

With Dr Dowson's
Compliments.

ERASMUS DARWIN.

PREPARING FOR PUBLICATION, a fuller Account of THE
LIFE AND WORKS—especially the Medical Works—OF DR.
DARWIN.

“ZOONOMIA.—We could wish that this book were better known at the present day; it contains the results of much acute and original thought.”—*British and Foreign Medico-Chirurgical Review*, Oct. 1861.

ERASMUS DARWIN :

PHILOSOPHER, POET, AND PHYSICIAN.

5

A L E C T U R E

TO

THE LITERARY AND PHILOSOPHICAL SOCIETY OF WHITBY

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WITH MANY ADDITIONS,

AND AN APPENDIX ON THE ORIGIN OF SPECIES,

SELECTED FROM THE WORKS OF DR. DARWIN.

LONDON :

E. K. LEWIS, 15, GOWER STREET, NORTH.

1861.

“ OMNIA E CONCHIS.”

“The motto, allusive to his favourite hypothesis, inscribed by Dr. Darwin on his family arms, which are three scallop shells. On his chaise, in the year 1770, he painted the arms thus inscribed.”

A LECTURE,

&c.

GENTLEMEN—

When I was asked by your Council to contribute a Lecture to your Winter Course, it occurred to me that a few passages from the works of the once famous Dr. Darwin; some particulars of his life, chiefly from Miss Seward's Memoirs of him; and a few remarks of my own on his writings and character, might perchance form an address of sufficient interest to secure an hour's attention. He was a speculative philosopher and a poet, as well as a practical physician, and he has just now (Dec. 1860) a particular claim to our notice; for one of the boldest, not to say wildest, of his hypotheses has been lately revived, and supported by so many additional facts, that it has probably been discussed in every Philosophical Society in England, except our own, and certainly in every private scientific circle.

He was born at Elston, near Newark, in Nottinghamshire, on the 12th of December, 1731, and was the seventh child and fourth son of Robert Darwin, a private gentleman, who is said to have had a taste for literature and science, which he endeavoured to impart to his sons. Erasmus received his early education at Chesterfield school, and was then entered at St. John's College, Cambridge, where he obtained a

scholarship of about £16 a year, and distinguished himself by his poetical exercises, which he composed with uncommon facility. He took the degree of M.B. there in 1755, and afterwards further prepared himself for the practice of medicine by attendance on the lectures of Dr. Hunter in London, and a course of studies at Edinburgh.

He first settled as a physician at Nottingham ; but meeting with no success there, he removed in the autumn of 1756, his twenty-fifth year, to Lichfield, where he was more fortunate ; for, a few weeks after his arrival, to use the words of Miss Seward, “ he brilliantly opened his career of fame.” A young gentleman of family and fortune lay sick of a dangerous fever. A physician who had for many years possessed the confidence of Lichfield and the neighbourhood attended, but at length pronounced the case hopeless, and took his leave. Dr. Darwin was then called in, and, “ by a reverse and entirely novel course of treatment,” the patient recovered. “ The far-spreading report of this judiciously daring and fortunate exertion brought Dr. Darwin into immediate and extensive employment, and soon eclipsed the hopes of an ingenious rival, who resigned the contest ; nor, afterwards, did any other competitor bring his certainly ineffectual lamp into *that* sphere, in which so bright a luminary shone.” *

In 1757, the year after Dr. Darwin settled at Lichfield, he married Miss Howard of that place, “ a blooming and lovely young lady of eighteen ;” in these respects something of a contrast to her husband, whose appearance was not attractive. “ He was somewhat above the middle size ; his form athletic and inclined to corpulence ; his limbs too heavy

* Every quotation without a reference is from Miss Seward.

for exact proportion. The traces of a severe small-pox, features and countenance which, when they were not animated by social pleasure, were rather saturnine than sprightly, a stoop in the shoulders, and the then professional appendage, a large full-bottomed wig, gave at that early period of life an appearance of nearly twice the years he bore. He stammered extremely ; but whatever he said, whether gravely or in jest, was always worth waiting for, though the impression it made might not always be pleasant. Conscious of great native elevation above the general standard of intellect, he became, early in life, sore upon opposition, whether in argument or conduct, and always resented it by sarcasm of very keen edge. Nor was he less impatient of the sallies of egotism and vanity ; even when they were in so slight a degree, that strict politeness would rather tolerate than ridicule them, he seldom failed to present their caricature in jocose but wounding irony. If these ingredients of colloquial despotism were discernible in unworn existence, they increased as it advanced, fed by an ever-growing reputation within and without the pale of medicine.”

By his first wife, who died in 1770, he had three sons. The eldest, Charles, died at Edinburgh, whilst prosecuting, with great assiduity and success, his medical studies in the University. Erasmus, the second son, an attorney at Derby, and a man of “untainted reputation for probity and benevolence, beloved and respected by all who knew him,” but of too acute sensibility, drowned himself in Dec. 1799. The third, Robert Waring, practised as a physician at Shrewsbury for sixty years, and died there in Nov. 1848.

There is perhaps no town of its size in England so rich in literary reminiscences as Lichfield; and, with one exception—that of Sir John Floyer, a celebrated physician who flourished there at the end of the 17th and the beginning of the 18th centuries—its eminent characters all eluster round two great names, those of Darwin and Johnson, who were acquaintances, but not friends.

“Dr. Johnson was several times at Lichfield, on visits to Mrs Lucy Porter, his daughter-in-law (step-daughter), while Dr. Darwin was one of its inhabitants. They had one or two interviews, but never afterwards sought each other. Mutual and strong dislike subsisted between them. It is curious that in Dr. Johnson’s various letters to Mrs. Thrale, dated from Lichfield, the name of Darwin cannot be found; nor indeed that of any of the ingenious and lettered people who lived there. . . . But Johnson liked only worshippers. . . . Where he was, Dr. Darwin had no chance of being heard, though at least his equal in genius, his superior in science; nor indeed, from his impeded utterance, in the company of *any* overbearing declaimer; and he was too intellectually great to be an humble listener to Johnson, therefore he shunned him, on having experienced what manner of man he was. The surly dictator felt the mortification and revenged it, by *affecting* to avow his disdain of powers too distinguished to be an object of genuine scorn. Dr. Darwin, in his turn, was not much more just to Dr. Johnson’s genius and talents, from which only prejudice and resentment could withhold respect.”

But this mutual dislike of Darwin and Johnson was probably not so strong as Miss Seward has represented it. They

were not likely indeed to agree very well, for both were dogmatical ; both “ sore upon opposition ; ” and on the exciting subjects of religion and politics their difference was as great as well could be ; and yet Johnson, as appears by his own diary, was “ at Dr. Darwin’s ” in July, 1774, when he visited his other acquaintances at Lichfield ; and the Lichfield Botanical Society, of which Darwin was the founder and leading member, in the preface to their *System of Vegetables*, published in 1782, only two years before Dr. Johnson’s death, acknowledge their obligations “ to that great master of the English tongue, Dr. Samuel Johnson, for his advice in the formation of the botanic language ; ” and further, Darwin has, individually, awarded praise to Johnson which strong dislike would probably have withheld. He says :—“ The following line, translated from Juvenal by Dr. Johnson—

‘ Slow rises worth, by poverty depressed,
is much superior to the original.’

Of the “ ingenious and lettered people ” who lived at Lichfield in Miss Seward’s time, she herself and Dr. Darwin were the most distinguished. Sir Walter Scott, who edited her poems after her death, says that she “ held for many years a high rank in the annals of British Literature ; ” and Dr. Johnson, on one occasion at least, paid a warm compliment to her poetical talents. “ Madam,” said he, “ there is not any thing equal to your description of the sea round the North Pole, in your Ode on the death of Capt. Cook.” Even in *conversation* with Johnson she appears to great advantage. At Dilly’s, on the 15th of April, 1778, he “ breathed out threatenings and slaughter against the Americans, calling them Rascals—Robbers—Pirates ; and

exclaiming he'd burn and destroy them ; Miss Seward, looking at him with mild but steady astonishment, said, ' Sir, this is an instance that we are always most violent against those whom we have injured.' He was irritated still more by this delicate and keen reproach ; and roared out another tremendous volley, which one might fancy could be heard across the Atlantic !"—*Boswell*.

About the year 1771, Dr. Darwin began the composition of his great philosophical and medical work entitled, "Zoonomia, or the Laws of Organic Life," and devoted to it much time and thought for five and twenty years. The first volume was published in 1794, the second, with a new edition of the first, in 1796.

"Its purport," he says, "is an endeavour to reduce the facts belonging to ANIMAL LIFE into classes, orders, genera, and species ; and, by comparing them with each other, to unravel the theory of diseases."

"The great CREATOR of all things has infinitely diversified the works of his hands, but has at the same time stamped a certain similitude on the features of nature, that demonstrates to us that *the whole is one family of one parent*. On this similitude is founded all rational analogy ; which, so long as it is concerned in comparing the essential properties of bodies, leads us to many and important discoveries ; but when with licentious activity it links together objects, otherwise discordant, by some fanciful similitude, it may indeed collect ornaments for wit and poetry, but philosophy and truth recoil from its combinations."

"The want of a theory, deduced from such strict analogy, to conduct the practice of medicine, is lamented by its professors," but "there are some modern practitioners who declaim against medical theory in general, not considering that to think is to theorize ; and that no one can direct a method of cure to a person labouring under disease without thinking ; that is, without theorizing ; and happy therefore is the patient whose physician possesses the best theory."—*Preface*.

Darwin then was avowedly a theorist, and he was really such, not merely because he was a thinker, for theory does not include all thought, but because he was a diligent framer of theories, commonly so called, or rather of hypotheses, and most of them resting on a basis of hypothetical materialism.

He tells us, indeed, at the beginning of "Zoonomia," that "the WHOLE OF NATURE may be supposed to consist of two essences or substances ; one of which may be termed spirit and the other matter ; the former possessing the power to commence or produce motion, and the latter to receive or communicate it ;" but he subsequently classes "the spirit of animation," by which he means animal and even vegetable life, with heat, electricity, and magnetism, and says in other parts of the work that "the sensorial power or spirit of animation is perpetually renewed by the secretion or production of it in the brain and spinal marrow ;" (I, 75,) that "the spirit of animation at the time it communicates or receives motion from solid bodies must itself possess some property of solidity," (I, 115,) and that "the oxygen of the atmosphere supplies the material from which it is extracted or fabricated." (II, 185, 706.) And further, that "the word *idea*, which has various meanings in the writers of metaphysic," is used by him "simply for those notions of external things, which our organs of sense bring us acquainted with originally, and is defined a contraction, or motion, or configuration of the fibres, which constitute the immediate organ of sense." (I, 11, 2nd edition.)

"The spirit of animation has four different modes of action, or in other words, the animal sensorium possesses four different faculties, which are occasionally exerted, and cause all the contractions of the

fibrous parts of the body. These four faculties of the sensorium during their inactive state are termed irritability, sensibility, voluntariness, and associability; in their active state they are termed irritation, sensation, volition, association." I, 32.

To illustrate the meaning of these terms, which, with the fibrous motions, explain, according to Darwin, all the phenomena of life, I shall quote a few short passages from "Zoonomia," and also a few lines from the last of his poetical works, "The Temple of Nature." His poetry is always more expressive, and often more clear and precise than his prose.

"IRRITATION is an exertion or change of some extreme part of the sensorium residing in the muscles or organs of sense, in consequence of the appulses of external bodies.

" Thus, when illumined by the solar beams,
Yon waving woods, green lawns, and sparkling streams,
In one bright point by rays converging lie
Plann'd on the moving tablet of the eye ;
The mind obeys the silver goads of light,
And IRRITATION moves the nerves of sight.

" SENSATION is an exertion or change of the central parts of the sensorium, or of the whole of it, *beginning* at some of those extreme parts of it, which reside in the muscles or organs of sense. Sensitive ideas are those which are preceded by the sensation of pleasure or pain.

" Oft from sensation quick VOLITION springs,
When pleasure thrills us, or when anguish stings ;
Hence Recollection calls with voice sublime
Immersed ideas from the wrecks of Time,
With potent charm in lucid trains displays
Eventful stories of forgotten days.
Hence Reason's efforts good with ill contrast,—
Compare the present, future, and the past ;

Each passing moment, unobserved restrain
 The wild discordancies of Fancy's train ;
 But leave uncheck'd the Night's ideal streams,
 Or, sacred Muses! your meridian dreams.

“ When we sleep, the faculty of volition ceases to act, and in consequence the uncompar'd trains of ideas become incongruous and form the farrago of our dreams ; in which we never experience any surprise, or sense of novelty.

“ And last Suggestion's mystic power describes
 Ideal hosts arranged in trains or tribes.
 So when the Nymph with volant finger rings
 Her dulcet harp, and shakes the sounding strings ;
 As with soft voice she trills the enamour'd song,
 Successive notes, unwill'd, the strain prolong ;
 The transient trains ASSOCIATION steers,
 And sweet vibrations charm the astonish'd ears.”

“ These four faculties of the animal sensorium may at the time of their exertions be termed motions without impropriety of language ; for we cannot pass from a state of insensibility or inaction to a state of sensibility or of exertion, without some change of the sensorium, and every change includes motion. We shall therefore sometimes term the above described faculties *sensorial motions*, to distinguish them from *fibrous motions* ; which latter expression includes the motions of the muscles and organs of sense.” (I, 33.)

Darwin's axiom that “ every change includes motion ” is doubtless true in physics, but that any motion, except in a figurative sense,* occurs when a man *changes his mind* requires proof. It is indeed possible, and perhaps not improbable, that little movements in the brain, or nerves, or both, may accompany every mental act ; but if we could see them we should only see the particles of the brain change

* “ The motions of his spirit are dull as night,
 And his affections dark as Erebus.”

their place a little—upwards, downwards, sideways, or in some other direction—and this would furnish of course no explanation of sensation, thought, or volition ; so that if we allow Darwin all the sensorial motions that he can wish for, we are just as much in the dark as to the mind as we were before : and yet by means of fibrous and sensorial motions he attempts to explain all the changes of body and mind, in disease as well as in health ; for all diseases are divided by him into four classes—those of irritation, sensation, volition, and association.

But it may be asked, how come the emotions ? To this he replies, “ All our emotions and passions seem to arise out of the exertions of these two faculties of the sensorium,” sensation and volition. To illustrate this I will quote a few sentences from his account of the origin of love, with which he has blended that of the sense of beauty, as arising in the same manner.

“ Our perception of beauty consists in our recognition by the sense of vision of those objects, first, which have before inspired our love by the pleasure which they have afforded to many of our senses : as to our sense of warmth, of touch, of smell, of taste, hunger and thirst ; and secondly, which bear any analogy of form to such objects.

“ When the babe, soon after it is born into this cold world, is applied to its mother’s bosom, its sense of perceiving warmth is first agreeably affected ; next its sense of smell is delighted with the odour of her milk ; then its taste is gratified by the flavour of it ; afterwards the appetites of hunger and of thirst afford pleasure by the possession of their objects, and by the subsequent digestion of their aliment ; and, lastly, the sense of touch is delighted by the softness and smoothness of the milky fountain, the source of such variety of happiness.”—(I, 146.)

Thus then arise, according to Darwin, the emotion of love,

as well as the sense of beauty ; but unhappily for his hypothesis, experience teaches us that a man who has been brought up *with the spoon*, is as susceptible of both, as if he had been nourished at his mother's breast.

Even vegetables are said to be not only "in reality an inferior order of animals," but to have the "passion of love," and various sensations generally thought peculiar to the *higher* animals.

"Thus, besides a kind of taste at the extremities of their roots, similar to that of the extremities of our lacteal vessels, for the purpose of selecting their proper food ; and besides different kinds of irritability residing in the various glands, which separate honey, wax, resin, and other juices from their blood ; vegetable life seems to possess an organ of sense to distinguish the variations of heat, another to distinguish the varying degrees of moisture, another of light, another of touch, and probably another analogous to our sense of smell. To these must be added the indubitable evidence of their passion of love, and I think we may truly conclude, that they are furnished with a common sensorium, belonging to each bud, and that they must occasionally repeat those perceptions, either in their dreams or waking hours, and consequently possess ideas of so many of the properties of the external world, and of their own existence." (I, 107.)

I think it will be admitted that we are now fairly out of the regions of reality, and in those of fancy ; we will therefore turn to Dr. Darwin's chief poetical work, "The Botanic Garden."

About the year 1777 he purchased a little, wild, umbrageous valley, a mile from Lichfield, which he improved by widening and varying the course of a brook that ran through it, and embellishing it with various plants. Miss Seward wrote a little poem upon it, which pleased him so much that he said to her, "It ought to form the exordium of a great

work. The Linnæan system," he added, "is unexplored poetie ground, and a happy subject for the Muse. It affords fine scope for poetie landseape ; it suggests metamorphoses of the Ovidian kind, though reversed. Ovid made men and women into flowers, plants, and trees. You should make flowers, plants, and trees into men and women. I," continued he, "will write the notes, which must be seientifie, and you shall write the verse." Miss Seward observed that, besides her want of botanie knowledge, the plan was not strictly proper for a female pen ; but that she felt how eminently it was adapted to the efflorescence of his own fancy. He objected the professional danger of coming forward an acknowledged poet. It was pleaded, in reply, that on his first commencing medical professor, there might have been some danger ; but that, beneath the unbounded confidence his experienced skill in medicine had obtained from the public, all risk of injury by reputation flowing in upon him from a new source was precluded ; especially since the subject of the poetry, and still more the notes, would be connected with pathology. Dr. Darwin took his friend's advice, and very soon began his great poetie work, adopting for its commencement Miss Seward's lines, but with some alteration, and, to do her justice, not for the better.

He had been a diligent student of botany for many years, and had formed a Botanical Society at Lichfield, which however never consisted of more than three members : himself, Mr. (afterwards Sir Brooke) Boothby, and a proctor of the name of Jackson, of whom Miss Seward speaks with great disrespect, but who appears to have been the chief worker, or, as she says, the drudge of the party. They not merely

collected and examined plants, but also translated into English, and published in 1782, Linnæus's "System of Vegetables," and in 1787 his "Families of Plants." The latter translation I have not seen, but the former is correct and literal, except that some change has been made "in the construction of the social distinctions of the classes on account of the greater delicacy of modern language;" but if this change had been carried further, or the original names preserved without translation, the work would have been better suited to general use: for example, the names of the Linnæan classes, Monandria, Diandria, &c., are given as follows:—

CLASS I.—One male. One husband in marriage.

II.—Two males. Two husbands in the same marriage.

III.—Three males. Three husbands, &c.

XIV.—Two powers. Four husbands, two taller than the other two.

XIX.—Confederate males. Husbands joined together at the top.

And so on, through the rest of the classes and the orders, but with far greater impropriety. Well might Miss Seward say that the subject, if it were to be thus treated, was not strictly proper for a female pen. The Doctor had no scruples: he therefore proceeded with the poem, notwithstanding his friend Mr. Edgeworth's remonstrances against "his vegetable loves," and Miss Seward admits that only one passage in it can justly be charged with indelicacy, for which Homer, from whom the story is taken, must share the censure.

In ten years the second part of the poem, entitled "The Loves of the Plants," was published. The first part, "The Economy of Vegetation," was deferred, because it was thought less likely to interest the majority of readers, though it contained "grander conceptions and more splendid ima-

gery " than the other. The scheme seems to have answered its purpose, for the poem became at once extremely popular, and doubtless amply remunerated the enterprising publisher, who had given ten shillings a line for it. "I was much pleased, Doctor," said Mrs. Galton to him, "with your magnificent description of the Upas; but I was also much surprised, and more especially at the notes containing an elaborate account of it, for I had always considered what we heard of the Upas as a myth." The Doctor laughingly replied, "And so do I, my dear madam, there is not one word of truth in it; but so long as I can get the public to believe me, and as every line puts ten shillings in my pocket, I shall go on *ad infinitum*." (Life of Mrs. Schimmelpenninck, p. 207.)

The poem was written chiefly in his carriage, which was of the kind then called a sulky, because made to hold one person only. It was provided at the top with a skylight, and an awning to be drawn over at pleasure. In a receptacle in front he had paper and pencils, and in one corner a pile of books. Thus, as Dryden says of another poetical physician, Sir Richard Blackmore,

"He wrote to the rumbling of his coach's wheels."

Darwin's theory of poetical composition, to which he strictly adhered in his practice, is given in the Interludes to the second part of the poem. He says—

"The language of poetry consists of those words which are expressive of the ideas, which we originally receive by the organ of sight. . . And as our ideas derived from visible objects are more distinct than those derived from the objects of our other senses, the words expressive of these ideas belonging to vision make up the principal part of poetic language. That is, the poet writes principally to the eye, the prose

writer uses more abstracted terms. Mr. Pope has written a bad verse in the 'Windsor Forest.'

'And Kennet swift for silver cels *renowned*.'

The word *renowned* does not present the idea of a visible object to the mind, and is thence prosaic. But change this line thus :

'And Kennet swift where silver graylings *play*,'

and it becomes poetry, because the scenery is then brought before the eye."

This criticism is just, but it led its author practically to the conclusion that all poetry should be *picture*. He might have learnt from Dr. Johnson that only "one of the great sources of poetic delight is the power of presenting pictures to the mind."

"The general design of the 'Botanic Garden' is to enlist Imagination under the banner of Science; and to lead her votaries from the looser analogies, which dress out the imagery of poetry, to the stricter ones, which form the ratiocination of philosophy. While its particular design is to induce the ingenious to cultivate the knowledge of botany, by introducing them to the vestibule of that delightful science, and recommending to their attention the immortal works of the celebrated Swedish Naturalist, LINNÆUS."

The machinery of the poem is "The Rosierusian doctrine of Gnomes, Sylphs, Nymphs, and Salamanders," which the author supposes to have been originally the names of hieroglyphic figures representing the elements, or of genii presiding over their operations; Gnomes, over earth; Sylphs, air; Nymphs, water; and Salamanders, fire.

The Goddess of Botany having been invited by the Genius of the little valley, by whom was meant, in Miss Seward's lines, its first cultivator, Dr. Darwin;

"She comes!—the GODDESS!—thro' the whispering air,
Bright as the morn, descends her blushing car;
Each circling wheel a wreath of flowers entwines,

And gem'd with flowers the silken harness shines ;
 The golden bits with flowery studs are deck'd,
 And knots of flowers the crimson reins connect.—
 And now on earth the silver axle rings,
 And the shell sinks upon its slender springs ;
 Light from her airy seat the Goddess bounds,
 And steps celestial press the pansied grounds.

Fair spring advancing calls the feather'd quire,
 And tunes to softer notes her laughing lyre ;
 Bids her gay hours on purple pinions move,
 And arms her Zephyrs with the shafts of love ;
 Pleased GNOMES, ascending from their earthy beds,
 Play round her graceful footsteps as she treads ;
 Gay SYLPHS attendant beat the fragrant air
 On winnowing wings, and waft her golden hair ;
 Blue NYMPHS emerging leave their sparkling streams,
 And FIERY FORMS alight from orient beams.”

The Goddess of Botany having thus got hearers, she proceeds to address them in succession, and first the Nymphs of Fire.

“NYMPHS OF PRIMEVAL FIRE! your vestal train
 Hung with gold-tresses o'er the vast inane,
 Pierced with your silver shafts the throne of Night,
 And charm'd young Nature's opening eyes with light ;
 When LOVE DIVINE, with brooding wings uufur'd,
 Call'd from the rude abyss the living world.
 —‘LET THERE BE LIGHT!’ proclaimed the ALMIGHTY LORD,
 Astonish'd Chaos heard the potent word ;
 Through all his realms the kiudling ether runs,
 And the mass starts into a million suns ;
 Earths round each sun with quick explosions burst,
 And second planets issue from the first ;
 Bend, as they journey with projectile force,
 In bright ellipses their reluctant course ;

Orbs wheel in orbs, round centres centres roll,
 And form, self-balanced, one revolving whole.
 Onward they move, amid their bright abode,
 Space without bound, THE BOSOM OF THEIR GOD!"

The author, who was generally well pleased with his own works, seems to have regarded this passage with especial favour. He says in a note, "If these innumerable and immense suns, thus rising out of Chaos, are supposed to have thrown out their attendant planets by new explosions, as they ascended; and those their respective satellites, filling in a moment the immensity of space with light and motion, a grander idea cannot be conceived by the mind of man." (*Botanic Garden*, v. I, ll., 4th edition.)

The creation of the universe out of chaos having been thus depicted, the poet ranges through it, regardless of space and time, and forms his picture gallery from every object, either of nature or art, that suits his purpose. Stars and steam-engines, rocks and pottery, plants and pumps, with innumerable other objects, mostly personified, and scenes from biography, history, and mythology, decorate his vivid pages, of which the few short specimens that I can give will furnish but a very imperfect idea.

Again addressing the Nymphs of Fire, the Goddess proceeds:—

"ETHEREAL POWERS! YOU chase the shooting stars,
 Or yoke the vollied lightnings to your cars,
 Cling round the aërial bow with prisms bright,
 And pleased untwist the sevenfold threads of light;
 Eve's silken couch with gorgeous tints adorn,
 And fire the arrowy throne of rising morn."

The poet's anticipation of the power of steam has been even yet but partially realized.

“Soon shall thy arm, UNCONQUERED STEAM! afar
 Drag the slow barge, or drive the rapid car;
 Or on wide-waving wings expanded bear
 The flying-chariot through the fields of air.
 —Fair crews triumphant, leaning from above,
 Shall wave their fluttering kerchiefs as they move;
 Or warrior-bands alarm the gaping crowd,
 And armies shrink beneath the shadowy cloud.
 So mighty HERCULES o'er many a clime
 Wav'd his vast mace in Virtue's cause sublime,
 Unmeasured strength with early art combined,
 Awed, served, protected, and amazed mankind.” (I, 36.)

Dr. Franklin, with his lightning conductors, is compared to Cupid, in the celebrated Florentine gem, snatching the lightnings from Jupiter, which the poet considers a beautiful allegory, representing Divine Justice as disarmed by Divine Love, and relenting of his purpose.

“Thus when on wanton wing intrepid LOVE
 Snatch'd the raised lightning from the arm of JOVE;
 Quick o'er his knee the triple bolt he bent,
 The cluster'd darts and forky arrows rent;
 Snapp'd with illumin'd hands each flaming shaft,
 His tingling fingers shook, and stamp'd, and laugh'd;
 Bright o'er the floor the scatter'd fragments blazed,
 And Gods retreating trembled as they gazed,
 The immortal Sire, indulgent to his child,
 Bow'd his ambrosial locks, and Heaven relenting smiled.”

(I, 45.)

Darwin was a warm friend to the French Revolution—at least at its commencement,—and he thus personifies Liberty in its praise.

“ Long had the Giant-form on GALLIA’s plains
 Inglorious slept, unconscious of his chains ;
 Round his large limbs were wound a thousand strings
 By the weak hands of Confessors and Kings ;
 O’er his closed eyes a triple veil was bound,
 And steely rivets lock’d him to the ground ;
 While stern Bastile with iron-cage intrals
 His folded limbs, and hems in marble walls.
 —Touch’d by the patriot-flame, he rent amazed
 The flimsy bonds, and round and round him gazed ;
 Starts up from earth, above the admiring throng
 Lifts His colossal form, and towers along ;
 High o’er his foes his hundred arms He rears,
 Plowshares his swords, and pruning-hooks his spears ;
 Calls to the Good and Brave with voice that rolls
 Like Heaven’s own thunder round the echoing poles ;
 Gives to the winds his banner broad unfurl’d,
 And gathers in its shade the living world !” (I. 107.)

“ This sublime sally of a too-confiding imagination made the poet and his work countless foes. They triumphed over him on a result so contrary ; on the mortal wounds given by French crimes to real liberty. They forgot, or chose to forget, that this part of the poem, (though published after the other,) appeared in 1791, antecedent to the dire regicide, and to all those unprecedented scenes of sanguinary cruelty inflicted on France by three of her republican tyrants, compared to whom the most remorseless of her monarchs was mild and merciful.”

One of the most striking passages in the poem is that which describes the destruction, by being overwhelmed with sand, of the army of Cambyses, sent to plunder the temple of Jupiter Ammon. The whole is too long to be quoted, but the concluding lines are these :—

" Onward resistless rolls the infuriate surge,
 Clouds follow clouds, and mountains mountains urge ;
 Wave over wave the driving desert swims,
 Bursts o'er their heads, inhumes their struggling limbs ;
 Man mounts on man, on camels camels rush,
 Hosts march o'er hosts, and nations nations crush,—
 Wheeling in air the winged islands fall,
 And one great earthy ocean covers all !—
 Then ceased the storm,—NIGHT bow'd his Ethiop brow
 To earth, and listen'd to the groans below—
 Grim HORROR shook,—awhile the living hill
 Heaved with convulsive throes—and all was still ! (I. 116.)

From the address to the Aquatic Nymphs in the third canto, the following passage on the action of a pump is taken :--

" NYMPHS ! YOU first taught to pierce the secret caves
 Of humid earth, and lift her ponderous waves ;
 Bade with quick stroke the sliding piston bear
 The viewless columns of incumbent air ;—
 Press'd by the incumbent air the floods below,
 Through opening valves in foaming torrents flow,
 Foot after foot with lessen'd impulse move,
 And rising seek the vacancy above.—
 So when the Mother, bending o'er his charms,
 Clasps her fair nurseling in delighted arms ;
 Throws the thin kerchief from her neck of snow,
 And half unveils the pearly orbs below ;
 With sparkling eye the blameless plunderer owns
 Her soft embraces, and endearing tones,
 Seeks the salubrious fount with opening lips,
 Spreads his inquiring hands, and smiles, and sips. (I, 164.)

At the close of the first part of the poem, the Goddess of Botany is raised by the Zephyrs into the clouds, and disappears, after a short apostrophe to the Goddess of Health.

“ Oh, wave, *HYGEIA* ! o'er Britannia's throne
 Thy serpent-wand, and mark it for thy own ;
 Lead round her breezy coasts thy guardian trains,
 Her nodding forests, and her waving plains ;
 Shed o'er her peopled realms thy beamy smile,
 And with thy airy temple crown her isle !” (I, 237.)

The second part of the “*Botanic Garden*,” as I have already mentioned, was published first ; because, as Mrs. Schimmelpenninck tells us, Dr. Darwin said “ it was well to put the best foot foremost ;” that is, the second part was more likely to be popular than the first, which was better suited “ to entertain and charm the enlightened and judicious few ; but less calculated to amuse, and to be understood by, common readers.” He calls it “ *The Loves of the Plants*,” and the subject was then of great general interest. Linnæus had given, through his adoption of the sexual theory of the propagation of plants as the basis of his classification, and his admirable skill in carrying it out, such an impulse to the study of botany as it had never experienced before, and probably never will experience again. Hence arose in part the immediate popularity of Dr. Darwin's poem.

The ancients had some idea of an analogy, as to sex, between the animal and vegetable kingdoms, but no very precise ideas on the subject were established till late in the 17th century, when Sir Thomas Millington, Professor of Geometry in the University of Oxford, gave the first hint of it to the celebrated Grew. The doctrine is simply this :—The influence of the pollen, from the anthers of flowers, is essentially necessary to give fertility to the seed ;—or, as poetically expanded by Darwin,

“ The Stamen males, with appetencies just,
 Produce a formative prolific dust ;
 With apt propensities, the Stylee recluse
 Secrete a formative prolific juice ;
 These in the pericarp erewhile arrive,
 Rush to each other, and embrace alive.
 —Form'd by new powers progressive parts succeed,
 Join in one whole, and swell into a seed.”

(Temple of Nature, p. 64.)

Hence the stamens, or their anthers, are the ‘ six gay youths,’ and the styles or their stigmas the ‘ three blushing maids,’ in these lines on the common meadow saffron, *colchicum autumnale*.

“ When o'er the cultur'd lawns and dreary wastes
 Retiring Autumn flings her howling blasts,
 Bends in tumultuous waves the struggling woods,
 And showers their leafy honours on the floods,
 In withering heaps collects the flowery spoil,
 And each chill insect sinks beneath the soil ;
 Then bright from earth amid the troubled sky
 Ascends fair COLCHICA with radiant eye,
 Warms the cold bosom of the hoary year,
 And lights with beauty's blaze the dusky sphere.
 Three blushing Maids the intrepid Nymph attend,
 And six gay Youths, enamour'd train ! defend.
 So shines with silver guards the Georgian star,
 And drives on Night's blue arch his glittering car ;
 Hangs o'er the billowy clouds his lucid form,
 Wades through the mist, and dances in the storm. (II, 29.)

On the river Derwent, near Matlock, in Derbyshire, Sir Richard Arkwright erected his machinery for spinning cotton, and Dr. Darwin describes the process in a passage which is too curious to be passed over.

" So now, where Derwent rolls his dusky floods
 Through vaulted mountains, and a night of woods,
 The Nymph, GOSSYPHA, treads the velvet sod,
 And warms with rosy smiles the watery God;
 His ponderous oars to slender spindles turns,
 And pours o'er massy wheels his foamy urns;
 With playful charms her hoary lover wins,
 And wields his trident,—while the Monarch spins.
 —First with nice eye emerging Naiads cull
 From leathery pods the vegetable wool;
 With wiry teeth *revolving cards* release
 The tangled knots, and smooth the ravell'd fleece;
 Next moves the *iron hand* with fingers fine,
 Combs the wide card, and forms the eternal line;
 Slow with soft lips, the *whirling can* acquires
 The tender skeins, and wraps in rising spires;
 With quicken'd pace *successive rollers* move,
 And these retain, and those extend the *rove*;
 Then fly the spoles, the rapid axles glow,
 And slowly circumsolves the labouring wheel below."

(II, 84.)

You have learnt from a former quotation that Darwin was a warm friend to the French Revolution. Of course when Canning, with Frere and other social and political friends, started the "Antijacobin," a weekly paper of which the object was to attack the principles and abettors of the revolution, Darwin could not escape; and Frere and Canning undertook to turn him into ridicule in a parody on "The Loves of the Plants," entitled "The Loves of the Triangles, a Mathematical and Philosophical Poem, inscribed to Dr. Darwin." This poem has been termed 'the perfection of parody,' and it abounds with wit and humour, but I shall only quote a few lines of the Invocation, and a short passage which corresponds

with the description of cotton-spinning that I have just read.

“ But chief, thou Nurse of the Didactic Muse,
 Divine NONSENSIA all thy sense infuse ;
 The charms of *Secants* and of *Tungents* tell,
 How Loves and Graces in an *Angle* dwell ;
 How slow progressive *Points* protract the *Line*,
 As pendant spiders spin the filmy twine ;
 How lengthened *Lines*, impetuous sweeping round,
 Spread the wide *Plane*, and mark its circling bound ;
 How *Planes*, their substance with their motion grown,
 Form the huge *Cube*, the *Cylinder*, the *Cone*.

Lo ! where the chimney’s sooty tube ascends,
 The fair TROCHAIIS from the corner bends !

(Trochais is the Nymph of the Wheel, supposed to be in love with Smoke Jack.)

Her coal black eyes upturn’d, incessant mark
 The eddying smoke, quick flame, and volant spark :
 Mark, with quick ken, where flashing in between,
 Her much-loved *Smoke Jack* glimmers through the scene ;
 Mark, how his various parts together tend,
 Point to one purpose,—in one object end :
 The spiral *grooves* in smooth meanders flow,
 Drags the long *chain*, the polished *axles* glow,
 While slowly circumsolves the picce of beef below. }
 The conscious fire with bickering radiance burns,
 Eyes the rich joint, and roasts it as it turns.

So youthful Horner roll’d the roguish eye,
 Cull’d the dark plum from out his Christmas pie,
 And cried in self-applause—‘ How good a boy am I ! ’ ” }

Darwin’s reputation as a poet fell as rapidly as it rose, and he is now very seldom read, though there are passages in the “ Botanic Garden ” of great moral as well as poetical beauty—such is his graphic eulogium of Howard, the philanthropist.

" And now, PHILANTHROPY! thy rays divine
 Dart round the globe from Zembla to the Line ;
 O'er each dark prison plays the cheering light,
 Like northern lustres o'er the vault of night. —
 From realm to realm, with cross or crescent crown'd,
 Where'er Mankind and Misery are found,
 O'er burning sands, deep waves, or wilds of snow,
 Thy HOWARD journeying seeks the house of woe.
 Down many a widing step to dungeons dank,
 Where anguish wails aloud, and fetters clank ;
 To caves bestrew'd with many a mouldering bone,
 And cells, whose echoes only learn to groan ;
 Where no kind bars a whispering friend disclose,
 No sunbeam enters, and no zephyr blows,
 He treads, inemulous of fame or wealth,
 Profuse of toil, and prodigal of health,
 With soft assuasive eloquence expands
 Power's rigid heart, and opes his clenching hands ;
 Leads stern-eyed Justice to the dark domains,
 If not to sever, to relax the chains.

— The Spirits of the Good, who bend from high
 Wide o'er these earthly scenes their partial eye,
 When first, array'd in VIRTUE's purest robe,
 They saw her HOWARD traversing the globe ;
 Mistook a Mortal for an Angel-Guest,
 And ask'd what Seraph-foot the earth imprest.
 Onward he moves !—Disease and Death retire,
 And murmuring Demons hate him, and admire."

(II, 112.)

In the spring of 1778, the children of Colonel and Mrs. Pole, of Radburn, in Derbyshire, who " had been injured by a dangerous quantity of the cicuta, injudiciously administered to them in the hooping cough," were brought to the house of Dr. Darwin by their mother, who remained with them a few

weeks till their health was restored. "Mrs. Pole was then in the full bloom of her youth and beauty. Agreeable features; the glow of health; a fascinating smile; a fine form, tall and graceful; playful sprightliness of manners; a benevolent heart; and maternal affection, in all its unwearied cares and touching tenderness, contributed to inspire Dr. Darwin's admiration and to secure his esteem." Soon after she left Lichfield, he sent to his friend, Mr. Boulton, of Birmingham, some poetical directions for making a tea-vase designed as a present to her. The lines are expressive of much more than esteem, or even admiration, and were followed by several other little poems of the same tenor, which he seems to have taken no care to conceal. In the autumn of the same year she "was taken ill; her disorder a violent fever. Dr. Darwin was called in, and perhaps never, since the death of Mrs. Darwin, prescribed with such deep anxiety. Not being requested to continue in the house through the ensuing night, which he apprehended might prove critical, he passed the remaining hours till day-dawn beneath a tree opposite her apartment, watching the passing and repassing lights in the chamber. During the period in which a life he so passionately valued was in danger, he paraphrased Petrarch's celebrated sonnet, narrating a dream, whose prophecy was accomplished by the death of Laura;" but Mrs. Pole recovered, and soon after, Dr. Darwin wrote an "Ode to the river Derwent," of which the concluding lines are these.

"And tell her, Derwent, as you murmur by,
 How in these wilds with hopeless love I burn,
 Teach your lone vales and echoing caves to sigh,
 And mix my briny sorrows with your urn."

But his love was not long hopeless. Col. Pole died in 1780, leaving his widow a jointure of £600 a year, and an ample provision for a son and two daughters; and in the following year she was married to Dr. Darwin. "She had much vivacity and sportive humour," says Miss Seward, "with very engaging frankness of temper and manners; but however benevolent, friendly, and sweet tempered, she was not perhaps exactly the woman to have exclaimed with Akenside—

Mind, mind alone, bear witness earth and heaven!
The living fountain in itself contains
Of beauteous and sublime!

"Yet did her choice support his axiom when she took Dr. Darwin for her husband, who was never handsome or personally graceful; with extremely impeded utterance; with hard features on a rough surface; older much in appearance than in reality; lame and clumsy!—and this, when half the wealthy youth of Derbyshire were said to have disputed the prize with him."

His lameness was owing to an accident. He had contrived for himself "a very singular carriage. It was a platform, with a seat fixed upon a very high pair of wheels, and supported in the front, upon the back of the horse, by means of a kind of proboscis, which, forming an arch, reached over the hind quarters of the horse, and passed through a ring, placed on an upright piece of iron, which worked in a socket, fixed in the saddle." This is the whole of Miss Seward's description; it is not very clear, but that is of little moment, for the contrivance did not well answer its purpose. From this whimsical contrivance, she says, the Doctor was

several times thrown, and the last time he used it, had the misfortune to break the patella of his right knee, which caused an incurable lameness.

This was not his only mechanical contrivance. Several, for medical and other purposes, are described and figured in his works; in particular, a machine for draining morasses, and a drill plough. He also invented a speaking machine. Mr. Edgeworth mentions a French one that could say *mamma* and *papa*, but he says the Doctor's, which he had seen many years before, could say *go* as well; and it would seem to have spoken pretty distinctly, for, when it was speaking, it was thought, by some persons who were near, to be a child calling *papa* and *mamma*. (Memoirs of R. L. Edgeworth, II, 199.)

Though Mrs. Pole accepted the Doctor's offer of marriage, it was on condition that she should not live at Lichfield, to which she had taken a dislike. "To quit that city, after so long and prosperous a residence, seemed a great sacrifice; but the philosopher was too much in love to hesitate one moment. He removed to Derby directly after his marriage. His reputation and the unlimited confidence of the public followed him thither, and his renown still increased as time rolled on. Patients resorted to him, more and more, from every part of the kingdom, and often from the Continent. All ranks, all orders of society, all religions, leaned upon his power to ameliorate disease and to prolong existence."

Though his professional engagements were so numerous, he devoted much time to extra-professional science. When he had published "*Zoonomia*" and "*The Botanic Garden*," each in two quarto volumes, he began a supplement to the

former, entitled "Phytologia, or the Philosophy of Agriculture and Gardening." It is an elaborate system of vegetable anatomy and physiology, as well as of agriculture and gardening, and though much more a compilation than either of his former works, it contains many important original views, practical as well as theoretical; several interesting facts in natural history, as for example instances of the wars of bees which came under his own observation, and of course not a few singular proposals, of which the following may be cited. He says, "In the 'Transactions of the American Philosophical Society,' there is a paper showing that the water-rats of that country are so liable to be affected with tape-worm as much to diminish their numbers. Could some of these diseased American rats be imported into this country, and propagate their malady among the native rats of this climate?" (p. 584.) In one chapter he gives some very important suggestions for the improvement of the Linnæan arrangement of plants, by employing the proportions, situations, and forms of the stamens and pistils instead of their number, but this had been already done by Jussieu. In another he expatiates on "The Happiness of Organic Life," and concludes "that all the calcareous mountains in the world, and all the strata of clay, coal, marl, sand, and iron, which are incumbent on them, have been fabricated from their simpler elements by vegetable and animal life; and hence are *Monuments of the past felicity of organized nature! and consequently of the Benevolence of the Deity.*" (p. 560.)

"The marble mountain, and the sparry steep,
Were built by myriad nations of the deep,—

Age after age were formed their spiral shells,
 Their sea-fan gardens, and their coral cells ;
 Till central fires with unextinguished sway
 Raised the primeval islands into day.

.

Thus the tall mountains that emboss the lands,
 Huge isles of rock, and continents of sands,
 Whose dim extent eludes the inquiring sight,
Are mighty Monuments of past delight ;
 Shout round the globe, how Reproduction strives
 With vanquished Death, and Happiness survives ;
 How Life increasing peoples every clime,
 And young renascent Nature conquers time ;
 —And high in golden characters record
 The immense munificence of NATURE'S LORD !”

This last quotation, as well as several former ones, is from a poem which Dr. Darwin left in manuscript at his death, and which was published in the following year. It is entitled “The Temple of Nature, or the Origin of Society,” and is in four cantos : the first, on the Production of Life ; the second, on the Reproduction of Life ; the third, on the Progress of the Mind ; and the fourth, on Good and Evil. It is a summary of his philosophy, as expounded in his other works ; the poetry sometimes, the notes often, in the very words he had used before. Another of his publications—the only one that I have not read—is entitled “A Plan for the Conduct of Female Education in Boarding Schools.” It was written for the benefit of two natural daughters, whom he settled as teachers of a school at Ashbourn in Derbyshire. Miss Seward says “the composition was by no means worthy of his exalted abilities, but some good rules for promoting the health of growing children will be found on its pages,

and they promised unfeigned attention from its author to the diseased in that school. On the whole it is a meagre work."

A favourite doctrine of Darwin's, which he has stated and supported at great length in "Zoonomia," and frequently referred to in his other works, is that "all the productions of nature are in their progress to greater perfection: an idea countenanced," he says, "by the modern discoveries and deductions concerning the progressive formation of the solid parts of the terraqueous globe, and consonant to the dignity of the great Creator of all things. (*B.G.* II. 9.) This is the hypothesis to which I referred at the beginning of the lecture, as having been lately revived, and so keenly discussed as to have engaged the attention of every one interested in natural science. Dr. Darwin refers the origin of his own opinions on the subject to a hint from Linnæus, whose words are these:—

"We may suppose GOD at the beginning to have proceeded from simple to compound, from few to many! and therefore at the beginning of Vegetation to have created just so many different plants, as there are *Natural Orders*. That HE then so intermixed the plants of these orders by their marriages with each other, that as many plants were produced as there are now distinct *Genera*. That Nature then intermixed these Generic plants, by reciprocal marriages (which did not change the structure of the flowers) and multiplied them into all possible existing *Species*; excluding however from the number of species the Mule-plants produced from their marriages, as being barren."

This supposition Darwin greatly extends. He says:—

"As Linnæus has conjectured in respect to the vegetable world, it is not impossible but the great variety of species of animals, which now tenant the earth, may have had their origin from a mixture of a few natural orders. And that those animal and vegetable mules which could continue their species have done so, and constitute the nu-

merous families of animals and vegetables which now exist; and that those mules, which were produced with imperfect organs, perished without reproduction, according to the observation of Aristotle; and are the animals which we now call mules.”—*Zoon*. I. 502.

After noticing the many and great changes that occur in warm-blooded animals under various circumstances, he continues :—

“From thus meditating on the great similarity of the structure of the warm-blooded animals, and at the same time on the great changes they undergo both before and after their nativity; and by considering in how minute a portion of time many of the changes of animals above described have been produced; would it be too bold to imagine, that in the great length of time since the earth began to exist, perhaps millions of ages before the commencement of the history of mankind, would it be too bold to imagine, that all warm-blooded animals have arisen from one living filament, which the GREAT FIRST CAUSE endued with animality, with the power of acquiring new parts, attended with new propensities, directed by irritations, sensations, volitions, and associations; and thus possessing the faculty of continuing to improve by its own inherent activity, and of delivering down those improvements by generation to its posterity, world without end!”—*Z*. I. 509.

The argument is continued through the lower tribes of animals, as well as through vegetables, and he proceeds :—

“Shall we then say that the vegetable living filament was originally different from that of each tribe of animals above described? and that the productive living filament of each of those tribes was different originally from the other? or, as the earth and ocean were probably peopled with vegetable productions long before the existence of animals; and many families of these animals long before other families of them, shall we conjecture that one and the same kind of living filaments is and has been the cause of all organic life?”—*Z*. I. 511

His views on this subject are thus summed up in “The Temple of Nature.”

“ ORGANIC LIFE beneath the shoreless waves
 Was born, and nursed in Ocean’s pearly caves ;
 First forms minute, unseen by spheric glass,
 Move on the mud, or pierce the watery mass ;
 These, as successive generations bloom,
 New powers acquire, and larger limbs assume ;
 Whence countless groups of vegetation spring,
 And breathing realms of fin, and feet, and wing.

Thus the tall Oak, the giant of the wood,
 Which bears Britannia’s thunders on the flood ;
 The Whale, unmeasured monster of the main,
 The lordly Lion, monarch of the plain,
 The Eagle soaring in the realms of air,
 Whose eye undazzled drinks the solar glare,
 Imperious Man, who rules the bestial crowd,
 Of language, reason, and reflection proud,
 With brow erect, who scorns this earthly sod,
 And styles himself the image of his God ;
 Arose from rudiments of form and sense,
 An embryo point, or microscopic ens !” p. 28.

That these views have much agreement with those of the author of the celebrated book “ *on the Origin of Species,*” is shown by the following remarks near the conclusion of that work.

“ I believe that animals have descended from at most only four or five progenitors, and plants from an equal or lesser number. Analogy would lead me one step farther, namely, to the belief that all animals and plants have descended from some one prototype. . . . If we look even to the two main divisions,—namely, to the animal and vegetable kingdoms—certain low forms are so far intermediate in character that naturalists have disputed to which kingdom they should be referred, and, as Professor Asa Gray has remarked, ‘ the spores and other reproductive bodies of many of the lower algæ may claim to have first a characteristically animal, and then an unequivocally vegetable

existence.' Therefore, on the principle of natural selection with divergence of character, it does not seem incredible that, from some such low and intermediate form, both animals and plants may have been developed; and, if we admit this, we must admit that all the organic beings which have ever lived on this earth may have descended from some one primordial form." p. 519. 3rd edition.

But though the two Darwins agree in their main conclusions as to the past history of the organic life of the globe, and support their opinions by very similar, if not identical arguments,* they differ much in their anticipations of the future; except as to the general law of "progress towards perfection."

Mr. Darwin says,

"As all the living forms of life are the lineal descendants of those which lived long before the Silurian epoch, we may feel certain that the ordinary succession by generation has never once been broken, and that no cataclysm has desolated the whole world. Hence we may look with some confidence to a secure future of equally inappreciable length. And as natural selection works solely by and for the good of each being, all corporeal and mental endowments will tend to progress towards perfection." p. 524.

This is pleasant. But Dr. Darwin thinks the gradual and tranquil progress here anticipated will be interrupted by catastrophes, though not by cataclysms. He says

"As the remains of former life are not again totally decomposed, or converted into their original elements, they supply more copious food to the succession of new animal and vegetable beings on their surface; which consists of materials convertible into nutriment with less labour or activity of the digestive powers; and hence the quantity or number of organized bodies, and their improvement in size, as well as their happiness, has been continually increasing along with the solid parts of the globe; and will probably continue to increase, till the whole

* See Appendix.

terraqueous sphere, and all that inhabit it shall dissolve by a general conflagration, and be again reduced to their elements."

Thus all the suns, and the planets which circle round them, may again sink into one central chaos; and may again by explosions produce a new world; which in process of time may resemble the present one, and at length again undergo the same catastrophe! These great events may be the result of the immutable laws impressed on matter by the Great Cause of Causes, Parent of Parents, Ens Entium!"—*Temple of Nature*, p. 167.

"— Roll on, ye STARS! exult in youthful prime,
 Mark with bright curves the printless steps of time;
 Near and more near your beamy cars approach,
 And lessening orbs on lessening orbs encroach;—
 Flowers of the sky! ye too to age must yield,
 Frail as your silken sisters of the field!
 Star after star from Heaven's high arch shall rush,
 Suns sink on suns, and systems systems crush,
 Headlong, extinct, to one dark centre fall,
 And Death and Night and Chaos mingle all!
 — Till o'er the wreck, emerging from the storm,
 Immortal NATURE lifts her changeful form,
 Mounts from her funeral pyre on wings of flame,
 And soars and shines, another and the same." *B. G. I.* 213.

On Sunday morning, the 18th of April, 1802, Dr. Darwin wrote the following letter:—

"DEAR EDGEWORTH,

I am glad to find that you still amuse yourself with mechanism, in spite of the troubles of Ireland.

The *use* of turning aside, or downwards, the claw of a table, I don't see; as it must then be reared against a wall, for it will not stand alone. If the use be for carriage, the feet may shut up, like the usual brass feet of a reflecting telescope.

We have all been now removed from Derby about a fortnight, to the Priory, and all of us like our change of situation. We have a pleasant house, a good garden, ponds full of fish, and a pleasing valley,

somewhat like Shenstone's—deep, umbrageous, and with a talkative stream running down it. Our house is near the top of the valley, well screened by hills from the east and north, and open to the south, where, at four miles distance, we see Derby tower.

Four or more strong springs rise near the house, and have formed the valley, which, like that of Petrarch, may be called *Val chiusa*, as it begins, or is shut, at the situation of the house. I hope you like the description, and hope farther, that yourself and any part of your family will sometime do us the pleasure of a visit.

Pray tell the authoress, that the water-nymphs of our valley will be happy to assist her next novel.

My bookseller, Mr. Jobson, will not begin to print the *Temple of Nature*, till the price of paper is fixed by parliament. I suppose the present duty is paid * * * *

At these words Dr. Darwin's pen stopped. What follows was written on the opposite side of the paper by another hand.

SIR,—This family is in the greatest affliction. I am truly grieved to inform you of the death of the invaluable Dr. Darwin. Dr. Darwin got up apparently in health; about eight o'clock, he rang the library bell. The servant, who went, said, he appeared fainting. He revived again,—Mrs. Darwin was immediately called. The Doctor spoke often, but soon appeared fainting; and died about nine o'clock

S. M."

P.S.—This letter was begun this morning by Dr. Darwin himself.

“Thus,” says Miss Seward, “in one hour, was extinguished that vital light which the preceding hour had shone in flattering brightness, promising duration; such is often the ‘cunning flattery of nature;’ that light, which, through half a century, had diffused its radiance and its warmth so widely; that light in which Penury had been cheered, in which Science had expanded; to whose orb Poetry had brought all her images; before whose influence Disease had continually re-

treated, and Death so often turned aside his levelled dart !”

Much of this is true, but it is coloured by friendship : *our* estimate of Darwin must be less partial. That he was a man of great activity and energy, both of body and mind, must be admitted. His carriage was constantly going ; and it would seem, not merely in the discharge of his numerous professional engagements ; for “conscious of his full habit of body, he probably thought the established custom of imbibing changed and pure air by almost daily journeys into the country essential to his health ; perhaps to the duration of his life. In allusion to that perpetual travelling, a gentleman once humourously directed a letter, ‘*Dr. Darwin, upon the road.*’”

Of his mental activity, the composition of six large quarto volumes furnishes abundant proof. Much of these was the result of his own observation, thought, and imagination ; but more was derived from others, for he was a diligent reader, as well as voluminous writer, and well versed in the natural history, chemistry, and mechanical philosophy of his day. Even the notes to his poems furnished a large amount of information on each of those subjects which students of natural science could not readily find elsewhere. Some of the facts in these notes, and most of the explanations, illustrations, and inferences, were then original, and many of them are still both instructive and amusing. Here (*B. G. I, 471.*) is a short example of the latter. The leaves and roots of plants are necessary to prepare the food of animals,

“For how could a man or quadruped have carried on his head or back a forest of leaves, or have had long branching lacteal or absorbent vessels terminating in the earth? Animals therefore subsist on vegetables ;

that is, they take the matter so far prepared, and have organs to prepare it further for the purposes of higher animation, and greater sensibility."

His sanguine temper led him to expect great results from every discovery. After mentioning the death of two persons in diving bells, he says,

"These two unhappy events may for a time check the ardor of adventurers in traversing the bottom of the ocean, but it is probable in another half century that it may be safer to travel under the ocean than over it, since Dr. Priestley's discovery of procuring pure air in such great abundance from the calces of metals." (B. G. I, 202.)

And when Franklin brought lightning from the clouds, Darwin thought *rain* might be brought in a similar way.

He is especially entitled to *our* respect as the founder of two scientific societies: the Botanical Society of Lichfield, of which I have already spoken, and the Philosophical Society of Derby. The former was broken up when he left Lichfield, if not before: the latter was amalgamated in 1858 with the Derby Town and County Museum, of which one of his sons by his second wife, Sir Francis Darwin, was for many years a Vice-president, and they now form a prosperous Institution.*

As a metaphysician it is clear, I think, that Dr. Darwin is entitled only to the low position in which he is now generally placed. His explanation of all states of mind by the motions of matter is a sufficient proof that he had not the accuracy of thought necessary in psychological inquiries; but it would be easy to show that he has furnished valuable hints to later metaphysicians.

* See a "Paper read at the *Conversazione* held at the Derby Museum, February 14th, 1859," by John Jones, Hon. Secretary, and the Report read at the Annual Meeting in February, 1860.

As a poet his merits are of a much higher order ; indeed, if his judgment and taste had been equal to his genius, few poets would have excelled him ; but he sacrificed permanent fame to an erroneous opinion that poetry ought to speak only through the eye ; hence, whatever may be the subject, similes, metaphors, and personifications, are introduced in such profusion as to have frequently the fatiguing effect of a succession of dazzling pictures. One additional example may be given from his poetical catalogue of “ siliceous stones.”

“ Hence silvery Selenite her crystal moulds,
 And soft Asbestus smooths his silky folds,
 His cubic forms phosphoric Fluor prints,
 Or rays in spheres his amethystine tints.
 Soft cobweb clouds transparent Onyx spreads,
 And playful Agates weave their colour'd threads ;
 Gay pictured Mochoes glow with landscape-dyes,
 And changeful Opals roll their lucid eyes ;
 Blue lambent light around the Sapphire plays,
 Bright Rubies blush, and living Diamonds blaze.”

(*B. G. I, 95.*)

Again : not to speak of the general subject of the second part of the Botanic Garden ;—“ the Loves of the Plants ;”—many of the loftiest flights of Darwin's fancy border so closely on absurdity as to remind one frequently that from the *sublime* to the *ridiculous* is but a step. For instance ; the passage already quoted, on the projection of suns and planets out of chaos, is, I think, sublime ; but when he descends to particulars, and tells us that the moon was thrown out of that part of the earth where the great Southern Ocean now rolls, and that

“ The earth recoiling stagger'd from her course,”

few will deem the supposition any thing but ridiculous. Still, though it is probable that the whole of Darwin's poetical works will never be reprinted, they furnish many beautiful, and some sublime passages, which will long stand in our books of selections; and if these should disappear, his name at least will go down to a remote posterity in the pages of another poet whose "Task" he declared he could not read through, on account of its "egotism, prosaicism, rough and slovenly style, and utter want of regular design." How astonished he would have been could he have known that he would be indebted to a few complimentary lines from WILLIAM COWPER, of whom he thought so lightly, for the best chance of his own name and merits as a poet being *generally* known in future ages.

"Two Poets,* (poets by report,
Not oft so well agree)
Sweet harmonist of Flora's court!
Conspire to honour Thee.

.

No envy mingles with our praise,
Though could our hearts repine
At any Poet's happier lays,
They would, they must, at thine.
But we in mutual bondage knit
Of Friendship's closest tie,
Can gaze on even DARWIN'S wit,
With an unjaundiced eye;
And deem the bard, whoe'er he be,
And howsoever known,
Who would not twine a wreath for Thee,
Unworthy of his own."

W. C.

* The other was Hayley, who had previously complimented Darwin in verse.

Of Dr. Darwin's character as a physician this is not the place to speak at length, but it cannot be quite passed over. He was charged with being "rash and experimental," and Miss Seward admits the justice of the latter part of the charge, by contending that he was right; but Mr. Edgeworth, who had a good opportunity of knowing the truth gives a very different account. He says, "I had the utmost reliance on the skill and attention of Dr. Darwin. His enemies, for merit must excite envy, always hinted, that he was inclined to try experiments upon such patients as were disposed to any chronic disease. I had frequent opportunities of knowing this to be false; and, in the treatment of Mrs. Edgeworth, he never, without the entire concurrence of her friends, followed any suggestion, even of his own comprehensive and sagacious mind, that was out of the usual line of practice; on the contrary, it was always in the most cautious, I may almost say in the most timid manner, that he proposed anything which he thought beyond the established limits." This account agrees much better than Miss Seward's with Darwin's treatment of diseases as given in his *Zoonomia*. Whenever any new or unusual remedy is proposed, it is commonly put in a question, thus hinting to his readers the want of further evidence to establish its efficacy. As an example, I quote part of his directions for the treatment of erysipelas affecting the head.

"Six grains of rhubarb and one of calomel. Afterwards five drops of tincture of opium, which may be repeated every six hours, *if it seems of service*. Might the head be bathed *for a minute* with cold water? or with ether? or vinegar?"

His treatment however was abundantly decisive, as well

as active, when activity was supposed to be justified by experience. In inflammation of the lungs, for instance, he says:

“The lancet is the anchor of hope in this disease; which must be repeated 4 or 5 times, or as often as the fever and difficulty of breathing increase.”
(Z. II, 197.)

It is true that he occasionally tried an experiment. Having observed that a mixture of Peruvian bark and sugar of lead was useful as an application to external scrofulous ulcers, he directed a patient in the last stage of consumption to inhale it in fine powder from “a box with a circulating brush in it.” It did neither good nor harm, and when the last edition of “Zoonomia” was published, he had not repeated the experiment, which in such a case was surely justifiable.

It may excite surprise that one so bold in theory should be so distrustful of novelty in practice. We may suppose that he considered human life too sacred to be subjected to the treatment which even his own hypotheses suggested, and if so his reserve did him honour; but perhaps he carried his caution too far, for there can be no improvement without innovation, and errors as serious in medical practice have arisen from experience *misinterpreted*, as even from hypothesis itself. However this may be, he had great merits as a practitioner.

He carefully distinguished the various forms and causes of disease, and took a very comprehensive view of remedial agents. To the regulation of diet, air, exercise, and clothing, he paid great attention. Mechanical expedients he frequently used, and invented several new ones. Swinging, electricity, inhalation of various gasses, cold and warm bathing he often recommended. Remedial influence on the mind too, though in a very peculiar way, he never neglected. But

though these were often the principal means, and sometimes the only ones used, he was no sceptic in the efficacy of medicines strictly so called, and he used them freely, though in simpler combinations, and therefore probably with more precision and better effect than most of his contemporaries. A paper of directions to a patient who had lived freely, and suffered long from rheumatism and gout, is given in "Zoonomia," (II, 457.) and begins thus:—

"Drink no malt liquor on any account. Let your beverage at dinner consist of two glasses of wine diluted with three half-pints of water. On no account drink any more wine or spirituous liquors in the course of the day; but, if you want more liquid, take cream and water, or milk and water, or lemonade, with tea, coffee, or chocolate. Use the warm bath twice a week for half an hour before going to bed, at the degree of heat which is most grateful to your sensations. Eat meat constantly at dinner, and with it any kind of tender vegetables you please;" and so on.

The only medicine directed, and that is to be avoided if possible, is "the size of a nutmeg of lenitive electuary occasionally, or five grains of rhubarb every night." These directions are excellent: clear, definite, comprehensive, and, as it proved, they were efficacious, for the patient,—a clergyman who reports his own case—says he followed them most scrupulously, and soon found his appetite improve, and with it his strength and spirits; but I quote them chiefly to show how completely Darwin sunk the poet and the speculative philosopher in the plain-speaking practical physician, when the sick required his aid.

He was further a zealous sanitary reformer, when sanitary reform met with little favour. He says,

"The manures of towns and cities which are all now left buried in deep wells, or carried away by soughs into the rivers, should be removed

for the purposes of agriculture, and thus the purity and healthiness of the towns may contribute to the thriftiness and wealth of the surrounding country.

“There should be no burial places in churches or in church-yards, where the monuments of departed sinners shoulder God’s altar, pollute His holy places with dead men’s bones, and produce by putrid exhalations contagious diseases among those who frequent his worship. But proper burial grounds should be consecrated out of towns.” *Phytologia*, p. 243.

He pointed out the means of supplying Derby with good water, (B. G. I, 143) and I shall give you by and bye a proof of the importance he attached to ventilation as a preventive of disease.

It is true that his mind revelled in the *speculation* which every fact suggested.

“Two dysenteric patients,” he says, “in the same ward of the infirmary at Edinburgh quarrelled, and whipped each other with horse-whips a long time, and were both much better after it.”

And then he speculates on the reason why the whipping was so useful, and finds it in “the exertion of much of the sensorial power of volition, which, like real insanity, added excitement to the whole system.” But his *practice* was based on former experience,—his own and that of others,—correct observation, and good common sense. One additional proof of this may be given. At the end of a highly hypothetical chapter on “stimulus and exertion,” he says:—

“There is a golden rule by which the necessary and useful quantity of stimulus in fevers with debility may be ascertained. When wine or beer is exhibited, either alone or diluted with water, if the pulse becomes slower the stimulus is of a proper quantity; and should be repeated every two or three hours, or when the pulse again becomes quicker.

In the chronic debility brought on by drinking spirituous or fermented liquors I have directed several patients to omit one fourth part of the quantity of vinous spirit they have been lately accustomed to, and if in a fortnight their appetite increases, they are advised to omit another fourth part; but if they perceive that their digestion becomes impaired on the want of this quantity of spirituous potation, they are advised to continue as they are, and rather bear those ills they have than risk the encounter of greater." (Z. I, 100.)

Such observations as these, and there are many such in "Zoonomia," prove that Darwin was much more, and much better, than a mere framer of wild hypotheses, which he has of late been commonly deemed; and furnish good reason for believing that he well deserved the great popularity that he enjoyed as a practical physician.

But enough of this; perhaps more than enough. I cannot expect *you* to be interested in medical details. A few additional notices of his opinions and habits, and I have done.

Mrs. Schimmelpenninck more than hints that he was an atheist, but this is utterly inconsistent with innumerable passages in his works. He was a Theist but not a Christian, though he knew something of the value of Christianity, for he says in "Zoonomia" (II, 372) under the head of Grief, which he considers as a disease, "Consolation is best supplied by the Christian doctrine of a happy immortality." And yet I fear the only immortality in which he believed was the eternal transmutation of matter.

"Hence when a Monarch or a mushroom dies,
Awhile extinct the organic matter lies;
But, as a few short hours or years revolve,
Alchemic powers the changing mass dissolve, &c."

One of a party at Mr. Galton's having expressed the hope that one day he would receive Christianity, he replied,

“ Before I do that, you Christians must all be agreed. The other morning I received two parcels ; one containing a work of Dr. Priestley’s, proving there is no spirit ; the other a work by Berkeley, Bishop of Cloyne, proving there is no matter. What am I to believe amongst you all ?”

He might as well have said that he would not believe the propositions of Euclid, because *all are not agreed* on the definitions, postulates, and axioms, from which they are deduced. The truth seems to be, that he had a pleasure in startling his hearers by blurting out opinions more heterodox than any that he really held. In no other way can I account for Mrs. Schimmelpenninck’s statement that “ Dr. Darwin often used to say ‘ Man is an eating animal, a drinking animal, and a sleeping animal, and one placed in a material world, which furnishes all the human animal can desire. He is gifted besides with knowing faculties, practically to explore and to apply the resources of this world to his use. These are realities. All else is nothing ; conscience and sentiment are mere figments of the imagination.’ And to a patient—a young lady—he said, “ my dear Madam, you have but one complaint ; it is one ladies are very subject to, and it is the worst of all complaints ; and that is, having a conscience. Do get rid of it with all speed.” This may have been a mere joke, as Paley said he could not afford to keep a conscience ; or the lady’s case may have been one of extreme scrupulosity bordering on monomania. Very differently Darwin speaks of conscience in his exhortation to the British Parliament to abolish slavery.

“ Throned in the vaulted heart, his dread resort,
Inexorable CONSCIENCE holds his court ;

With still small voice the plots of Guilt alarms,
 Bares his mask'd brow, his lifted hand disarms ;
 But, wrapp'd in night with terrors all his own,
 He speaks in thunder, when the deed is done.
 Hear him, ye Senates ! hear this truth sublime,
 ' *He who allows oppression, shares the crime.*'

No radiant pearl, which crested Fortune wears,
 No gem, that twinkling hangs from Beauty's ears,
 Not the bright stars, which night's blue arch adorn,
 Nor rising suns that gild the vernal morn,
 Shine with such lustre as the tear that flows
 Down Virtue's manly cheek for others' woes." *B. G. II, 165.*

A large portion of the woes of mankind he attributed to the habitual use of spirituous liquors, which he declared to be "the curse of the Christian world ;" and accordingly he recommended

a total prohibition of the destructive manufactory of grain into spirits, or into strong ale, and thus converting the natural nutriment of mankind into a chemical poison, and thinning the ranks of society both by lessening their quantity of food, and shortening their lives by disease. *Phytologia*, p. 468.

Miss Edgeworth says, he always expressed the strongest aversion to "what he called *vinous potation*. He believed, that almost all the distempers of the higher classes of people arise from drinking, in some form or other, too much vinous spirit. To this he attributed the aristocratic disease of gout, the jaundice, and all bilious or liver complaints ; in short, all the family of pain. This opinion he supported in his writings with the force of his eloquence and reason ; and still more in conversation, by all those powers of wit, satire, and peculiar humour, which never appeared fully to the public in his works, but which gained him strong ascendancy in private

society. During his life-time, he almost banished wine from the tables of the rich of his acquaintance ; and persuaded most of the gentry in his own and the neighbouring counties, to become water-drinkers. Partly in jest and partly in earnest, he expressed his suspicions, and carried his inferences on this subject, to a preposterous excess. When he heard that my father was bilious, he suspected that this must be the consequence of his having, since his residence in Ireland, and in compliance with the fashion of the country, indulged too freely in drinking. His letter, I remember, concluded with—“ Farewell, my dear friend. God keep you from whiskey—if he can.”

But I am sorry to say he did not always practise what he taught : he was not a consistent teetotaller.

A few gentlemen of Staffordshire prevailed upon him “ to join them in an expedition by water, from Burton to Nottingham, and on to Newark. They had cold provisions on board, and plenty of wine. It was midsummer ; the day ardent and sultry. The noon-tide meal had been made, and the glass gone gayly round. It was one of those *few* instances, in which the medical votary of the Naiads transgressed his general and strict sobriety. If not absolutely intoxicated, his spirits were in a high state of vinous exhilaration. On the boat approaching Nottingham, within the distance of a few fields, he surprised his companions by stepping, without any previous notice, from the boat into the middle of the river, and swimming to shore. They saw him get upon the bank, and walk coolly over the meadows toward the town : they called to him in vain ; he did not once turn his head.

Anxious lest he should take a dangerous cold by remain-

ing in his wet clothes, and uncertain whether or not he intended to desert the party, they rowed instantly to the town, at which they had not designed to have touched, and went in search of their river-god.

In passing through the market-place, they saw him standing upon a tub, encircled by a crowd of people, and resisting the entreaties of an apothecary of the place, one of his old acquaintance, who was importuning him to go to his house, and accept of other raiments till his own could be dried.

The party, on pressing through the crowd, were surprised to hear him speaking without any degree of his usual stammer.

Have I not told you, my friend, that I had drank a considerable quantity of wine before I committed myself to the river. You know my general sobriety; and, as a professional man, you *ought* to know, that the *unusual* existence of *internal* stimulus, would, in its effects upon the system, counteract the *external* cold and moisture.

Then, perceiving his companions near him, he nodded, smiled, and waved his hand, as enjoining them silence, thus, without hesitation, addressing the populace.

Ye men of Nottingham, listen to me. You are ingenious and industrious mechanics. By your industry life's comforts are procured for yourselves and families. If you lose your health, the power of being industrious will forsake you. *That* you know; but you may *not* know, that to breathe fresh and changed air constantly, is not less necessary to preserve health, than sobriety itself. Air becomes unwholesome in a few hours if the windows are shut. Open those of your sleeping-rooms whenever you quit them to go to your workshops. Keep the windows of your workshops open, whenever the weather is not insupportably cold. I have no *interest* in giving you this advice. Remember what I,

your countryman, and a physician, tell you. If you would not bring infection and disease upon yourselves, and to your wives and little ones, change the air you breathe, change it many times in a day, by opening your windows.

So saying, he stept down from the tub, and returning with his party to their boat, they pursued their voyage."

But though Dr. Darwin was generally abstemious in potables, he was by no means so in catables. I have mentioned already, that he had in his carriage a receptacle for paper and pencils, with which he wrote as he travelled, and in one corner a pile of books: but he had also a receptacle for a knife, fork, and spoon, and in the other corner a hamper containing fruit and sweetmeats, cream and sugar. He provided also for his horses, by having a large pail lashed to his carriage for watering them, as well as hay and oats to be eaten on the road. Mrs. Schimmelpenninck says that when he came on a professional visit to her father's house, they had, as was the custom whenever he came, "a luncheon table set out with hothouse fruit, and West India sweetmeats, clotted cream, Stilton cheese, &c. While the conversation went on, the dishes in his vicinity were rapidly emptied, and what, she adds, was my astonishment when, at the end of the three hours during which the meal had lasted, he expressed his joy at hearing the dressing-bell, and hoped dinner would soon be announced." This was not mere gluttony: he thought an abundance, or what most persons would consider a superabundance, of food conducive to health. '*Eat or be eaten,*' is said to have been often his medical advice. He had especially a very high opinion of the nutritive value of sugar, and said "that if our improved chemistry should ever

discover the art of making sugar from fossil or aerial matter, without the assistance of vegetation, food for animals would then become as plentiful as water, and mankind might live upon the earth as thick as blades of grass, with no restraint to their numbers but the want of room." *B. G. I.*, 470.

In conclusion it is right to say that I find I have been led to speak less of Dr. Darwin's merits, than of his errors and eccentricities ; but whatever these may have been, it is only justice to add, that he was fully entitled to respect, and even admiration, for his activity, energy, and decision, and for his courage in publishing the numerous convictions of his own mind which he must have known that every one else would deem absurd ; still more for his learning, talent, and genius ; and most of all for his hospitality, generosity, and humanity. "Diligently," says Miss Seward, "did he attend to the health of the poor of Lichfield, and afterwards of Derby, and supplied their necessities with food and every sort of charitable assistance. In each of those towns *his* was the cheerful board of almost open-housed hospitality, without extravagance or parade. . . . Generosity, wit, and science, were his household Gods."

N O T E S .

Page 5. DR. ROBERT WARING DARWIN was born at Lichfield, on the 30th of May, 1766, and died at Shrewsbury in his 83rd year, on the 13th of November, 1848. He contributed a paper on Ocular Spectra to the Transactions of the Royal Society in 1786, and was elected a Fellow in 1788. He commenced medical practice before he was 21 years old, after studying at Leyden, Edinburgh, and Paris In his private character he was remarkable for sagacity, benevolence, and strong feelings of sympathy, which made him widely beloved by the poor and rich.—*Proceedings of the Royal Society*, No. 74.

Page 7. MISS SEWARD is characterized in the *Athenæum* (Jan. 26, 1861, as "fantastic, though not false, and in her literary appreciations prescient and just." But *fantastic* must be understood only of some of her literary compositions, to which it is too correctly applicable. In her habits and manners she was perfectly correct and ladylike, and withal very beautiful. Sir Walter Scott, who visited her at Lichfield, two years before her death, says she was an amiable and highly accomplished woman, and her society delightful. "When young she must have been exquisitely beautiful; for, in advanced age, the regularity of her features, and the fire and expression of her countenance, gave her the appearance of beauty and almost of youth. . . . Her tone of voice was melodious, guided by excellent taste. . . . Her stature was tall, and her form was originally elegant; but having broken the *patella* of her knee by a fall, she walked with pain and difficulty."—*The Poetical works of Anna Seward*. I. xxiii.

Page 13. *Love and Beauty*. See BROWN'S *Observations on Zoonomia*. 1798. Acute, but tediously hypercritical.

Page 20. Dr. Darwin's approval of the French Revolution brought upon him several hits from the author of *The Pursuits of Literature*.

"Mark, with vast convolution DRACO holds
The ecliptic axis in his scaly folds!

What does the reader *mark* in all Dr. Darwin's poetry and philosophy? For my own part I *mark* and *see* too frequently in this very ingenious man and most excellent physician, (for such he undoubtedly is,) Martinus Scriblerus himself in exultation at his own discoveries, and in sovereign contempt over his brother Albertus See Chaos exploding! see Stars projected from Chaos by *explosions*; see the Earth thrown from a Solar Volcano! the Moon (per contra) thrown from a Terrestrial Volcano! see *Ice-Islands* (on a principle of economy among the sovereigns of the northern hemisphere, and to prevent the wasting of the public money in unnecessary wars,) navigated by their united labours from north to south!! &c. Coelum ipsum petimus stultitia.

'If the nations who inhabit this hemisphere of the globe, instead of destroying their seamen, and exhausting their wealth in unnecessary wars, could be induced to unite their labours to navigate these immense masses of ice into the more southern oceans, two great advantages would result to mankind; the tropic countries would be much cooled by their solution, and our winters in this latitude would be rendered much milder for perhaps a century or two, till the masses of ice became again enormous.' Dr. Darwin's own words.

Page 24. COTTON SPINNING. "The mills erected by Sir Richard Arkwright are most interesting buildings at the present day. The sites chosen, doubtless on account of the sufficiency of the fall of the streams to move the machinery, are nevertheless situated in spots of great beauty in Derbyshire, on the Derwent and other streams. The mill at Cromford, or Matlock, is still occupied by the descendants of Sir R. Arkwright and lower down the same river, the Derwent, we meet with two other cotton-spinning mills, the spindles of which are moved by the "watery God,"—the Belper and Milford mills, belonging to the Messrs. Strutt. The systematic cleanliness and order which pervade these mills are beyond praise. The machinery is kept scrupulously clean, the floors rival the polished wainscot of a library, the walls are bright with the whiteness of lime-wash, the air is clear and free from dust, and those whom the poet calls "emerging naiads," and we in the vulgar tongue "factory girls," have some claim, perhaps, to the ethereal character of the poet, in that they are happy, smiling, prosperous creatures, cleanly to a degree of perfection, tidily clad, healthy and robust." REDGRAVE on the progress of Textile Manufactures in Great Britain.—*Journal of the Society of Arts*, March 8, 1861.

Page 25. *The Loves of the Triangles*. "Of all modern parodies, 'the Loves of the Triangles,' in the *Antijacobin* is by far the best: it combines science, invention, and the charms of beautiful poetry, so as to give an air of originality that would please the reader were he totally unacquainted with Dr. Darwin's poem. One of the authors of this book read the [*Loves of the Triangles* to Dr. Darwin, when this number of the *Antijacobin* first appeared. It was impossible that the Doctor should not feel some pain at the recital, but he most certainly felt high admiration for the talents of the writer."—R. L. and M. EDGEWORTH'S *Readings on Poetry*. 1816. p. 207.

Page 31. *Phytologia*. "Among the casual discoveries which this ingenious work had the merit of bringing forward, was the use of bone dust as a manure. Having mentioned phosphorus as an element under different forms, existing universally in vegetables, and not before sufficiently attended to, the Doctor specifies the different substances from which this essential food of plants may be obtained, and which therefore might be advantageously employed as manure; he then proceeds—"and, lastly, the use of recent shells, or bones ground into powder, or of bone-ashes spread on land may be deduced, as they consist almost entirely of phosphorus and calcareous earth. The fertilizing properties of this manure had been previously noticed by Hunter, (Georgical

Essays, vol. II.) but they were first theoretically explained and brought forward with authority by Dr. Darwin. Perhaps no modern discovery has contributed so powerfully to improve the fertility and to increase the produce of the soil." *Memoirs of the Life and Works of SIR JOHN SINCLAIR, BART.*, to whom the *Phytologia*, "begun by his instigation," was dedicated.

Page 36. Of the writers who have anticipated Dr. Darwin in his views on the Transmutation of Species, De Maillet seems to have the best claim to notice. Crude as his speculations are, they are scarcely more so than some of Darwin's. "It may happen," he says, "that winged or flying fish, either chasing, or being chased, in the sea, stimulated by the desire of prey, or the fear of death, or pushed near the shore by the billows, have fallen among reeds or herbage, whence it was not possible for them to resume their flight to the sea. Then their fins being no longer bathed in the sea-water, were split and became warped by their dryness. While they found among the reeds and herbage among which they fell, any aliments to support them, the vessels of their fins being separated were lengthened and clothed with beards, or to speak more justly, the membranes which before kept them adherent to each other, were metamorphosed. The beard formed of these warped membranes was lengthened. The skin of these animals was insensibly covered with a down of the same colour with the skin, and this down gradually increased. The little wings they had under their belly, and which like their fins helped them to walk in the sea, became feet and served them to walk on land. There were also other small changes in their figure. The beak and neck of some were lengthened, and those of others shortened. The conformity, however, of the first figure subsists in the whole, and it will be always easy to know it The transformation of a silkworm or a caterpillar into a butterfly, would be a thousand times more hard to be believed than that of fish into birds, if this metamorphosis was not daily made before our eyes." *Telliamed: or Discourses between an Indian Philosopher and a French Missionary, on the Diminution of the Sea, the Formation of the Earth, the Origin of Men and Animals, &c.* London, 1750, p. 223-5.

Dr. Darwin's views, too, of the destination of the Universe have considerable resemblance to those of De Maillet, but I find no direct evidence that he was acquainted with them, and if he were, they are mere conjecture; while the credit of having been the first to give *a series of plausible reasons*, and the best that have yet been advanced, for believing the Origin of Species by transmutation possible, is certainly due to Dr. Darwin.

J. D.

A P P E N D I X .

—— Without parent, by spontaneous birth,
Rise the first specks of animated earth.—*T. of N.* p. 22.

The existence of spontaneous vitality is only to be expected to be found in the simplest modes of animation, as the complex ones have been formed by many successive reproductions.—*T. of N.* Notes, p. 3.

I conceive the primordium, or rudiment of the embryo, as secreted from the blood of the parent, to consist of a simple living filament as a muscular fibre ; which I suppose to be an extremity of a nerve of locomotion, as a fibre of the retina is an extremity of a nerve of sensation. *Zoonomia*, I, 496.

When we revolve in our minds, First, the great changes which we see naturally produced in animals after their nativity ; as in the production of the butterfly with painted wings from the crawling caterpillar ; or of the respiring frog from the subnatant tadpole.

Secondly, when we think over the great changes introduced into various animals by artificial or accidental cultivation ; as in horses, which we have exercised for the different purposes of strength or swiftness, in carrying burthens or in running races ; or in dogs, which have been cultivated for strength and courage, as the bull-dog, &c. . . . with the changes of the forms of cattle which have undergone so total a transformation that we are now ignorant from what species of wild animals they had their origin. Add to these the great changes of shape and colour, which we daily see produced in smaller animals from our domestication of them, as rabbits or pigeons ; or from the difference of climates and even of seasons ; add to these the various changes produced in the forms of mankind by their early modes of exertion, or by the diseases occasioned by their habits of life ; both of which become hereditary and that through many generations. . .

Thirdly, when we enumerate the great changes produced in the species of animals before their nativity ; these are such as resemble the form or colour of their parents, which have been altered by the cultivation or accidents above related, and are thus continued to their posterity. Or they are changes produced by the mixture of species, as in mules ; or changes produced probably by the exuberance of nourishment supplied to the fœtus . . . Ibid, p. 505.

Fourthly, when we revolve in our minds the great similarity of structure, which obtains in all the warm-blooded animals, as well quadrupeds, birds, and amphibious animals, as in mankind; from the mouse and bat to the elephant and whale; one is led to conclude, that they have alike been produced from a similar living filament. In some this filament in its advance to maturity has acquired hands and fingers, with a finer sense of touch, as in mankind. In others it has acquired claws or talons, as in tigers and eagles. In others toes with an intervening web or membrane, as in seals and geese . . . and all this exactly as is daily seen in the transmutations of the tadpole, which acquires legs and lungs when he wants them, and loses his tail when it is no longer of service to him.—Ibid, p. 506.

Fifthly, from their first rudiment, or primordium, to the termination of their lives, all animals undergo perpetual transformations; which are in part produced by their own exertions in consequence of their desires and aversions, of their pleasures and their pains. . . . A great want of one part of the animal world has consisted in the desire of the exclusive possession of the females; and these have acquired weapons to combat each other for this purpose, as the very thick, shield-like, horny skin on the shoulder of the boar is a defence only against animals of his own species. . . . So the horns of the stag are sharp to offend his adversary, but are branched for the purpose of parrying or receiving the thrusts of horns similar to his own, and have therefore been formed for the purpose of combating other stags for the exclusive possession of the females; who are observed, like the ladies in the times of chivalry, to attend the car of the victor. . . . The birds, which do not carry food to their young and do not therefore marry, are armed with spurs for the purpose of fighting for the exclusive possession of the females, as cocks and quails. It is certain that these weapons are not provided for their defence against other adversaries, because the females of these species are without this armour. The final cause of this contest amongst the males seems to be, that the strongest and most active animal should propagate the species, which should thence become improved.—Ibid, p. 505.

Another great want consists in the means of procuring food, which has diversified the forms of all species of animals. Thus the nose of the swine has become hard for the purpose of turning up the soil in search of insects and of roots. The trunk of the elephant is an elongation of the nose for the purpose of pulling down the branches of trees for his food, and for taking up water without bending his knees. Beasts of prey have acquired strong jaws or talons; &c. . . . all which seem to have been gradually produced during many generations by the perpetual endeavours of the creatures to supply the want of food, and to have been delivered to their posterity with constant improvement for the purposes required.

The third great want amongst animals is that of security, which seems much to have diversified the forms of their bodies and the colour of them; these consist in the means of escaping other animals more powerful

than themselves. Hence some animals have acquired wings instead of legs, as the smaller birds, for the purpose of escape. . . . The contrivances for the purposes of security extend even to vegetables, as is seen in the wonderful and various means of their concealing or defending their honey from insects and their seeds from birds. . . .

From thus meditating, &c. (See page 34.)

Sixthly, the cold-blooded animals, as the fish tribes, . . . differ so much in their general structure from the warm-blooded animals, that it may not seem probable at first view, that the same living filament could have given origin to this kingdom of animals, as to the former. Yet are there some creatures which unite or partake of both these orders of animation, as the whales and seals; and more particularly the frog who changes from an aquatic animal furnished with gills to an aerial one furnished with lungs.—Ibid, p. 509.

The numerous tribes of insects without wings, from the spider to the scorpion, from the flea to the lobster; or with wings, from the gnat and the ant to the wasp and the dragon-fly, differ so totally from each other, and from the red-blooded classes above described, both in the forms of their bodies, and their modes of life . . . that it can scarcely be supposed that this nation of animals could have been produced by the same kind of living filament, as the red-blooded classes above mentioned. And yet the changes which many of them undergo in their early state to that of their maturity are as different as one animal can be from another. . . .

There is still another class of animals, which are termed vermes by Linnæus, . . . which possess the simplest structure of all animals, and appear totally different from those already described. The simplicity of their structure, however, can afford no argument against their having been produced from a living filament as above contended.

Last of all, the various tribes of vegetables are to be enumerated amongst the inferior orders of animals, . . . and to these must be added the buds and hulbs which constitute the viviparous offspring of vegetation (I., p. 510) and they exactly resemble their parents, as is observable in grafting fruit-trees, and in propagating flower-roots; whereas the seminal offspring of plants, being supplied with nutriment by the mother, is liable to perpetual variation. . . . M. Koelreuter impregnated a stigma of the *nicotiana rustica* with the farina of the *n. paniculata*, and obtained prolific seeds from it. With the plants which sprung from these seeds he repeated the experiment, impregnating them with the farina of the *n. paniculata*. As the mule plants which he thus produced were prolific, he continued to impregnate them for many generations with the farina of the *n. paniculata*, and they became more and more like the male parent, till he at length obtained six plants in every respect perfectly similar to the *n. paniculata*.—Ibid, page 492.

Shall we then say, &c. (See page 34.)

I contend, that the number of the sexual organs in flowers is more liable to change by the influence of soil or climate, or by the progress of time, than their situations or proportions, or forms, and might therefore pro-

bably be more advantageously employed in distinguishing their classes and orders from each other, as well as in rendering them more natural combinations. This mutability or uncertainty of the number of organs of reproduction belonging to individual flowers, would seem to arise from an attempt of all organized beings towards greater perfection. Whence as the success of the process of reproduction becomes more certain from the greater perfection of the vegetable being, the organs for the purpose of reproduction seem to become fewer. Whence some flowers have lost half the stamina, and in others the anthers of those stamina are yet only deficient, and in others the pistilla are deficient; all which in process of time may gradually become less numerous, or separate themselves from hermaphrodite flowers into sexual ones, as in the classes of monoecia and dioecia; and all of them finally, after a long process of ages, become of the orders monandria and monogynia of those classes; whilst new kinds of vegetables may begin a similar progress from less to greater perfection. So in animals, the less perfect seem to possess organs for a more numerous reproduction, as fish and insects. Such would seem to be the perpetual progress of all organized being from less to greater perfection existing from the beginning of time to the end of it! a power impressed on nature by the great Father of all. *Phytologia*, p. 568.

Linnæus supposes, in the Introduction to his Natural Orders, that very few vegetables were at first created, and that their numbers were increased by their intermarriages, and adds, suadent hæc Creatoris leges a simplicibus ad composita. Many other changes seem to have arisen in them by their perpetual contest for light and air above ground, and for food or moisture beneath the soil Plants which in this contest for light and air were too slender to rise by their own strength, learned by degrees to adhere to their neighbours, either by putting forth roots like the ivy, or by tendrils like the vine, or by spiral contortions like the honeysuckle; or by growing upon them like the mistletoe, and taking nourishment from their barks; or by only lodging or adhering on them, and deriving nourishment from the air, as tillandsia. *Z. I.*, 511.

A contest for air and light obtains throughout the whole vegetable world; shrubs rise above herbs, and, by precluding the air and light from them, injure or destroy them; trees suffocate or incommode shrubs; the parasite climbing plants, as Ivy, Clematis, incommode the taller trees; and other parasites, which exist without having roots on the ground, as Mistletoe, Tillandsia, Epidendrum, and the mosses and funguses, incommode them all. *B.G. II.*, 152.

In tussocks of grass, or where too many seeds of wheat have been sown near together, the central part of the knot of wheat or grass grows much taller than the external part so as to give it a conical figure; which has been by some ascribed to the central part having been sheltered from the cold by the external ring, but is more generally owing to the struggle of the internal stems for the acquisition of light and air. *Phytologia*, p. 516. Their roots also must descend lower in their contest for moisture, and for other advantages of the soil; whence many of

these crowded stems become barren, producing no ears, or ill-corned ones. p. 290.

CAUSE AND EFFECT may be considered as the progression, or successive motions, of the parts of the great system of Nature. The state of things at this moment is the effect of the state of things, which existed in the preceding moment; and the cause of the state of things, which shall exist in the next moment

This perpetual chain of causes and effects, whose first link is rivetted to the throne of God, divides itself into innumerable diverging branches, which, like the nerves arising from the brain, permeate the most minute and most remote extremities of the system, diffusing motion and sensation to the whole. As every cause is superior in power to the effect which it has produced, so our idea of the power of the Almighty Creator becomes more elevated and sublime, as we trace the operations of nature from cause to cause, climbing up the links of these chains of being, till we ascend to the Great Source of all things.

Hence the modern discoveries in chemistry and in geology, by having traced the causes of the combinations of bodies to remoter origins, as well as those in astronomy, which dignify the present age, contribute to enlarge and amplify our ideas of the power of the Great First Cause. And had those ancient philosophers, who contended that the world was formed from atoms, ascribed their combinations to certain immutable properties received from the hand of the Creator, such as general gravitation, chemical affinity, or animal appetency, instead of ascribing them to a blind chance; the doctrine of atoms, as constituting or composing the material world by the variety of their combinations, so far from leading the mind to atheism, would strengthen the demonstration of the existence of a Deity, as the first cause of all things; because the analogy resulting from our perpetual experience of cause and effect would have thus been exemplified through universal nature.

The heavens declare the glory of GOD, and the firmament sheweth his handy-work! One day telleth another, and one night certifieth another; they have neither speech nor language, yet their voice is gone forth into all lands, and their words into the ends of the world. Manifold are thy works, O LORD! in wisdom hast thou made them all. Psalm xix. civ.

Zoonomia, I, 537.

