more elongated than in the others.

The felt cap was worn not only by *desultores*, but by others of the Romans upon a journey, in sickness, or in cases of unusual exposure. Hence Martial says in *Epig.* xiv. 132, entitled "Pileus,"

Si possem, totas cuperem misisse lacernas :

Nunc tantum capiti munera mitto tuo.

i. e.

O that a whole lacerna I could send !

Let this (I can no more) your head defend.

The wig (*galerus*) answered the same purpose for the wealthy classes (*arrepto pileo vel galero*, Sueton. *Nero*, 26), and the *cucullus* and *cudo* for both rich and poor. On returning home from a party, a person sometimes carried his cap and slippers under his arm (Hor. *Epist.* l. xiii. 15).

The hats worn by the *Salii*‡ are said by Dionysius of Halicarnassus to have been "tall hats of a conical form§." Plutarch distinctly represents them as made of felt. He says (*l. c.*), that the *flamines* were so called *quasi pilamines*, because they wore felt hats, and because in the early periods of Roman history it was more common to invent names derived from the Greek. On coins, however, this official cap of the *Salii* and *Flamines* is commonly oval like that attributed to the *Dioscuri*. We observe indeed continual variations in the form of the pi-

* Montfaucon, *Ant. Expl.* vol. i. pl. 46. figs. 1. 2. 3; *Mus. Florent. Gemmæ Ant. a Gorio illustratæ*, tom. ii. tab. 40. fig. 3.

† Bartoli, *Lucerne Antiche*, P. III. tab. 11. There is a beautiful figure of Ulysses in *Picturæ Antiquæ Virgiliani cod. Bibl. Vat.* a Bartoli, tab. 103, taken from a gem. In Winckelmann, *Mon. Ined.* ii. No. 154, he is represented giving wine to the Cyclops: this figure is copied in Smith's *Dict.* p. 762.

‡ Smith's *Dict. of Gr. and R. Antiquities*, art. Apex.

§ *Ant. Rom.* L. ii.

leus from hemispherical to oval, and from oval to conical. A conical cap is seen on the head of the reaper in the wood-cut to the article FLAX in Smith's *Dictionary* of Greek and Roman Antiquities, which wood-cut is taken from a coin of one of the Lagidæ, kings of Egypt. Caps, regularly conical and still more elongated, are worn by the buffoons or comic dancers, who are introduced in an ancient mosaic preserved in the Villa Corsini at Rome*. Telephus, king of Mysia, is represented as wearing a "Mysian cap†." This "Mysian cap" must have been the same which is known by the moderns under the name of *the Phrygian bonnet*, and with which we are familiar from the constant repetition of it in statues and paintings of Priam, Paris, Ganymede‡, Atys, Perseus, and Mithras, and in short in all the representations not only of Trojans and Phrygians, but of Amazons and of all the inhabitants of Asia Minor, and even of nations dwelling still further to the East. Also, when we examine the works of ancient art which contain representations of this Mysian cap, we perceive that it was a cone bent into the form in which it is exhibited, and so bent, perhaps by use, but more probably by design. This circumstance is well illustrated in a bust of Parian marble, supposed to be intended for Paris, which is preserved in the Glyptotek at Munich. A drawing of it is given in Plate VIII. fig. 13. The flaps of the bonnet are turned up and fastened over the top of the head. The stiffness of the material is clearly indicated by the sharp angular appearance of that portion of it which is turned forwards. Mr. Dodwell, in his *Tour in Greece* (vol. i. p. 134), makes the following observations on the modern costume, which seems to resemble the ancient, except that the ancient *πίλος* and *πίλιδιον* were probably of undyed wool:—"The Greeks of the maritime parts, and particularly of the islands, wear a red or blue cap of a conical form, like the pilidion. When it is new it stands upright, but it soon bends, and then serves as a pocket

* Bartoli, *Luc. Ant.* P. I. tab. 35.

† Aristoph. *Acham.* 429.

‡ Stuart, in his *Antiquities of Athens*, vol. iii. ch. 9. plates 8, 9, has engraved two beautiful statues of Telephus and Ganymede from a ruined colonnade at Thessalonica. In these the cap is very little pointed.

for the handkerchief, and sometimes for the purse. Others wear the red skull-cap, or *fess*." The Lycians, as we are informed by Herodotus (viii. 92), wore caps of felt, which were surrounded with feathers. Some of the Lycian coins and bas-reliefs, however, show the "Phrygian bonnet," as it is called, in the usual form*.

The cap worn by the Persians is called by Greek authors *κυρβασία* or *τιάρα*†, and seems to have had the form now under consideration. Herodotus, when he describes the costume of the Persian soldiers in the army of Xerxes, says, that they wore light and flexible caps of felt, which were called *tiaras*. He adds, that the Medes and Bactrians wore the same kind of cap with the Persians, but that the Cissii wore a *mitra* instead (vii. 61, 62, 64). On the other hand he says, that the Sacæ wore *cyrbasiæ*, which were sharp-pointed, straight, and compact. The Armenians were also called "weavers of felt" (Brunck, *Anal.* ii. p. 146. No. 22). The form of their caps is clearly shown in the coins of the Emperor Verus, one of which, preserved in the British Museum, is engraved in Plate VIII. fig. 14. The legend, surrounding his head, L. VERVS. AVG. ARMENIACVS, refers to the war in Armenia. The reverse shows a female figure representing Armenia, mourning and seated on the ground, and surrounded by the emblems of Roman warfare and victory. The caps represented on this and other coins agree remarkably with the forms still used in the same parts of Asia. Strabo (L. xi. p. 563, ed. Sieb.) says, that these caps were necessary in Media on account of the cold. He calls the Per-

* Fellows's *Discoveries in Lycia*, Plate 35. Nos. 3, 7. The "Phrygian bonnet" is seen in the bas-reliefs brought from Xanthus by this intelligent traveller, and now deposited in the British Museum.

† Herod. v. 49. According to Mæris, v. *Κυρβασία*, this was the Attic term, *τιάρα* meaning the same thing in the common Greek. Plutarch applies the latter term to the cap worn by the younger Cyrus: 'Αποπίπτει δὲ τῆς κεφαλῆς ἡ τιάρα τοῦ Κύρου.—*Artaxerxes*, p. 1858. ed. Steph.

The "Phrygian bonnet" is called *Phrygia tiara* in the following lines of an epitaph (*ap. Gruter.* p. 1123):

Indueris teretes manicas Phrygiamque tiaram?
Non unus Cybeles pectore vivet Atys.

sian cap "felt in the shape of a tower" (L. xv. p. 231). The king of Persia was distinguished by wearing a stiff *cyrbasia*, which stood erect, whereas his subjects wore their tiaras folded and bent forwards.* Hence in the *Aves* of Aristophanes the cock is ludicrously compared to the Great King, his erect comb being called his "*cyrbasia*." The Athenians no doubt considered this form of the tiara as an expression of pride and assumption. It is recorded as one of the marks of arrogance in Apollodorus, the Athenian painter, that he wore an "erect cap†."

The coin represented in Plate VIII. fig. 15. (taken from Patin, *Imp. Rom. Numismata*, Par. 1697, p. 213) is of the reign of the Emperor Commodus, and belonged according to the legend either to Trapezus in Cappadocia or to Trapezopolis in Caria. It represents the god Lunus or Mensis, who was the moon considered as of the male sex agreeably to the ideas of many northern and Asiatic nations (Patin, p. 173). This male moon or month was, as it seems, always represented with the *cyrbasia*‡. In another coin published by Patin (*l. c.*) a cock stands at the feet of this divinity, proving that this was the sacred bird of Lunus, and probably because the rayed form of the cock's comb was regarded as a natural type of the *cyrbasia*, which distinguished the kings of Persia and was attributed also to this Oriental divinity. A lamp found on the Celian Mount at Rome§ represents in the centre Lunus with 12 rays, probably designed to denote the 12 months of the year, and on the handle two cocks pecking at their food. A head of the same divinity, published by Hirt (*l. c.*) from an antique gem at Naples, has 7 stars upon the cap, perhaps referring to the 7 planets.

Instead of the conical cap of the Asiatics many of the Northern nations of Europe appear to have worn a felt cap, the form of which was that of a truncated cone. Of this a good example is shown in the group of Sarmatians, represented in the

* Xenoph. *Anab.* ii. 5. 23 ; *Cyrop.* viii. 3, 13. Clitarchus, *ap. Schol. in Aristoph. Aves*, 487.

† Πίλονος θόν. Hesychius, *s. v.* Σκιαγραφαί.

‡ Hirt's *Bilderbuch*, p. 88. tab. xi. figs. 8, 9.

§ Bartoli, *Luc. Ant.*, P. II. tav. 11.

wood-cut in Smith's *Dictionary of Greek and Roman Antiquities* (p. 160), which is taken from the Column of Trajan. The same thing appears in various coins belonging to the reign of this Emperor, two of which, preserved in the British Museum, are engraved in Plate VIII. fig. 16. represents Dacia sitting as a captive with her hands tied behind her back, wearing trowsers (*braccæ*) and a conical or oval cap with the edge turned up. Figure 17. represents Dacia mourning. In each we see a Dacian target together with Roman armor. Each has the same legend, DAC. CAP. COS. V. P. P. S. P. Q. R. OPTIMO. PRINC. On the reverse is the head of the Emperor with the inscription IMP. TRAJANO. AUG. GER. DAC. P. M. TR. P.

According to the representation of Lucian (*de Gymnas.*), the Scythians were in the constant habit of wearing caps or hats: for in the conversation between Anacharsis and Solon described by that author, Anacharsis requests to go into the shade, saying that he could scarce endure the sun, and that he had brought his cap (*πίλον*) from home, but did not like being seen alone in a strange habit. In later times we read of the "pileati Gothi" and "pileati sacerdotes Gothorum*."

In considering the use of the skull-cap, or of the conical cap of felt, it remains to notice the use of it among the Romans as the emblem of liberty†. When a slave obtained his freedom he had his head shaven, and wore instead of his hair the pileus, or cap of undyed felt, (Diod. Sic. Exc. Leg. 22. p. 625, ed. Wess.). Plutarch, in allusion to the same custom, calls the cap *πίλιον*, which is the diminutive of *πίλος*. It is evident, that the Latin *pileus* or *pileum* is derived from the Greek *πίλος* and its diminutive, and this circumstance in conjunction with other evidence tends to show, that the Latins adopted this use of felt from the Greeks. Sosia says in Plautus (*Amphit.* i. 1, 306), as a description of the mode of receiving his liberty, "Ut ego hodie, raso capite calvus, capiam pileum." Servius (*in Virg. Æn.* viii. 564) says, the act of manumitting slaves in this form was

* Jornandes, &c., *ap. Div. Gentium Hist. Ant.*, Hamb. 1611, pp. 86, 93.

† Hæc mea libertas ; hoc nobis pilea donant.—Persius, v. 82.

done in the temple of Feronia, who was the goddess of freedmen. In her temple at Terracina was a stone seat, on which was engraved the following verse :

“ Benemeriti servi sedeant, surgent liberi.”

In allusion to this practice it appears that the Romans, though they did not commonly wear hats, put them on at the Saturnalia*. At the death of Nero, the common people to express their joy went about the city in felt caps†. In allusion to this custom the figure of Liberty on the coins of Antoninus Pius holds the cap in her right hand. Figures 1 and 2 in Plate IX. are examples selected from the collection in the British Museum, and, as we learn from the legend, were struck when he was made consul the fourth time, *i. e.* A. D. 145.

In contradistinction to the various forms of the felt cap now described and represented, all of which were more or less elevated, and many of which were pointed upwards, we have now to consider those, which, though made of felt, and therefore classed by the ancients under the general terms *pileus*, *πίλος*, &c.‡, corresponded more nearly to our modern *hat*. The Greek word *πέτασος*, *dim.* *πετάσιον*, derived from *πετάννυμα*, *extendo*, *dilato*, and adopted by the Latins in the form *petasus*, *dim.* *petasunculus*, well expressed the distinctive form of these hats. They were more or less broad and expanded. What was taken from their height was added to their width. Those already mentioned had no brim; the petasus of every variety had a brim, which was either exactly or nearly circular, and which varied greatly in its width. In some cases it seems to be a mere circular disc without any crown at all. Of this we have an example in a beautiful statue, which has, no doubt, been meant for Endymion, in the Townley collection of the British Museum. See Plate IX. Fig. 3. His right hand encircles his head, and his scarf is spread over a rock as described

* Pileata Roma. *Martial*, xi. 7 ; xiv. 1.

† Plebs pileata. *Sueton. Nero*, 57.

‡ Plutarch (*Solon*, 179) says that Solon, pretending to be mad and acting the part of a herald from Salamis, *ἐξεπήδησεν εἰς τὴν ἀγορὰν ἄφνω πιλίον περιθέμενος*. Here *πιλίον* seems to mean the *πέτασος*.

by Lucian*. He sleeps upon it, holding the fibula in his left hand. His feet are adorned with boots (*cothumi*) and his simple petasus is tied under his chin. In this form the petasus illustrates the remark of Theophrastus, who, in describing the Egyptian Bean, says, that the leaf was of the size of the Thessalian petasus†. For the purpose of comparing these two objects, a representation of the leaves of the plant referred to, is introduced into the same Figure (3); taken from the "Botanical Magazine," Plates 903, 3916, and Sir J. E. Smith's "Exotic Botany," Tab. 31, 32. The petasus here shown on the head of Endymion, the original statue being as large as life, certainly resembles very closely both in size and in form the leaf of the Egyptian Bean, which is the *Cyamus Nelumbo*, or *Nelumbium Speciosum* of modern botanists.

The flowers of umbelliferous plants are aptly called by Phainias‡ *πετασώδη*, i. e. like a petasus. The petasus, as worn by the two shepherds, who discover Romulus and Remus, in a bas-relief of the Vatican§, is certainly not unlike the umbel of a plant. See Plate IX. Fig. 4.

* In the Dialogues of the Gods (xi.), the Moon says in answer to Venus, that Endymion is particularly beautiful "when he sleeps, having thrown his scarf under him upon the rock, holding in his left hand the darts just falling from it, whilst his right hand bent upwards lies gracefully round his face, and, dissolved in sleep, he exhales his ambrosial breath."

The recumbent statue, here represented, is of white marble, and is placed in room XI. of the Townley Gallery. It was found in 1774 at Roma Vecchia (Dallaway's *Anecdotes of the Arts*, p. 303). It has been called Mercury or Adonis. But there are no examples or authorities in support of either of these suppositions. It is not sufficient to say that every beautiful youth may have been meant either for Mercury, who was never represented asleep, or for Adonis. We know that the fable of Endymion and the Moon was a favorite subject with the ancient artists. In the *Antichita d'Ercolano*, tom. iii. tav. 3, we find a picture, which was discovered at Portica, and which represents this subject. It is still more frequent in ancient bas-reliefs. See *Mus. Pio-Clem.* tom. iv. v. 8, pp. 38, 41; Sandrart, *Sculp. Vet. Adm.* p. 52; Gronovii *Thesaur.* tom. i. folio O; *Proceedings of the Philological Society*, vol. i. pp. 8, 9.

† Πετάσφ Θεταλική. *Hist. Plant.* iv. 10. p. 147, ed. Schneider.

‡ *Apud Athen.* ix. 12. p. 371 D. ed. Casaub.

§ Museo Pio-Clementino, tom. v. tav. 24. This bas-relief formerly belonged to the Mattei collection. See *Monumenta Matthæinana*, tom. iii. tab. 37.

Callimachus ascribes the same head-dress to shepherds in the following lines :

Ἐπρσπε τοι προέχουσα κάρης εὐρέϊα καλύπτρη,
Ποιμενικὸν πῖλημα.—*Frag.* cxxv.

The wide covering projecting from your head, the pastoral hat, became you.

This "pastoral hat," if we may judge from the representation of the two shepherds in the bas-relief just referred to (Fig. 4.), was in its shape very like the "bonny blue bonnet" of the Scotch. Figure 5 in Plate IX. is taken from a painted Greek vase, and represents the story of the delivery of Œdipus to be exposed. His name ΟΙΔΙΠΟΔΑΣ is written beside him. The shepherd ΕΤΦΟΡΒΟΣ, who holds the naked child in his arms, wears a flat and very broad petasus hanging behind his neck. It is of an irregular shape, as if from long usage*. The shepherd Zethus wears a petasus hanging behind his back in a bas-relief belonging to the Borghese collection, published by Winckelmann (*Mon. Inediti*, ii. 85). See Plate IX. Fig. 6.

The Athenian ephebi wore the broad-brimmed hat, together with the scarf or chlamys†. Meleager, in an epigram on a beautiful boy, named Antiochus, says, that he would be undistinguishable from Cupid, if Cupid wore a scarf and petasus instead of his bow and arrows and his wings‡.

When a young Greek conquered in the games, his friends sometimes bestowed a hat (*petasus*) upon him as a present§.

In consequence of the use of the petasus as a part of the ordinary costume of the Athenian youth, we find it in a great variety of works of ancient art illustrative of the religion and mythology of Greece. For example:—

1. In the inner frieze of the Parthenon, the remains of which are now in the British Museum, it is worn by many of the riders on horseback. Figure 7, in Plate IX. shows one of

* See *Monumenti Inediti publicati dall' Istituto di Corrispondenza Archeologica*, vol. ii. tav. 14.

† Pollux, *Onom.* x. 164; Philemon, p. 367. ed. Meineke; Brunck, *Anal.* vol. ii. p. 41; Jacobs in *Athol. Græc.* i. l. p. 24.

‡ Brunck, *Anal.* vol. i. p. 5.

§ Eratosthen. a *Bernhardy*, p. 249. 250.

these horsemen (from the slab No. 54.) with his petasus tied under his chin.

2. It is worn by Theseus, as represented on a vase in the Vatican collection. See Winckelmann, *Mon. Inediti*, vol. ii. 98, and Fig. 8, Plate IX.

3. Also by Œdipus, as represented on one of Sir William Hamilton's vases (vol. ii. Plate 24.), standing before the sphinx.

4. The coins of Ætolia exhibit Meleager wearing the petasus. Five of these have been selected from the collection in the British Museum, which are engraved according to the size of the originals in Plate IX. Figures 9, 10, and 11, are of silver. In each of them the petasus has the form of a circular disc with a boss at the top like that on a Scotch bonnet: on the reverse is the Calydonian boar, with a spear head beneath it, and the word ΑΙΤΩΛΩΝ. Figure 12, which is of gold*, and Figure 13, which is of silver, have the head of Hercules on the reverse. The hero, supposed to be Meleager, wears a petasus, a scarf, and boots, as we have seen to be the case with Endymion (Fig. 3), this being the attire of hunters. In these two coins he also holds a spear in his right hand, and is seated upon a shield (see Fig. 13.) and other pieces of armor. ΑΙΤΩΛΩΝ is written by the side. The gold coin (see Fig. 12.) represents him with a Victory in his left hand, and with a small figure of Diana Lucifera in front.

The broad-brimmed hat, or petasus, was more especially worn by the Greeks when they were travelling†. Its appearance is well shown in Fig. 14, taken from a fictile vase belonging to the late Mr. Hope‡. It represents a Greek soldier on a journey, wearing his large blanket, and holding two spears in his right hand. This figure also shows one of the methods of fastening on the hat, viz. by passing the string round the occiput.

The comedies of Plautus, being translated from the Greek, contain allusions to the same practice. In the *Pseudolus* (ii. 4. 55, and iv. 7. 90,) the petasus and the scarf are supposed to be

* This is engraved by Taylor Combe, *Vet. Populorum Nunni*. tab. v. No. 23

† Brunck, *Anal.* ii. 170, No. 5.

‡ Hope, *Costume of the Ancients*, vol. i. pl. 71.

worn by a person to indicate that he was coming from a journey. In the prologue to the *Amphitryo*, Mercury says,

Ego has habebō hic usque in petaso pinnulas,
Tum meo patri autem torulus inerat aureus
Sub petaso : id signum Amphitruoni non erit.

Mercury and his father Jupiter are here supposed to be attired like *Sosia* and *Amphitryo* his master, both of whom had been travelling and were returning home. At the same time there is an allusion to the winged hat of Mercury, of which more hereafter. Again, in act i. scene i. l. 287, the *petasus* is attributed to *Sosia*, because he is supposed to be coming from a journey; and to Mercury, both because it was commonly attributed to him, and because on this occasion he was personating *Sosia*.

The Romans were less addicted to the use of the *petasus* than the Greeks: they often wore it when they were from home; but that they did not consider it at all necessary to wear hats in the open air is manifest from the remark of Suetonius about the Emperor Augustus, that he could not even bear the winter's sun, and hence "domi quoque non nisi *petasus* sub divo spatiabatur." (*August.* 82.) Caligula permitted the senators to wear them at the theatres as a protection from the sun (*Dio. Cass. lix. 7. p. 909, ed. Reimari*). What was meant by wearing hats "according to the Thessalian fashion" is by no means clear. Perhaps the Thessalians may have worn hats resembling those of their neighbors, the Macedonians, and of the shape of these we may form some conception from the coins of the Macedonian kings. One of these coins from the collection in the British Museum is copied in Plate IX. Fig. 15. It is a coin of the reign of Alexander I. and exhibits a Macedonian warrior standing by the side of his horse, holding two spears in his left hand, and wearing a hat with a broad brim turned upwards. This Macedonian *petasus* is called the *Causia* (*καυσία*)*, and was adopted by the Romans†, and more

* Val. Max. v. 1. *Extrem.* 4. Pausan., *ap. Eustath. in Il.* ii. 121. It is to be observed, that the *causia* and *petasus* are opposed to one another by a writer in Athenæus (L. xii. 537, e), as if the *causia* was not a *petasus*!

† Plautus, *Mil.* iv. 4. 42. *Pers.* i. 3. 75. Antip. Thess. in *Brunck Anal.* ii. 111.

especially by the Emperor Caracalla, who, as Herodian states, aimed to imitate Alexander the Great in his costume. It appears probable, nevertheless, that the turning up of the brim was not peculiar to the Macedonians, and it may have depended altogether on accident or fancy; for we find instances of it on painted fictile vases, where there is no reason to suppose that any reference was intended either to Macedonia or Thessaly. Fig. 16. Plate IX. for example, is taken from the head of Bellerophon, on one of Sir William Hamilton's vases*; and the left-hand figure from a fictile vase at Vienna, engraved by Ginzrot†. This hat is remarkable for the boss at the top, which we observe also on the Ætolian coins, and in various other examples.

In connection with the above quoted expression of Dio Cassius it may be observed further, that besides the *causia* two varieties of the petasus seem to be alluded to by several ancient authors, viz. the Thessalian, and the Arcadian or Laconian. How they were distinguished, cannot be ascertained, but the passages which mention them will now be produced, that the reader may judge for himself. The Thessalian variety is mentioned by Dio Cassius, by Theophrastus, as above quoted (p. 427), and by Callimachus in the following fragment, which is preserved in the Scholia on Sophocles, *Æd. Col.* 316.

And about his head lay a felt, newly come from Thessaly, as a protection from wet.—*Frag.* 124. *ed.* Ernesti.

The frenzied Cynic philosopher Menedemus, among other peculiarities, wore an Arcadian hat, HAVING THE TWELVE SIGNS OF THE ZODIAC WOVEN INTO IT‡! Ammianus (Brunck, *Anal.* ii. 384.) represents an orator dedicating “an Arcadian hat” to Mercury, who was the patron of his art, and also a native of Arcadia.

Herodes Atticus wore “the Arcadian hat” at Athens, as a protection from the sun; and the language of Philostratus, in recording the fact, shows that the Athenians of his time com-

* Vol. i. pl. 1.

† *Über die Wägen und Fuhrwerke der Alten*, vol. i. p. 342.

‡ *Diog. Laërt.* vi. 102. See Gilroy's *Treatise on the Art of Weaving*, American edition, p. 446.

monly wore it, more especially in travelling*. Arrian, who wrote about the middle of the second century, says, that "Laconian or Arcadian hats," were worn in the army by the *pelastæ* instead of helmets†. This circumstance shows a remarkable change of customs; for in the early Greek history we find the Persian soldiers held up as the objects of ridicule and contempt, because they wore hats and trowsers‡. On the whole, it is very evident that "the Arcadian or Laconian hat" was one and the same variety, and that this variety of head-dress was simply the *petasus*, or hat with a brim, so called to distinguish it from the proper *πίλος*, which was the skull-cap, or hat without a brim.

This supposition suits the representations of the only imaginary beings who are exhibited in works of ancient art wearing the *petasus*, viz. the Dioscuri and Mercury.

It has been already observed that the Dioscuri are commonly represented with the skull-cap, because they were worshipped, as the reader will have perceived, as the guardians of the mariner§; but on ancient vases we find them sometimes painted with the *petasus*; and if this was the same with the *πίλος Λακωνικὸς*, it would coincide with their origin as natives of Sparta. In Plate IX. Fig. 16, an example is shown, on one of Sir William Hamilton's vases, in which their attire resembles that of the Athenian *ephebi*. They wear boots and a tunic, over which one of them also wears the scarf or *chlamys*. They are conducted by the goddess Night.

In like manner Mercury, as a native of Arcadia, might be expected to wear "the Arcadian hat." In the representations of this deity on works of ancient art, the hat, which is often decorated with wings to indicate his office of messenger, as his *talaria* also did||, has a great variety of forms, and sometimes the brim is so narrow, that it does not differ from the cap of the artificer already described, or the *πίλος* in its ordinary form.

* *Vit. Sophist.* ii. 5. 3.

† *Tactica*, p. 12. ed. Blancardi.

‡ Herod. v. 49.

§ See p. 419.

|| Servius (on *Virg. Æn.* viii. 138) says, that Mercury was supposed to have wings on his *petasus* and on his feet, in order to denote the swiftness of speech, he being the god of eloquence.

These hats, with a brim of but small dimensions, agree most exactly in appearance with the cheapest hats of undyed felt, now made in the United States and Great Britain*. On the heads of the rustics and artificers in our streets and lanes we often see forms the exact counterpart of those which we most admire in the works of ancient art. The petasus is also still commonly worn by agricultural laborers in Greece and Asia Minor.

A bas-relief in the Vatican collection†, represents the birth of Hercules, and contains two figures of Mercury. In one he carries the infant Hercules, in the other the caduceus. In both he wears a large scarf, and a skull-cap, like that of Dædalus‡, without a brim. This example therefore proves that, although the petasus, as distinguished from the pileus, was certainly the appropriate attribute of Mercury§, yet the artists of antiquity sometimes took the liberty of placing on his head the skull-cap instead of the hat, just as we have seen that they sometimes made the reverse substitution in the case of the Dioscuri.

Another bas-relief in the Vatican||, represents the story of the birth of Bacchus from Jupiter's thigh. Thus the subject of it is very similar to that, which relates to the birth of Hercules, the infant being in each instance consigned to the care of Mercury. But the covering of Mercury's head in these two cases is remarkably different, though from no other reason than

* These hats are sold in the shops for sixpence, ninepence, or a shilling each.

† *Museo Pio-Clementino*, tom. iv. tav. 37.

‡ See Plate VIII. Fig. 8.

§ See Brunck, *Anal.* ii. 41, and Arnobius, *Adv. Gentes*, lib. vi. See also Epippus, *ap. Athen.* xii. 53. p. 537 F. Casaub.

It is remarkable that the person who acted the part of a Silenus in the Dionysiac procession instituted by Ptolemy Philadelphus at Alexandria, wore a hat and a golden caduceus (*Athen.* v. 27. p. 198 A.). In this case the imagination appears to have been indulged in decorating a mere festive character with the peculiar attributes of Mercury. It is added, that various kinds of chariots were driven by "boys wearing the tunics of charioteers and petasi" (*Athen.* v. p. 200 F.). This would be in character, being agreeable to the custom of the Grecian youth.

The following is from a sepulchral urn found near Padua (*Gruter.* p. 297):

Abite hinc, pessimi fures, * * * vestro cum Mercurio petasato caduceatoque.

|| *Museo Pio-Clementino*, tom. iv. tav. 19.

the fancy of the artist. In the bas-relief now under consideration, Mercury holds the skin of a lynx or panther to receive the child. He wears the scarf or chlamys and cothumi. This was a very favorite subject with the ancients. It occurs on a superb marble vase with the inscription ΣΑΛΠΙΩΝ ΕΠΟΙΗΣΕ*, and on one of Sir W. Hamilton's fictile vases†.

Figure 4. in Plate X. is from Hope's *Costume of the Ancients*, vol. ii. pl. 175. The money-bag is in Mercury's right hand.

In a painting found at Pompeii‡, Mercury is represented with wings (*pinnulæ*) on his petasus, though not very ancient, is also recognized in the *Amphitryo* of Plautus.

Figure 5. in Plate X. is from the Marquis of Lansdowne's marble bust, published by the Dilettanti Society§. In this beautiful bust the brim of the hat is unfortunately damaged.

Figures 6 and 7, Plate X., are from coins engraved in Carrelli's *Nummi Veteris Italiae* (plates 58 and 65). Figure 7 is a coin of Suessa in Campania.

To these illustrations might have been added others from ancient gems, good examples of which may be found in the second volume of Mariette's *Traité des Pierres Gravées*, folio, Paris, 1750.

Besides the application of felt as a covering of the head for the male sex in the manner now explained, it was also used as a lining for helmets. When in the description of the helmet worn by Ulysses we read

Μέσση δ' ἐνὶ πῖλος ἀρήρειλλ,

we may suppose πῖλος to be used in its most ordinary sense,

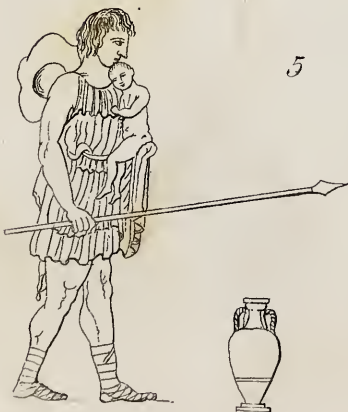
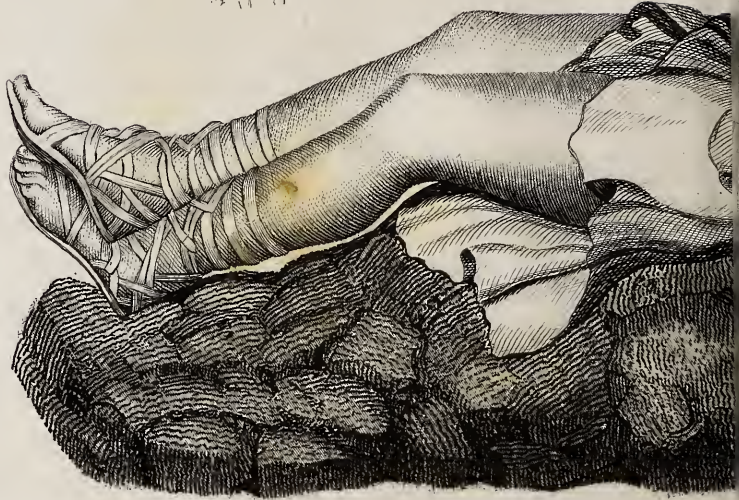
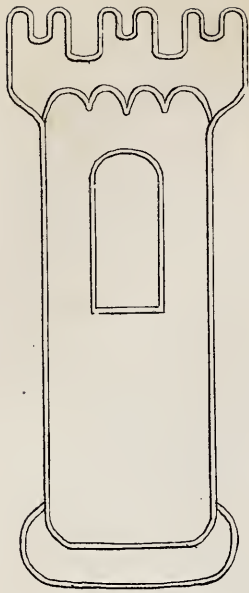
* Spon., *Misc. Erud. Ant.* § xi. art. 1.

† Vol. i. No. 8.

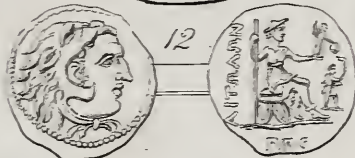
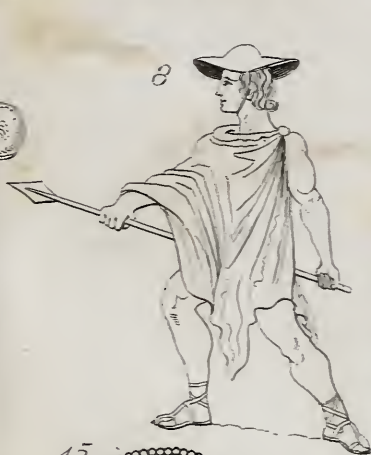
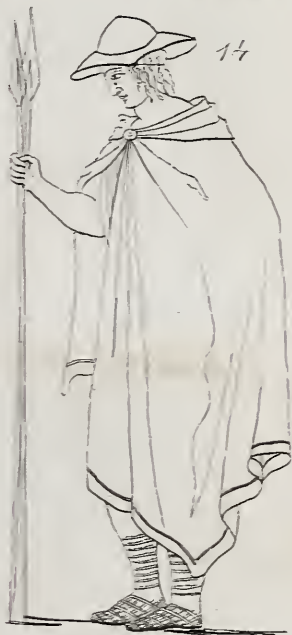
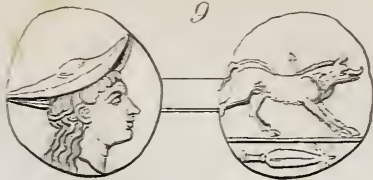
‡ Gell's *Pompeiana*, London 1819, pl. 76.

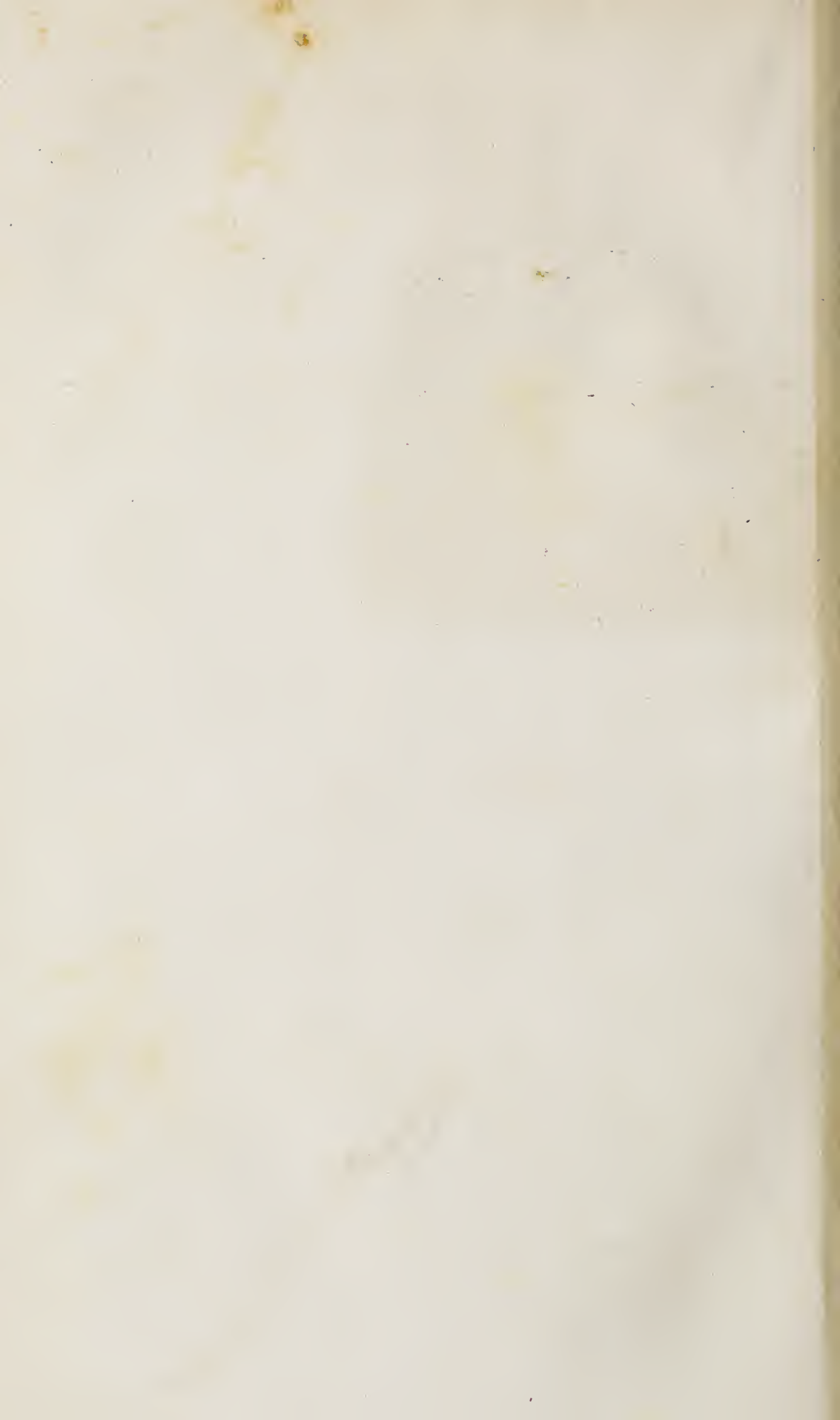
§ *Specimens of Ancient Sculpture*, London 1809, pl. 51.

|| Homer, *Il.* x. 265. Eustathius, in his commentary on this passage, says, that the most ancient Greeks always wore felt in their helmets, but that those of more recent times, regarding this use of felt as peculiar to Ulysses, persuaded the painters to exhibit him in a skull-cap, and that this was first done, according to the tradition, by the painter *Apollidorus*. The account of Pliny, who, together with Servius (*in Æn.* ii. 44), represents Nicomachus, and not Apollidorus, as having first adopted this idea.



3





consequently that the interior of the helmet was a common skull-cap.

Being generally thicker than common cloth, felt presented a more effectual obstacle to missile weapons. Hence, when the soldiers under Julius Cæsar were much annoyed by Pompey's archers, they made shirts or other coverings of felt, and put them on for their defence*. Thucydides refers to the use of similar means to protect the body from arrows†; and even in besieging and defending cities felt was used, together with hides and sackcloth, to cover the wooden towers and military engines‡.

Felt was also sometimes used to cover the bodies of quadrupeds. According to Aristotle§, the Greeks clothed their *molles oves* either with skins or with pieces of felt; and the wool became gray in consequence. The Persians used the same material for the trappings of their horses (Plutarch, *Artax.* II. p. 1858. ed. Stephani).

The loose rude coverings for the feet called *Udones* were sometimes made of felt, being worn within the shoes or brogues of the rustic laborers||.

In concluding this investigation it may be proper to observe, that, although *πίλος* originally meant *felt*, and more especially a skull-cap made of that manufacture, it was sometimes used, at least by the later Greek authors, by an extension of its meaning, to denote a cap of any other material. Thus Athenæus (lib. vi. p. 274. Casaub.) speaking of the Romans, says, that they wore about their heads *πίλους προβατείων δερμάτων δασείς, ἰ. ε.* "thick caps made of sheep skins."

* Jul. Cæsar, *Bell. Civ.* iii. 44.

† Thucyd. iv. 34. Schol. *ad loc.*

‡ Æneas Tacticus, 33.

§ *De Gen. Animalium*, v. 5. p. 157. ed. Bekker.

|| Hesiod, *Op. ed Dies*, 542; Grævius, *ad loc.*; Cratini, *Fragmenta*, p. 29. ed. Runkel.

APPENDIX D.

ON NETTING.

 MANUFACTURE AND USE OF NETS BY THE ANCIENTS—ILLUSTRATIONS
 OF THE SCRIPTURES, ETC.

Nets were made of Flax, Hemp, and Broom—General terms for nets—Nets used for catching birds—Mode of snaring—Hunting-nets—Method of hunting—Hunting-nets supported by forked stakes—Manner of fixing them—Purse-net or tunnel-net—Homer's testimony—Nets used by the Persians in lion-hunting—Hunting with nets practised by the ancient Egyptians—Method of hunting—Depth of nets for this purpose—Description of the purse-net—Road-net—Hallier—Dyed feathers used to scare the prey—Casting-net—Manner of throwing by the Arabs—Cyrus king of Persia—His fable of the piper and the fishes—Fishing-nets—Casting-net used by the Apostles—Landing-net (Scap-net)—The Sean—Its length and depth—Modern use of the Sean—Method of fishing with the Sean practised by the Arabians and ancient Egyptians—Corks and leads—Figurative application of the Sean—Curious method of capturing an enemy practised by the Persians—Nets used in India to catch tortoises—Bag-nets and small purse-nets—Novel scent-bag of Verres the Sicilian prætor.

THE raw materials, of which the ancients made nets, were flax, hemp*, and broom†. Flax was most commonly used; so that Jerome, when he is prescribing employment for monks, says, "Texantur et *lina* capiendis piscibus‡." The operation of netting, as well as that of platting, was expressed by the verb *πλέκειν*§. The meshes were called in Latin *maculæ*||, in Greek *βρόχοι*, *dim. βροχίδες*¶.

* Rete cannabina. Varro, *De Re Rust.* iii. 5. p. 216, ed. Bipont.

† Pliny, H. N. xix. 1. s. 2; xxiv. 9. s. 40.

‡ Hieron. *Epist.* l. ii. p. 173, ed. Par. 1613, 12mo. Hunting-nets are called "lina nodosa" by Ovid, *Met.* iii. 153, and vii. 807. Compare Virg. *Georg.* i. 142; Homer, *Il.* v. 487; Brunck, *Anal.* ii. 94, 494, 495; Artimedorus, ii. 14. See also Pliny, H. N. xix. 1. s. 2.

§ Πλεξάμενος ἄρκυς, Aristoph. *Lysist.* 790. Τῶν πεπλεγμένων δίκτυων, Bekkeri *Anecdota*, vol. i. p. 354.

|| Varro, *De Re Rust.* iii. 11; Ovid, *Epist.* v. 19; Nemesiani Cyneg. 302.

¶ Heliodor. l. v. p. 231, ed. Commelini.

The use of all the Latin and Greek terms for nets will now be explained, and in connection with this explanation of terms, will be produced all the facts which can be ascertained upon the subject.

I.

RETIS and RETE; *dim.* RETICULUM.

ΔΙΚΤΥΟΝ*.

Retis or *Rete* in Latin, and *δίκτηον* in Greek, were used to denote nets in general. Thus in an epigram of Leonidas Tarentinus†, three brothers, one of whom was a hunter, another a fowler, and the third a fisherman, dedicate their nets to Pan. Several imitations of this epigram remain by Alexander Ætolius‡, Antipater Sidonius§, Archias||, and others¶. In one of these epigrams (Ἰουλιάνου Αἰγυπτίου) we find *λίνα* adopted as a general term for nets instead of *δίκτηα*, no doubt for the reason above stated. In another epigram** a hare is said to have been caught in a net (*δίκτηον*). Aristophanes mentions nets by the same denomination among the contrivances employed by the fowler††. Fishing-nets are called *δίκτηα* in the following passages of the New Testament: Matt. iv. 20, 21; Mark i. 18, 19; Luke v. 2, 4-6; John xxi. 6, 8, 11: also by Theocritus, *ap. Athen.* vii. 20. p. 284, Cas.; and by Plato, *Sophista*, 220, b. p. 134, ed. Bekker.

Netting was applied in various ways in the construction of *hen-coops* and aviaries; and such net-work is called *rete*‡‡. It was used to make pens for sheep by night. At the amphitheatres it was sometimes placed over the podium. At a gladiatorial show given by Nero, the net, thus used as a fence against

* From *δικῆν*, to throw. See Eurip. *Bacc.* 600, and the Lexicons of Schneider and Passow.

† Brunck, *Anal.* i. 225.

‡ Brunck, *Anal.* i. 418. *Alexandri Ætoli Fragmenta*, a Capelmann, p. 50.

§ *Ibid.* ii. 9, Nos. 15, 16.

|| *Ibid.* ii. 94, No. 9.

¶ *Ibid.* ii. 494, 495. Jacobs, *Anthol.* vol. i. p. 188, 189.

** Brunck, *Anal.* iii. 239, No 417.

†† *Aves*, 526-528.

‡‡ Varro, *De Re Rust.* iii. 5.

the wild beasts, was knotted *with amber**. The way in which the net was used by the *Retiarii* is well known. The head-dress called κεκρύφαλος, was a small net of fine flax, silk, or gold thread, and was also called *reticulum*†. But by far the most important application of net-work was to the kindred arts of hunting and fishing: and besides the general terms used alike in reference to both these employments, there are special terms to be explained under each head.

The use of nets for catching birds was very limited, on which account we find no appropriate name for fowlers' nets‡. Nevertheless thrushes were caught in them§, and doves or pigeons, with their limbs tied up, or fastened to the ground, or with their eyes covered or put out, were confined in a net in order that their cries might allure others into the snare||. An account of the nets used by the Egyptians to catch birds is given by Sir Gardner Wilkinson¶, being derived from the paintings found in the catacombs. The net commonly employed for the purpose was the clap-net. Bird-traps were also made by stretching a net over two semicircular frames, which, being joined and laid open, approached to the form of a circle. The trap was baited, and when a bird flew to it and seized the bait, it was instantly caught by the sudden rising of the two sides or flaps.

II.

CASSIS; PLAGA.

ΕΝΟΔΙΟΝ, ΑΡΚΥΣ.

In hunting it was usual to extend nets in a curved line of considerable length**, so as in part to surround a space, into

* Plin. H. N. xxxvii. 3. s. 11.

† Nonius Marcellus, p. 542, ed. Merceri. See also the article CALANTICA, in Smith's *Dict. of Greek and Roman Antiquities*.

‡ See Aristophanes, *l. c.*

§ Hor. *Epod.* ii. 33, 34.

|| Aristoph. *Aves*, 1083.

¶ *Man. and Customs*, vol. iii. p. 35–38, 45.

** Τά δίκτυα περιβάλλονσι. Ælian, H. A. xii. 46. Uno portante multitudinem, qua saltus cingerentur. Plin. H. N. xix. 1. s. 2. Oppian (*Cyneg.* iv. 120–123) says, that in an Asiatic lion-hunt the nets (ἄρκυες) were placed in the form of the new moon.

which the beasts of chase, such as the boar, the wild goat, the deer, the hare, the lion, and the bear might be driven through the opening left on one side. Tibullus (iv. 3. 12) speaks of inclosing woody hills for this purpose :—

. densos indagine colles
Claudentem.

The following lines of Virgil show, that the animals were driven into the toils from a distance by the barking of dogs and the shouts of men :

Thy hound the wild-ass in the sylvan chase,
Or hare, or hart, with faithful speed will trace ;
Assail the muddy cave with eager cries,
Where the rough boar in secret ambush lies ;
Press the tall stag with clamors echoing shrill
To secret toils, along the aërial hill.

Georg. iii. 411–413.—*Warton's Translation.*

In another splendid passage the boar is described as coming into the midst of the nets after he has been driven to them from a mountain or a marsh at a great distance :

And as a savage boar on mountains bred,
With forest mast and fattening marshes fed ;
When once he sees himself in toils inclosed,
By huntsmen and their eager hounds opposed ;
He whets his tusks, and turns and dares the war :
The invaders dart their javelins from afar :
All keep aloof and safely shout around,
But none presumes to give a nearer wound.
He frets and froths, erects his bristled hide,
And shakes a grove of lances from his side.

Æn. x. 707–715.—*Dryden's Translation.*

Even in a case where the same poet introduces an equivalent expression to that of Tibullus, already quoted, viz. “saltus indagine cingunt” (*Æn.* iv. 121), he represents the hunting-party as going over a large extent of country to collect the animals out of it :

Postquam altos ventum in montes atque in via lustra,
Ecce feræ saxi dejectæ vertice capræ
Decurrere jugis ; alia de parte patentes
Transmittunt cursu campos, atque agmina cervi
Pulverulenta fuga glomerant, montesque relinquunt.

At puer Ascanius mediis in vallibus acri
 Gaudet equo, jamque hos cursu, jam præterit illos,
 Spumantemque dari pecora inter inertia votis
 Optat aprum, aut fulvum descendere monte leonem.

Æn. iv. 151–159.

So Ovid (*Epist.* iv. 41, 42):

In nemo ire libet, pressisque in retia cervis,
 Hortari celeres per juga summa canes;

and (*Epist.* v. 19, 20):

Retia sæpe comes maculis distincta tetendi,
 Sæpe citos egi per juga longa canes.

The *younger* Pliny describes himself on one occasion sitting beside the nets, while the hunters were pursuing the boars and driving them into the snare (*Epist.* i. 6). In Euripides (*Bacc.* 821–832) we find the following beautiful description of a fawn, which has been driven into the space inclosed by the nets, but has leaped over them and escaped:—

ὡς νεβρὸς χλοεραῖς
 ἐμπαίζουσα λείμακος ἡ-
 δοναῖς, ἠνίκ' ἄν φοβερὸν φύγη
 θήραμ' ἔζω φυλακᾶς
 ἐπλέκτων ἑπὲρ ἀρκύων, &c.

Here a Bacchanal, tossing her head into the air with gambols and dancing, is said to be “like a fawn sporting in the green delights of a meadow, when she has escaped the fearful chase by leaping over the well-platted nets so as to be out of the inclosure, whilst the shouting hunter has been urging his dogs to run still more swiftly: by great efforts and with the rapidity of the winds she bounds over a plain beside a river, pleased with solitudes remote from man, and hides herself in the thickets of an umbrageous forest.”

If hollows or valleys were inclosed*, the nets were no doubt

* Nec, velit insidiis altassi claudere valles,

Dum placeas, humeri retia ferre negent.—Tibullus, i. 4. 49, 50.

It was the duty of the attendants (*J. Pollux*, v. 4. 27–31) in most cases to carry the nets on their shoulders, agreeably to the representation in the Plate X. *Pliny*, l. c.

Cassibus impositos venor.—*Propert.* iv. 2. 32.

. alius raras

Cervice gravi portare plagas.—*Sen. Hippol.* i. 1. 44.

extended only in those openings, through which it was possible for the animals to escape. Also a river was of itself a sufficient boundary :

Inclusum flumine cervum.—Virg. *Æn.* xii. 749.

The proper Latin term for the hunting-net, but more especially for the purse-net, which will be hereafter described, was *CASSIS*. “*Cassis, genus venatorii retis.*” Isidori Hispalensis *Orig.* xix. 5. “*Arctos rodere casses*” is applied by Persius (v. 170) to a quadruped with incisor teeth caught in such a net and striving to escape. See also Propertius as just quoted, and the *Agamemnon* of Seneca and Virgil’s *Georgics* as quoted below. *Cassis* seems to be derived from the root of *capere* and *catch*. But *PLAGA* was also applied to hunting-nets, so that Horace describes the hunting of the boar in the following terms :

Aut trudit acres hinc et hinc multa cane
Apros in obstantes plagas.—*Epod.* ii. 31, 32.

Lucretius (lib. v. 1251, 1252) aptly compares the setting up of the *plagæ* to the planting of a hedge around the forest :

Nam fovea atque igni prius est venarier ortum,
Quam sæpire plagis saltum, canibusque ciere.

In the same manner *plagæ* is used in the *Hippolytus* of Seneca, as above quoted, and in Pliny*.

To dispose the nets in the manner which has been described, was called “*retia ponere*” (Virg. *Georg.* i. 307) or “*retia tendere*” (Ovid, *Art. Amat.* i. 45).

In Homer a hunting-net is called *λίον πάναγρον*, literally, “the flax that catches everything†.” But the proper Greek term for the hunting-net, corresponding to the Latin *cassis*, was *ἄρκυς*, which is accordingly employed in the passages of Oppian and Euripides cited above. Also the epigram of Antipater Sidonius, to which a reference has already been made, specifies the hunting-net by the same appellation :

Δᾶμις μὲν θηρῶν ἄρκυν ὀρειονόμων.

The word is used in the same sense by Cratinus‡; also by Ar-

* H. N. xix. 1. s. 2.

† *Il.* v. 487.

‡ Cratini *Fragmenta*, a Runkel, p. 28.

rian, where he remarks that the Celts dispensed with the use of nets in hunting, because they trusted to the swiftness of their greyhounds*. In Euripides† it is used metaphorically: the children cry out, when their mother is pursuing them,

‘Ως ἐγγυς ἦδη γ’ ἐσμέν ἀρκύων ζίφους,

i. e. “Now how near we are being caught with the sword.”

Also in the *Agamemnon* of Æschylus (l. 1085):

‘Ἡ δίκτυον τί γ’ Αἴδου;

ἀλλ’ ἄρκυς ἢ ζύεννος, ἢ ζωναιτία

φόνου.

In this passage reference is made to the large shawl in which Clytemnestra wrapt the body of Agamemnon, as in a net, in order to destroy him. On account of the use made of it, the same fatal garment is afterwards (l. 1353) compared to a casting-net, which in its form bore a considerable resemblance to the *cassis*. In l. 1346, ἀρκύστατα‡ denotes this net as set up for hunting. The same form occurs again in the *Eumenides* (l. 112); and in the *Persæ* (102–104) escape from danger is in nearly the same terms expressed by the notion of overleaping the net. In Euripides§ this contrivance is called ἀρκύστατος μηχανή; and in the *Agamemnon* of Seneca|| the same allusion is introduced:

At ille, ut altis hispidus silvis aper;
Cum, casse vinctus, tentat egressus tamen,
Arctatque motu vincla, et incassum furit,
Cupit, fluentes undique et cæcos sinus
Disjicere, et hostem quærit implicitus suum.

Part of the apparatus of a huntsman consisted in the stakes which he drove into the ground to support his nets, and which Antipater Sidonius thus describes:

Καί πυρὶ θηγαλέους ὄζυπαγεῖς στάλικας;

i. e. “The sharp stakes hardened in the fire¶.”

* Καί εἰσὶν αἱ κόνες αὐται, ὅτι περ αἱ ἄρκυς Ξενοφῶντι ἐκείνω, i. e. “And here greyhounds answered the same purpose as Xenophon’s hunting-nets.” *De Venat.* ii. 21. See Dansey’s translation, pp. 72, 121.

† *Medea*, 1268.

‡ Or, ἀρκύστατον, ed. Schütz. l. 1376.

§ *Orestes*, 1405, s. 1421.

|| L. 886–890.

¶ Brunck, *Anal.* ii. 10. We find στάλικες in Oppian, *Cyneg.* iv. 67, 71, 121, 380; Pollux, *Onom.* v. 31.

The term which Xenophon uses of the stakes is, according to some manuscripts of his work, *σχάλιδες*. He says, they should be fixed so as to lean backwards, and thus more effectually to resist the impulse of the animals rushing against them*. The Latin term answering to *στάλικες* was *VARI*. We find it thus used by Lucan :

Aut, cum dispositis adtollat retia varis
Venator, tenet ora levis clamosa Molossi.

Pharsalia, iv. 439, 440.

i. e. "The hunter holds the noisy mouth of the light Molossian dog, when he lifts up the nets to the stakes arranged in order."

Gratius Faliscus, adopting a Greek term, calls them *ancones*, on account of the "elbow" or fork at the top :

Hic magis in cervos valuit metus : ast ubi lentæ
Interdum Libyco fucantur sandyce pinnæ,
Lineaque extractis lucent anconibus arma,
Rarum, si qua metus eludat bellua falsos.—*Cyneg.* 85–88.

It was the business of one of the attendants to watch the nets :

Ego retia servo.—*Virg. Buc.* iii. 75.

Sometimes there was a watchman at each extremity and one in the middle, as in the Persian lion-hunt†. The prevalence of this method of hunting in Persia might be inferred from the circumstance, that one of the chief employments of the inhabitants consisted in making these nets (*ἀρκυς*, Strabo, xv. 3. § 18). To watch the nets was called *ἀρκυωρεῖν* (*Ælian*, H. A. i. 2), and the man who discharged this office *ἀρκυωρὸς* (*Xen.*, *De Ven.* ii. 3 ; vi. 1.).

The paintings discovered in the catacombs of Egypt show, that the ancient inhabitants of that country used nets for hunting in the same manner which has now been shown to have been the practice of the Persians, Greeks and Romans‡.

Hunting-nets had much larger meshes than fishing or fowls'-nets, because in general a fish or a fowl could escape through a much smaller opening than a quadruped. In hunting, the important circumstance was to make the nets so strong

* *De Venat.* vi. 7.

† Oppian, *Cyneg.* iv. 124, &c.

‡ Wilkinson's *Manners and Customs of the Ancient Egyptians*, vol. iii. p. 3–5.

that the beasts could not break through them. The large size of the meshes is denoted by the phrases "retia rara*" and "raras plagas†;" and it is exhibited in a bas-relief in the collection of ancient marbles at Ince-Blundell in Lancashire. See Plate X. fig. 1. This sculpture presents the following circumstances, which are worthy of notice as illustrative of the passages above collected from ancient authors. Three servants with staves carry a large net on their shoulders. The foremost of them holds by a leash a dog, which is eager to engage in the chase‡. Then follows another scene in the hunt. A net with very large meshes and five feet high is set up, being supported by three stakes. Two boars and two deer are caught. A watchman, holding a staff, stands at each end of the net. Fig. 2, Plate X. is taken from a bas-relief in the same collection, representing a party returning from the chase, with the quadrupeds which they have caught. Two men carry the net, holding in their hands the stakes with forks at the top. These bas-reliefs have been taken from sarcophagi erected in commemoration of hunters, and they are engraved in the *Ancient statues, &c. at Ince-Blundell*, vol. ii. pl. 89 and 126. An excellent representation of these forked staves is given in a sepulchral bas-relief in Bartoli, *Admiranda*, tab. 70, which Mr. Dansey has copied at p. 307 of his translation of Arrian *on Coursing*, and which represents a party of hunters returning from the chase. Another example of the *varus*, or forked staff, is seen in a sepulchral stone lately found at York (England), and engraved in Mr. Wellbeloved's *Eburacum*, pl. 14. fig. 2. The man, who holds the *varus* in his right hand, and who appears to be a huntsman and a native of the north of England, though partly clothed after the Roman fashion, wears an inner and outer tunic, and over them a fringed sagum. In the *Sepolcri de' Nasoni*, published by Bartoli, there is a representation of a lion-hunt, and of another in which deer are caught by means of nets set up so as to inclose a large space. In Mont-

* Virg. *Æn.* iv. 131; Hor. *Epod.* ii. 33.

† Seneca, *Hippol.* l. c.

‡ See Lucan, as quoted in the last page.

faucon's *Supplement*, tome iii., is an engraving from a bas-relief, in which a net is represented: but none of these are so instructive as the two bas-reliefs at Ince-Blundell.

Gratius Faliscus recommends that a net should be forty paces long, and full ten knots high:

Et bis vicanos spatium præterdere passus

Rete velim, plenisque decem consurgere nodis.—*Cyneg.* 31, 32.

The necessity of making the nets so high that the animals could not leap over them, is alluded to in the expression Ὑψος κρείσσον ἐκπηδήματος, *i. e.* "a height too great for the animals to leap out*."

Xenophon, in his treatise on *Hunting*, gives various directions respecting the making and setting of nets; and Schneider has added to that treatise a dissertation concerning the ἄρκυς. It is evident that this kind of net was made with a bag (κεκρούφαλος, vi. 7), being the same which is now called the *purse-net*, or the *tunnel-net*, and that the aim of the hunter was to drive the animal into the bag; that the watchman (ἀρκυωρὸς) waited to see it caught there; that branches of trees were placed in the bag to keep it expanded, to render it invisible, and thus to decoy quadrupeds into it; that a rope ran round the mouth of the bag (περίδρομος, vi. 9), and was drawn tight by the impulse of the animal rushing in so as to prevent its escape†. To this rope was attached another, called ἐπίδρομος, which was used as follows. In fig. 1. of Plate X. we observe, that the upper border of the

* Æschyli *Agamemnon*, 1347.

† This effect of the περίδρομος is well expressed by Seneca, "Arctatque motu vincla:" also the circumstance of the branches used to distend the bag and to make it invisible; "Fluentes undique et cæcos sinus."

Homer (*Il.* v. 487) seems to allude to the same contrivance, and to apply the term ἀχίδες to the rope which encircled the entrance of the bag, with the others attached to it.

We find in Brunck's *Analecta* (ii. 10. No. xx.) the phrase ἀγκύλα δίκτυα applied to hunting-nets. It was probably meant to designate the ἄρκυς, which might be called ἀγκύλα, *i. e.* "angular," because they were made like bags ending in a point. The term νεφέλη, which occurs in Aristophanes (*Aves*, 195), and denoted some contrivance for catching birds, is said by the Scholiast on the passage to have meant a kind of hunting-net. But this explanation is evidently good for nothing.

net consists of a very strong rope. Xenophon calls this *σαρδῶν* (vi. 9). In the purse-net it was furnished with rings. The *ἀρκυωρὸς*, or watchman, lay in ambush, holding one end of the *ἐπίδρομος*, which ran through the rings, and was fastened at the other end to the *περίδρομος*, so that by pulling it he drew the mouth of the bag still more firm and close. He then went to the bag and despatched the quadruped which it inclosed, or carried it off alive, informing his companions of the capture by *shouting**.

In this treatise Xenophon distinguishes the nets used in hunting by three different appellations; *ἄρκυς*, *ἐνόδιον*, and *δίκτυον*. Oppian also distinguishes the *δίκτυον* used in hunting from the *ἄρκυς*†. The *ἄρκυς* or *cassis*, i. e. “the purse- or tunnel-net,” was by much the most complicated in its formation. The *ἐνόδιον*, or “road-net,” was comparatively small: it was placed across any road, or path, to prevent the animals from pursuing that path: it must have been used to stop the narrow openings between bushes. The *δίκτυον* was a large net, simply intended to inclose the ground: it therefore resembled in some measure the sean used in fishing. The term, thus specially applied, may be translated *a hay*, or *a hallier*‡. These three kinds of nets appear to be mentioned together by Nemesianus under the names of *retia* (i. e. *δίκτυα*), *casses* (i. e. *ἄρκυς*), and *plagæ* (i. e. *ἐνόδια*):

Necnon et casses idem venatibus aptos,
Atque plagas, longoque meantia retia tractu
Addiscunt raris semper contexere nodis,
Et servare modum maculis, linoque tenaci.

Cyneg. 299–302.

Xenophon, in his treatise on Hunting, further informs us, that the cord used for making the *ἄρκυς*, or purse-net, consisted of three strands, and that three lines twisted together commonly made a strand (ii. 4); but that, when the net was intended to catch

* Oppian, *Cyneg.* iv. 409. Pliny mentions these *epidromi*, or *running ropes*: H. N. xix. l. s. 2.

† *Ibid.* iv. 381.

‡ See Arrian on *Coursing: the Cynegeticus of the younger Xenophon, translated from the Greek, &c. &c. by a graduate of Medicine* (William C. Dansey, M. B.). London, 1831, pp. 68, 188.

the wild boar, nine lines went to a strand instead of three (x. 2).

It remains to be noticed, that, when the long range of nets, set up in the manner which has been now represented, was designed to catch the stag (*cervus*), it was flanked by cords, to which, as well as to the nets themselves, feathers *dyled scarlet*, and of other bright colors intermixed with their native white, and sometimes probably birds' wings, were tied so as to flare and flutter in the wind*. This appendage to the nets was called the *metus* or *formido* (Virg. *Æn.* xii. 750), because it frightened these timid quadrupeds so as to urge them onwards into the toils. Hence Virgil, speaking of the method of taking stags in Scythia, says,

Nor toils their flight impede, nor hounds o'ertake,
Nor plumes of purple dye their fears awake.

Georg. iii. 371, 372.—*Sotheby's Translation.*

The following passages likewise allude to the use of this contrivance in the stag-hunt :

Nec formidatis cervos includite pennis.—Ovid. *Met.* xv. 475.

Vagos dumeta per avia cervos
Circumdat maculis et multa indagine pinnæ.

Auson. Epist. iv. 27.

Nemesianus, in the following passage, asserts that the cord (*linea*) carrying feathers of this description had the effect of terrifying not the stag only, but the bear, the boar, the fox and the wolf :

Linea quinetiam, magnos circumdare saltus
Quæ possit, volucresque metu concludere prædas,
Digerat innexas non una ex alite pinnas.
Namque ursos, magnosque sues, cervosque fugaces
Et vulpes, acresque lupos, ceu fulgura cæli
Terrificant, linique vetant transcendere septum.
Has igitur vario semper fucare veneno
Cura tibi, neveisque alios miscere colores,
Alternosque metus subtemine tendere longo.

Cyneg. 303-311.

The same fact is asserted in a striking passage, which has

* Dum trepidant alæ.—Virg. *Æn.* iv. 121.

been above quoted from Grattius Faliscus. To the same effect are the following passages :

Nec est mirum, cum maximos ferarum greges linea pennis distincta conterreat, et ad insidias agat, ab ipso effectu dicta formido.—Seneca, *de Ira*, ii. 11.

Feras lineis et pinna conclusas contine : easdem a tergo eques telis incessat : tentabunt fugam per ipsa quæ fugerant, proculcabantque formidinem—Seneca, *de Clementia*, i. 12.

Picta rubenti lineo pinna
Vano claudat terrore feras.
Seneca Frag. *Hippol.* i. 1.

III.

FUNDA, JACULUM, RETE JACULUM, RETIACULUM.

ΑΜΦΙΒΛΗΣΤΡΟΝ, ΑΜΦΙΒΟΛΟΝ.

Fishing-nets* were of six different kinds, which are enumerated by Oppian as follows :

Τῶν τὰ μὲν ἀμφίβληστρα, τὰ δὲ γοῖφοι καλέονται,
Γάγγαμα τ', ἡδ' ὑποχαῖ περιηγέες, ἡδὲ σαγήναι.
* Ἄλλα δὲ κικλήσκουσι καλύματα.—*Hal.* iii. 80-82.

Of these by far the most common were the ἀμφίβληστρον, or *casting-net*, and the σαγήνη, *i. e.* the *drag* or *sean*. Consequently these two are the only kinds mentioned by Virgil and Ovid in the following passages :

Atque alius latum funda jam verberat amnem,
Alta petens ; pelagoque alius trahit humida lina.
Virg. *Georg.* i. 141, 142.
Hi jaculo pisces, illi capiuntur ab hamis ;
Hos cava contento retia fune trahunt.
Ovid, *Art. Amat.* i. 763, 464.

By Virgil the casting-net is called *funda*, which is the common term for a sling. In illustration of this it is to be observed, that the casting-net is thrown over the fisherman's shoulder, and then whirled in the air much like a sling. By this action he causes it to fly open at the bottom so as to form a circle,

* Ἀλιευτικὰ δίκτυα. Diod. Sic. xvii. 43. p. 193, Wessel.

which is loaded at intervals with stones or pieces of lead, and this circle "strikes the broad river*:" for the casting-net is used either in pools of moderate depth, or in rivers which have, like pools, a broad smooth surface; whereas the sear is employed for fishing in the deep (*pelago*)†.

Isidore of Seville, in his account of the different kinds of nets (*Orig.* xix. 5), thus speaks: "*Funda* genus est piscatorii retis, dicta ab eo, quod in fundum mittatur. Eadem etiam a jactando *jaculum* dicitur. Plautus:

Probus quidem antea jaculator eras†."

Besides the passage of Plautus, here quoted by Isidore, there are two others, in which the casting-net is mentioned under the name of *rete jaculum*, viz. *Asinar.* l. i. 87, and *Truc.* l. i. 14. Pareus, as we find from his *Lexicon Plautinum*, clearly understood the meaning of the term, and the distinction between the casting-net and the sear. Of the *Rete jaculum* he says, "Sic dicitur ad differentiam *verriculi*, quod non jacitur, sed trahitur et verritur." He adds, that Herodotus calls it ἀμφίβληστρον, and the Germans *Wurffgarn*.

The word occurs twice in Herodotus, and both places throw light upon its meaning. In Book i. c. 141. he says: "The

* The Arabs now employ the casting-net on the shores of the Arabian Gulf. "Its form is round, and loaded at the lower part with small pieces of lead; and, when the fisherman approaches a shoal of fish, his art consists in throwing the net so that it may expand itself in a circular form before it reaches the surface of the water."—Wellsted's *Travels in Arabia*, vol. ii. p. 148.

† For a technical account of nets, including the casting-net as now made, the reader is referred to the Hon. and Rev. Charles Bathurst's *Notes on Nets; or the Quincunx practically considered*, London, 1837, 12mo. Duhamel wrote on the same subject in French.

‡ *Jaculator* corresponds to the Greek ἀμφιβολεὺς.

Ausonius, in the following lines, which refer to the methods of fishing in the vicinity of the Garonne, appears to distinguish between the *jaculum* and the *funda*.

Piscandi traheris studio? nam tota supellex
Dumnotoni tales solita est ostendere gazas:
Nodosas vestes animantium Nerinorum,
Et jacula, et fundas, et nomina villica lini,
Colaque, et indutos terrenis vermibus hamos.

Epist. iv. 51–55.

Lydians had no sooner been brought into subjection by the Persians than the Ionians and Æolians sent ambassadors to Cýrus at Sardis, entreating him to receive them under his dominion on the same conditions on which they had been under Cræsus. To this proposal he replied in the following fable. A piper, having seen some fishes in the sea, *played for a while on his pipe, thinking that this would make them come to him on the land.* Perceiving the fallacy of this expectation, he took a casting-net, and, having thrown it around a great number of the fishes, he drew them out of the water. He then said to the fishes, as they were jumping about, *As you did not choose to dance out of the water, when I played to you on my pipe, you may put a stop to your dancing now.*" The other passage (ii. 95) has been illustrated in a very successful manner by William Spence, Esq., F. R. S., in a paper in the Transactions of the Entomological Society for the year 1834. In connection with the curious fact, that the common house-fly will not in general pass through the meshes of a net, Mr. Spence produces this passage, in which Herodotus states, that the fishermen who lived about the marshes of Egypt, being each in possession of a casting-net, and using it in the day-time to catch fishes, employed these nets in the night to keep off the gnats, by which that country is infested. The casting-net was fixed so as to encircle the bed, on which the fisherman slept; and, as this kind of net is always pear-shaped, or of a conical form, it is evident that nothing could be better adapted to the purpose, as it would be suspended like a tent over the body of its owner. In this passage Herodotus twice uses the term ἀμφίβληστρον, and once he calls the same thing δίκτυον, because, as we have seen, this was a common term applicable to nets of every description*.

The antiquity of the casting-net among the Greeks appears

* None of the commentators appear to have understood these passages. In particular we find that Schweighäuser in his *Lexicon Herodoteum* explains Ἀμφίβληστρον thus: "Verriculum, Rete quod circumjicitur." *Rete*, however, corresponds to δίκτυον, which meant a net of any kind; and *Verriculum* is the Latin for Σαγήνη, which, as will be shown hereafter, was a sean, or drag-net.

from a passage in the *Shield of Hercules*, attributed to Hesiod (l. 213–215). The poet says, that the shield represented the sea with fishes seen in the water, “and on the rocks sat a fisherman watching, and he held in his hands a casting-net (*ἀμφίβληστρον*) for fishes, and seemed to be throwing it from him.” We apprehend that, the position of *sitting* was not so suitable to the use of the casting-net as standing, because it requires the free use of the arms, which a man cannot well have when he sits. In other respects this description exactly agrees with the use of the casting-net: for it is thrown by a single person, who remains on land at the edge of the water, observes the fishes in it, and throws the net from him into the water so as suddenly to inclose them.

In two of the tragedies of Æschylus we find the term *ἀμφίβληστρον* applied *figuratively* by Clytemnestra to the *shawl*, in which she enveloped her husband in order to murder him.

* Ἀπειρον ἀμφίβληστρον, ὥσπερ ἰχθῶν,
περιστιχίζω, πλοῦτον εἴματος κακόν.—*Agamem.* 1353, 1354.

Μέμνησο δ', ἀμφίβληστρον ὡς ἐκαίνισαν.—*Choëph.* 485.

Lycophron (l. 1101) calls this garment by the same name, when he refers to the same event in the fabulous history of Greece. We have seen, that in other passages the shawl so used is with equal aptitude called a purse-net (*ἄρκυς*).

One of the comedies of Menander was entitled Ἀλιεῖς, “the Fisherman.” The expression, Ἀμφιβλήστρον περιβάλλεται, is quoted from it by Julius Pollus (x. 132)†.

Athenæus (lib. x. 72. p. 450 c. Casaub.) quotes from Antiphanes the following line, which describes a man “throwing a casting-net on many fishes”:

Ἰχθύσιν ἀμφίβληστρον ἀνὴρ πολλοῖς ἐπιβάλλων.

In an epigram of Leonidas Tarentinus we find the casting-net called *ἀμφίβολον* instead of *ἀμφίβληστρον*†.

The *ἀμφίβληστρον* is mentioned together with two other kinds of nets by Artemidorus, and which will be quoted presently.

* Menandri et Phil. *Reliquæ, a Meineke*, p. 16.

† Brunck, *Anal.* i. 223, No. xii. Jacobs, *Anthol.* i. 2. p. 74.

The following curious passage of Meletius *de Natura Hominis*, in which that author, probably following Galen, describes the expansion of the optic nerves, mentions the casting-net as “an instrument used by fishermen”:

Διασχίζονται δὲ τὰ νεῦρα εἰς τοὺς θαλάμους, ὥσπερ ἦν τις λαβὼν πάπυρον, ταύτην εἰς λεπτὰ διατεμὼν καὶ διασχίζων ἀναπλέκῃται πάλιν, καὶ ποιῆ ἡμιτῶνα λεγόμενον ἀμφιβληστροειδῆ, ὅμοιον ἀμφιβλήστρω. ὄργανον δὲ τοῦτο θηρευταῖς ἰχθύων χρῆσιμον.—Salmasius, in *Tertull. de Pallio*, p. 213.

The ἡμιτῶν ἀμφιβληστροειδῆς, or *tunica retina*, was so called on account of its resemblance in form to the casting-net.

As we learn from Herodotus that the casting-net was universally employed by the fishermen of Egypt, we shall not be surprised to find it mentioned in the Alexandrine, or, as it is commonly called, the Septuagint version of the Psalms and Prophets:—

Πεσοῦνται ἐν ἀμφιβλήστρω αὐτοῦ ἁμαρτωλοὶ,
i. e. “Sinners shall fall in his casting-net.”—*Psalms* cxli. 10.

Cadent in retiaculo ejus peccatores.—*Vulgate Version*.

“Let the wicked fall in their own nets.”—*Common English Version*.

The word in the original Hebrew is מַכְמֵר, which Gesenius translates “Rete,” a net. This word must have been more general in its meaning than the Greek ἀμφιβληστρον, and included the purse-net, or ἄρκυς. The Chaldee and Syriac versions use in this passage a word, which denotes snares in general. See *Isaiah* li. 20, where the same word is used in the Hebrew, but applied to the catching of a quadruped, and where consequently the purse-net must have been intended.

Καὶ οἱ βάλλοντες σαγῆνας, καὶ οἱ ἀμφιβολεῖς πενήθουσι.

i. e. “And they who throw seans, and they who fish with the casting-net, shall mourn.”—*Isa.* xix. 8.

Et expandentes rete super faciem aquarum emarcescent.—*Vulgate Version*.

“And they that spread nets upon the waters shall languish.”—*Common English Version*.

It is to be observed, that this prophecy relates to Egypt. The Hebrew verb פָּרַשׁ, here translated “expandentes,” “they that spread,” is exactly applicable to the remarkable expansion of the casting-net just as it reaches the surface of the water. In

the Alexandrine version we may also observe the clear distinction between the two principal kinds of nets, the seān and the casting-net, and that the man who fishes with the latter is called ἀμφιβολεὺς, as in Latin he was designated by the single term *jaculator*.

Ἐΐλκυσεν αὐτὸν ἐν ἀμφιβλήσσοι, καὶ συνήγεν αὐτὸν ἐν ταῖς σαγήναις αὐτοῦ· ἔνεκεν τοῦτου εὐφρανθήσεται καὶ χαρήσεται ἡ καρδία αὐτοῦ. "Ἐνεκεν τοῦτου θύσει τῇ σαγήνῃ αὐτοῦ, καὶ θυμιάσει τῷ ἀμφιβλήστρῳ αὐτοῦ, ὅτι ἐν αὐτοῖς ἐλίπανε μερίδα αὐτοῦ καὶ τα βρώματα αὐτοῦ ἐκλεκτά. Διὰ τοῦτο ἀμφιβαλεῖ τὸ ἀμφίβληστρον αὐτοῦ, καὶ διαπαντὸς αποκτῆναι εἶθνη οὐ φείσεται.

i. e. "He (the Chaldean) hath drawn him in a casting-net and gathered him in his seans: therefore his heart shall rejoice and be glad. Therefore he shall sacrifice to his seān and burn incense to his casting-net, because by them he hath fattened his portion and his chosen dainties. Therefore he shall throw his casting-net, and not spare utterly to slay nations."—*Habakkuk*, i. 15–17.

"They catch them in their net and gather them in their drag; therefore they rejoice and are glad. Therefore they sacrifice unto their net and burn incense unto their drag: because by them their portion is fat and their meat plenteous. Shall they therefore empty their net, and not spare continually to slay the nations?"—*Common English Version*.

The Latin Vulgate in this passage uses without discrimination the terms *rete* and *sagena*, which latter is the Greek word in a Latin form.

Ἀμφίβληστρον occurs twice in the New Testament. Matthew iv. 18: "Jesus, walking by the sea of Galilee, saw two brethren, Simon and Andrew, *casting a net into the sea*; for they were fishers": in the original, βάλοντας ἀμφίβληστρον εἰς τὴν θάλασσαν; in the Vulgate version, "mittentes rete." It appears no sufficient objection to the sense which has been assigned to ἀμφίβληστρον, that here two persons are mentioned as using it at the same time. Being partners and engaged in the same employment, one perhaps collecting the fishes which the other caught, they might be described together as "throwing the casting-net," although only one at a time held it in his hands. In other respects this explanation is particularly suitable to the circumstances. Jesus was walking on the shore and accosted the two brothers. This suits the supposition that they were on the shore likewise, and not fishing out of a boat, as they did with the seān at other times. In verse 20 the Evangelist uses the term δίκτυα (nets), saying "they left their nets," and meaning

both their casting-net and those of other kinds. In verse 21 he mentions that James and John were in their boat, mending their nets (*δίκτρα*).

The same things are to be observed in Mark i. 16, which is the parallel passage.

IV.

ΓΡΙΦΟΣ, or ΓΡΙΠΟΣ.

Pursuing the order adopted by Oppian in his list of fishing nets above quoted, we come to the *Γρίφος*. What kind of net this was we have been unable to discover. It must, however, have been one of the most useful and important kinds, because Plutarch mentions *γρίφοι καὶ σαγήναι* as the common implements of the fisherman*, and Artemidorus speaks of this together with the casting-net and the sean in similar terms†.

It may be observed, that *Γριπεὺς* is used for a fisherman‡, apparently equivalent to *ἀλιεύς*§. We also find the expression *Γριπηίδι τέχνη*, meaning, “By the fisherman’s art||”.

V.

ΓΑΓΓΑΜΟΝ.

The third fishing-net in Oppian’s enumeration is *Γάγγαμον*. We find it once mentioned metaphorically, viz. by Æschylus, who calls an inextricable calamity, *Γάγγαμον ἄτης*¶. In Schneider’s edition of Oppian we find this note, “Rete ostreis capiendis esse annotavit Hesychius.” Passow also in his Lexicon explains it as “a small round net for catching oysters.” The reference to Hesychius is incorrect. If it was a net for catching oysters, which appears very doubtful, it may have been the net used by the Indians in the pearl-fishery**.

* *Περὶ ἐνθυμίας*, vol. v. p. 838, ed Steph.

† L. ii. c. 14.

‡ Jacobs, *Anthol.* vol. i. p. 186, Nos. 4 and 5.

§ Theocrit. i. 39 ; iii. 26.

|| Brunck, *Anal.* ii. 9, No. 14.

¶ *Agam.* 352.

** *Ἀέγει Μεγασθῆνης θηρεύεσθαι τὴν κόγχην αὐτοῦ δικτύοισι.* Arrian, *Indica*, vol. i p. 525, ed. Blancardi.

VI.

ΥΠΟΧΗ.

THE ὑποχή, which is the fourth in Oppian's enumeration, was the landing-net, used merely to take fishes out of the water when they rose to the surface, or in similar circumstances to which it was adapted. It was made with a hoop (κύκλος) fastened to a pole, and was perhaps also provided with the means of closing the round aperture at the top*.

Of the Κάλυμμα we find nowhere any further mention.

VII.

TRAGUM, TRAGULA, VERRICULUM.

ΣΑΓΗΝΗ.

THESE were the Greek and Latin names for the *sean*. Before producing the passages in which they occur, we will present to the reader an account of this kind of net as now used by the fishermen on the coast of Cornwall (England) for catching pilchards, and as described by Dr. Paris in his elegant and pleasant *Guide to Mount's Bay and Land's End*†.

“At the proper season men are stationed on the cliffs to observe by the color of the water where the shoals of pilchards are to be found. The sean is carried out in a boat, and thrown into the sea by two men with such dexterity, that in less than four minutes the fish are inclosed. It is then either moored, or, where the shore is sandy and shelving, it is drawn into more shallow water. After this the fish are bailed into boats and carried to shore. A sean is frequently *three hundred fathoms long, and seventeen deep*. The bottom of the net is kept to the ground by leaden weights, whilst the corks keep the top of it floating on the surface. A sean has been known to inclose at one time as many as *twelve hundred hogsheads*, amounting to about *three millions of fish*.”

* See Oppian, *Hal.* iv. 251.

† Penzance, 1816, p. 91

Let this passage be compared with the following, which gives an account of the use of the same kind of net among the Arabs. It will then appear how extensively it is employed, since we find it used in exactly the same way both by our own countrymen and by tribes which we consider as ranking very low in the scale of civilization; and on making this comparison, the inference will seem not unreasonable, that the ancient Greeks and Romans, who in several of their colonies in the Euxine Sea, on the coasts of Ionia, and of Spain, and in other places, carried on the catching and curing of fish with the greatest possible activity and to a wonderful extent, used nets of as great a compass as those which are here described.

“The fishery is here (*i. e.* at Burka, on the eastern coast of Arabia) conducted on a grand scale, by means of nets many hundred fathoms in length, which are carried out by boats. The upper part is supported by small blocks of wood, formed from the light and buoyant branches of the *date-palm*, while the lower part is loaded with lead. To either extremity of this a rope is attached, by which, when the whole of the net is laid out, about thirty or forty men drag it towards the shore. The quantity thus secured is enormous; and what they do not require for their own consumption is salted and carried into the interior. When, as is very generally the case, the nets *are the common property of the whole village*, they divide the produce into equal shares*.”

That this method of fishing was practised by the Egyptians from a remote antiquity appears from the remaining monuments. The paintings on the tombs show persons engaged in drawing the sean, which has floats along its upper margin and leads along the lower border†. An ancient Egyptian net, obtained by M. Passalacqua, is preserved in the Museum at Ber-

* Lieutenant Wellsted's *Travels in Arabia*, vol. i. (*Ornam*), pp. 186, 187.

† See Wilkinson's *Manners and Customs of Ancient Egypt*, vol. ii. p. 20, 21; see also vol. iii. p. 37. One of these paintings, copied from Wilkinson, is introduced in Plate X. fig. 3. of this work. The fishermen are seen on the shore drawing the net to land full of fishes. There are eight floats along the top, and four leads at the bottom on each side. The water is drawn as is usual in Egyptian paintings.

lin. Some of its leads and floats remain, as well as a gourd, which assisted the floats*.

Besides the verses of Oppian, which are above quoted, we find another passage of the same poem (*Hal.* iii. S2, S3), which mentions the following appendages to the *σαγήνη*, viz. the *πίσαι*, the *σφαιρῶνες*, and the *σκολιδὸς πάναγρος*. As the *πόδες*, or *feet* of a sail were the ropes fastened to its lower corners, we may conclude that the *πίσαι* were the ropes attached to the corners of the sear, and used in a similar manner to fasten it to the shore and to draw it in to the land, as is described by Ovid in the line already quoted,—

Hos cava contento retia fune trahunt.

The *σφαιρῶνες*, as the name implies, were spherical, and must therefore have been either the floats of wood or cork at the top, or the weights, consisting either of round stones or pieces of lead, at the bottom. The *σκολιδὸς πάναγρος* must have been a kind of bag formed in the sear to receive the fishes, and thus corresponding to the purse or conical bag in the *ἄρκυς*. The term is illustrated by the application of the equivalent epithet *ἀγκύλα* or “angular,” to hunting-nets in a passage from Brunck’s *Analecta*, which was formerly explained, and by the epithet “cava” in the line just quoted from Ovid†.

In the following passage Ovid mentions the use both of the corks and of the leads‡. This passage also shows that several nets were fastened together in order to form a long sear :

*Aspicis, ut summa cortex levis innatat unda,
Cum grave nexa simul retia mergat onus?*

Trist. iii. 4. 1, 12.

This use of cork and lead in fishing is also mentioned by Ælian, *Hist. Anim.* xii. 43; and that of cork by Pausanias,

* Un filet de pêche à petites mailles, et fait avec du fil de lin. Cet objet, qui est garni de ses plombs, conserve encore les morceaux de bois qui garnissaient sa partie supérieure, ainsi que un courge qui l’aidait à surnager.—Thèbes. Passalacqua, *Catalogue des Antiquités découvertes en Egypte*, No. 445. p. 22.

† Observe also the use of the word *μυχθὸς* in the passage of Lucian’s *Timon*, quoted below.

‡ *Μολύβδαινας*, J. Pollux, x. 30. § 132.

viii. 12. § 1; and by Pliny, H. N. xvi. 8. s. 13, where, in reciting the various uses of cork, he says it was employed “*piscantium tragulis.*” Sidonius Apollinaris, describing his own villa, says:—

Hinc jam spectabis, ut promoveat alnum piscator in pelagus, ut stataria retia suberinis corticibus extendat.—*Epist.* ii. 2.

“Hence you will see how the fisherman moves forward his boat into the deep water, that he may extend his stationary nets by means of corks.”

Alciphron, in his account of a fishing excursion near the Promontory of Phalerum, says, “The draught of fishes was so great as almost to submerge the corks*.” The earnest desire of a posterity, founded on the wish for posthumous remembrance, which was a very strong and prevailing sentiment among the ancients, is illustrated by the language of Electra in the Choëphoræ of Æschylus, where she entreats her father upon this consideration to attend to her prayer, and likens his memory to a net, which his children, like corks, would save from disappearing:—“*Do not extinguish the race of the Pelopidæ. For thus you will live after you are dead. For a man’s children are the preservers of his fame when dead, and, like corks in dragging the net, they save the flaxen string from the abyss.*” The use of the corks is mentioned in several of the epigrams of the Greek Anthology, already referred to, and in the following passage of Plutarch:—

“Ὡσπερ τοὺς τὰ δίκτυα διασημαίνοντας ἐν τῇ θαλάσῃ φελλοὺς ὀρῶμεν ἐπιφερομένους.—*De Genio Socratis*, p. 1050, ed Steph.

Passages have been already produced from Plutarch, Artemidorus, and the Alexandrine version of Isaiah and Habakkuk, in which the sean is mentioned by its Greek name *σαγήνη*, in contradistinction to other kinds of nets. Also the passage above cited from Virgil’s Georgics (“*pelagoque alius trahit humida lina*”), indicates the use of the sean in deep water, and the practice of dragging it out of the water by means of ropes, which gave origin both to its English name, *the Drag-net*, and to its Latin appellations, *tragula*, used by Pliny (*l. c.*),

* Μικρον και τοὺς φελλοὺς ἐδέησε κατασύραι ὕφαλον τὸ δίκτυον ἐξογκοῦμένον.—*Epist.* i. 1.

and *tragum*, which is found in the ancient Glossaries and in Isidore of Seville*.

We find mention of the sean more especially for the capture of the tunny and of the pelamys, which were the two principal kinds of fish caught in the Mediterranean. Lucian speaks of the tunny-sean†, which was probably the largest net of the kind, and he relates the circumstance of a tunny escaping from its bag or bosom‡. The sean is thrice mentioned in the Epistles of Alciphron (*l. c.* and *lib. i. epp. 17, 18.*), and in the two latter passages, as used for catching tunnies and pelamides. We read also of a dolphin (*δέλφης*) approaching the sean§; but this might be by accident. It was not, we apprehend, employed to catch dolphins.

In the following passage of the *Odyssey* (*xxii. 384–387*) we have a description of the use of a sean in a small bay, having a sandy shore at its extremity, and consequently most suitable for the employment of this kind of net :

"Ὡστ' ἰχθύας, οὓσθ' ἀλιήες
Κοῖλον ἐς αἰγιαλὸν πολιῆς ἔκτοσθε θαλάσσης
Δικτύῳ ἐξέρυσαν πολυωπῶ· οἱ δέ τε πάντες
Κύμβη' ἄλδς ποθίοντες ἐπι ψαμάθοισι κέχυνται.

The poet here compares Penelope's suitors, who lie slain upon the ground, to fishes, "which the fishermen by means of a net

* *Tragum* genus retis, ab eo quod trahatur nuncupatum : ipsum est et verriculum. Verrere enim trahere est.—*Orig.* xix. 5.

The Latin name *verriculum* occurs in a passage of Valerius Maximus, which is also remarkable for a reference to the Ionian fisheries, and for the use of the word *jactus*, literally, *a throw*, corresponding to that which the Cornish men denominate, *a haul of fish*.

A piscatoribus in Milesia regione verriculum trahentibus quidam jactum emerat.—*Memor.* lib. iv. cap. 1.

We introduce here an expression of Philo, in which we may remark that βόλος ἰχθύων corresponds exactly to *jactus* in Latin, and that the drawing of the net into a circle is clearly indicated: βόλον ἰχθύων πάντας ἐν κύκλῳ σαγηνεύσας.—*Vita Mosis*, tom. ii. p. 95. ed. Mangey.

† Σαγήνη θυννευτική.—*Epist. Saturn.* tom. iii. p. 406. ed. Reitz.

‡ Ὁ θύννος ἐκ μυχοῦ τῆς σαγήνης διέρυγεν.—*Timon*, § 22. tom. i. p. 136.

§ Οὐκ ἔτι πλησιάζει τῇ σαγήνῃ.—*Ælian*, H. A. xi. c. 12. In this chapter the same net is twice called by the common name, δίκτυον.

full of holes have drawn out of the hoary sea to a hollow bay, and all of which, deprived of the waves of the sea, are poured upon the sands." Although the general term *δίκτυον* is here used, it is evident that the net intended was the sean, or drag-net.

In one of the passages of Alciphron already referred to, mention is made of the use of the sean in a similar situation. Some persons, who are fishing in a bay for tunnies and pelamides, inclose nearly the whole bay with their sean, expecting to catch a very large quantity*. This circumstance proves, that the sean was used with the ancient Greeks, as it is with us, to encompass a great extent of water.

We have seen that the sean supplied figures of speech no less than the purse-net (*ἄρκυς*), and the casting-net (*ἀμφίβληστορον*). It is applied thus in the case of persons who are ensnared by the

* Τῇ σαγήνῃ μονονουχί τὸν κόλπον ὄλον περιελάβομεν.—*Epist.* i. 17.

A few miscellaneous passages, which refer to the use of the sean, may be conveniently introduced here :

Diogenes, seeing a great number of fishes in the deep, says there is need of a sean to catch them ; *σαγήνης δέσεις*.—Lucian, *Piscata*, § 51. tom. i. p. 618, ed. Reitz.

The sean is called, from its material, *σαγηναίον λίνον*, in an epigram of Archias.—Brunck, *Anal.* ii. 94. No. 10.

Plutarch, describing the *spider's web*, says, that its *weaving* is like the labor of women at the loom, its hunting like that of fishermen with the sean.—*De Solertia Animalium*, tom. x. p. 29, ed. Reiske. He here uses the term *σαγηνευτής* for a fisher with the sean. This verbal noun is regularly formed from *σαγηνευειν*, which means to *inclose or catch with the sean* : e. g. *ἐν δίκτυοις σεσαγηνευμένοι*.—Herodian, iv. 9, 12.

Lucian uses the same verb in reference to the story of Vulcan inclosing Mars and Venus in a net ; *σαγηνεύει τοῖς δεσμοῖς*.—*Dialogi Deor.* tom. i. p. 243. *Somnium*, tom. ii. p. 707, ed. Reitz.

Leonidas of Tarentum, in an epigram enumerating the ornaments of a lady's toilet (Brunck, *Anal.* i. p. 221), mentions *ὁ πλατὺς τριχῶν σαγηνευτήρ*. Jacobs (*Annot. in Anthol.* i. 2. p. 63) supposes this to mean the lady's comb ; but, judging from the known meaning of *σαγήνη* and its derivatives, we may conclude that it was the *κεκρόφαλος*, or net, which inclosed and encircled the hair, like a sean.

The following verse of Manilius (lib. v. ver. 678.) is remarkable as a rare instance of the adoption of the Greek word *sagena* by a Latin poet :—

Excipitur vasta circumvallata sagena.

wicked*, who are captivated by the charms of love† or of eloquence‡, or who are held in bondage by superstition§. But by far the most distinct, expressive and important of its metaphorical applications, was to the mode of besieging a city by encircling it with one uninterrupted line of soldiers, or sweeping away the entire population of a certain district by marching in similar order across it. Of this the first example occurs in Herodotus iii. 145 :—

Τὴν δὲ Σάμον σαγηνεύσαντες οἱ Πέρσαι παρέδοσαν Σολυσῶντι, ἐρῆμον ἐοῦσαν ἀνδρῶν.

“The Persians, having dragged Samos, delivered it, being now destitute of men, to Solyson.”

As we speak of *dragging* a pit, so the Greeks would have spoken, in this metaphorical sense, of *dragging* an island. In the sixth book (ch. xxxi.) Herodotus particularly describes this method of capturing the enemy. According to this account the Persians landed on the northern side of the island. They then took hold of one another's hands so as to form a long line, and thus linked together they walked across the island to the south side, so as to hunt out all the inhabitants. The historian here particularly mentions, that Chios, Lesbos, and Tenedos were reduced to captivity in this manner. It is recorded by Plato||, that Datis, in order to alarm the Athenians, against whom he was advancing at the head of the Persian army, spread a report that his soldiers, joining hand to hand, had

* Σαγηνεύομαι πρὸς ἀνδρῶν.—Lucian, *Timon*, § 25. tom. i. p. 138, ed. Reitz.

† Brunck, *Anal.* iii. 157. No. 32. Here the sear is called by the general term δίκτυον, but the particular kind of net is indicated by the participle σαγηνευθεῖς.

Τῶνδὲ μαθητῶν,

Οἱ κόσμον γλυκερῆσι Θεοῦ δῆσαντο σαγήναις,

i. e. “A disciple of those who bound the world in the sweet sears of God.”—Greg. Nazianz. *ad Nemesium*, tom. ii. p. 141, ed. Paris, 1630. (See Chap. III, p. 53.)

§ Plutarch, evidently referring to the siege of Jerusalem by Titus, says, “The Jews on the Sabbath sitting down on coarse blankets (ἐν ἀγνάμπτοις, literally, in ἱμάτια, or blankets, which had not been fulled, or cleansed by the γναφεύς), even when the enemy were setting the ladders to scale the walls, did not rise up, but remained, as if inclosed in one sear, namely, superstition, (ὥσπερ ἐν σαγήνημιᾷ, τῇ δεισιδαιμονίᾳ, συνδεδεμένοι).”—*Opp.* tom. vi. *De Superstit.* p. 647, ed. Reiske.

|| *De Legibus*, lib. iii. prope finem.

taken all the Eretrians captive as in a sean. The reader is referred to the Notes of Wesseling and Valckenaer on Herod. iii. 149 for some passages, in which subsequent Greek authors have quoted Herodotus and Plato. We find *σαγηνευθηναι*, "to be dragged," used in the same manner by Heliodorus*.

In addition to the passages of Isaiah and Habakkuk which mention the drag in opposition to the casting-net; we find three references to the use of it in the prophecies of Ezekiel, viz. in Ezek. xxvi. 5. 14; xlvii. 10. The prophet, foretelling the destruction of Tyre, says it would become *a place to dry seans upon*, *ψυγμὸς σαγηνῶν*; "siccatio sagenarum," *Vulgate Version*; "a place for the spreading of nets," *Common English Version*. The Hebrew term for a drag or sean is here הָרֵם.

The only passage of the New Testament which makes express mention of the sean, is Matt. xiii. 47, 48: "The kingdom of heaven is like unto a net (*σαγήνη*) that was cast into the sea, and gathered of every kind; which, when it was full, they drew to shore, and sat down, and gathered the good into vessels, but cast the bad away." The casting-net, which can only inclose part of a very small shoal, would not have been adapted to the object of this parable. But we perceive the allusion intended by it to the great quantity and variety of fishes of every kind which are brought to the shore of the bay (*ἀόγιαλόν*) by the use of the drag. The Vulgate here retains the Greek word, translating *sagena* as in the above-cited passages of Habakkuk and Ezekiel. In John xxi. 6: 8. 11, the use of the sean is evidently intended to be described, although it is called four times by the common term *δίκτυον*, which denoted either a sean, or a net of any other kind. It is in this passage translated *rete* in the Latin Vulgate.

The Greek *σαγήνη* having been adopted under the form *sagena* in the Latin Vulgate, this was changed into *rezne* by the Anglo-Saxons†, and their descendants, have still further abridged it into *sean*. In the south of England this word is also pronounced and spelt *seine*, as it is in French. We find in Bede's

* Lib. vii. p. 304. ed. Commelini.

† See Caedmon, p. 75. ed. Junii.

Ecclesiastical History* a curious passage on the introduction of this kind of net into England. He says, "the people had as yet only learnt to catch eels with nets. Wilfrid caused them to collect together all their eel-nets, and to use them as a sean for catching fishes of all kinds."

VIII.

RETICULUS OR RETICULUM.

ΓΥΡΓΑΘΟΣ.

In the ancient Glossaries we find Γύργαθος translated *Reticulus* and *Reticulum*: it meant, therefore, *a small net*. It was not a name for nets in general, nor did it denote any kind of hunting-net or fishing-net, although the net indicated by this term might be used occasionally for catching animals as well as for other purposes. It was used, for example, in an island on the coast of India to catch tortoises, being set at the mouths of the caverns, which were the resort of those creatures†. But the same term is applied to the nets which were used to carry pebbles and stones intended to be thrown from military engines‡; and a similar contrivance was in common use for carrying loaves of bread§. Hence it is manifest that the γύργαθος was often much like the nets in which the Jewish boys in our streets carry lemons, being inclosed at the mouth by a running string or noose. We may therefore translate γύργαθος, "a bag-net," as it was made in the form of a bag. "To blow into a bag-net," εἰς γύργαθον φυσᾶν, became a proverb, meaning to labor in vain. But this bag was often of much smaller dimensions, and of much finer materials, than in the instances already mentioned. From a passage of Æneas Tacticus (p. 54. ed. Orell.) we may

* Page 294, ed. Wilkins.

† Ἐν δὲ ταύτῃ τῇ νήσῳ καὶ γύργαθοις αὐτὰς ἰδίως λινεύουσιν, αὐτὶ δικτύων καθιεντες αὐτοὺς περὶ τὰ στόματα τῶν προράχων.—*Arrian, Per. Maris Eryth.* p. 151. ed. Blancardi.

‡ Athenæus, lib. v. § 43. p. 208, ed. Casaub.

§ Γύργαθον σκεῶς πλεκτον, ἐν ᾧ βάλλουσι τὸν ἄρτον οἱ ἀρτοκόποι.—*Hesych.*

Reticulum panis.—*Hor. Sat. i. l. 47.*

infer that it was sometimes not larger than a purse for the pocket. Hence Aristotle* properly applies the term γύργαθος to the small spherical or oval bag in which spiders deposit their eggs: Among the luxurious habits of the Sicilian prætor Verres, it is recorded, that he had a small and very fine linen net, filled with rose-leaves, “which ever and anon he gave his nose †.” This net was, no doubt, called γύργαθος in Greek.

* *Anim. Hist.* v. 27. Compare Apollodorus, *Frag.* xi. p. 454, ed. Heyne.

† Reticulum ad nares sibi admovebat, tenuissimo lino, minutis maculis, plenum rosæ.—Cic. *in Verr.* ii. 5. 11

THE END.





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