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MOSES OR DARWIN.

“Some of the purely physical discoveries of the world bear a closer relation to the religious life and the future welfare of humanity than do some of the great religions of ages in the history of the past. To-day the telegraph and the steam are doing more, and they have done more in fifty years, to bring about a sense of universal brotherhood, to help humanity feel that it is *one*, and that all humanity is related to every other part of humanity, than all the preaching and all the churches of the last eighteen hundred years.

“Is evolution, then, a radical or a conservative element in religion? It is both. It is radical in so far as it eats away, tears down, and leaves behind, the transient and perishable forms; for these things, when decayed and fallen, only become obstacles in the pathway of human progress. But, so far as essence and life are concerned, evolution is conservative. It would not knock an idol out of an ignorant religionist's hand, except as it can replace it by a purer and truer symbol. It lets the boy keep his toys, until, having become man, he is ready to put away childish things.”

M. J. SAVAGE.

MOSES OR DARWIN?

A SCHOOL PROBLEM FOR ALL FRIENDS OF TRUTH AND PROGRESS

BY

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other Scientific Works.*

The Truth-Seeker is the only God-Seeker.—M. J. SAVAGE.

TRANSLATED FROM THE THIRD GERMAN EDITION, WITH
PREFACE FOR THE AMERICAN EDITION,

AND

A DISQUISITION ON SCHOOL REFORM IN THE
WEST.

BY

FREDERICK W. DODEL.

NEW YORK:
THE TRUTH SEEKER COMPANY,
28 LAFAYETTE PLACE.

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PREFACE TO THE FIRST EDITION.

IN the scientific world the doctrine of Evolution has, long ago, been accepted as a well-established truth, so that any further attempt to vindicate it would seem to be carrying water into the sea. But I thought it opportune to cast, for once, a reviewing glance at the influence the new doctrine was expected to exert upon the Public Schools. The observations I made depressed me most sadly, so that, after looking silently on for many a year, I resolved to direct the attention of the public to the calamitous gulf lying between the Higher and the Common Schools, by means of a series of free lectures, and appeal to the love for truth and justice of the uncorrupted public.

In pursuance of this plan, I lectured, in January and February, 1890, in Zurich and in St. Gall, upon this subject, under the auspices of the "Gruetli Society" and of the "Workingmen's Progressive Union." The intense, almost sensational, interest which these lectures called forth—the large lecturing halls were, as a rule, too small for the eager crowds, and hundreds were obliged to return home unable to gain admission—demonstrated beyond anticipation that the problem "Moses or Darwin?" is of the greatest import and urgency.

The fanatic clamor of some ultramontane priests and the hypocritical caterwaul of a couple of pietists and would-be Zionguards, as well as the wishy-washy attitude of the daily press, have rendered it necessary to publish the three lectures in one volume. I submit them to the progressive-minded citizen and workingman, to the school teachers of every grade, to boards of schools and public instruction in general, to

the theologians and clergy of every denomination, and I doubt not but that all of them will peruse them to some advantage.

To the implacable opponents as well as to the enthusiastic friends of truth, I propose to do justice in a kind of epilogue—Part IV of this work.

ZURICH, Feb. 29, 1890.

PREFACE TO THE THIRD EDITION.

WITHIN the past year the problem "Moses or Darwin?" has been discussed very often; not only in Switzerland, where several Teachers' Associations deliberated upon it, but also in Germany, Austria, Holland, France, Italy, England, America, etc. There are friends and opponents everywhere, and the many inquiries that have been addressed to me by letter, from laymen and teachers from every quarter, afford abundant evidence that the disastrous discrepancy between Lower and Higher Schools has given rise to grave considerations. Thus the purpose underlying these lectures has been accomplished to a certain degree. The chief work, however, still to be performed, is in the province of the teachers and legislatures.

This volume called forth no less than three counter-pamphlets within the last year; but, I am sorry to say, when I had perused them, I was no wiser than before. All of them oppose my arguments on account of religious scruples, and resort, for the most part, to those childish, antiquated, so often repudiated, objections which to refute over and again I am not inclined. A few observations and marginal notes I purpose to annex to the epilogue of this edition. The best answer to the various manifestations of attention, on the part of the prosaic and some poetic readers, is the fact that a third edition of 5,000 copies was rendered necessary.

Let us hope that with the close of the present century the discrepancy between Higher and Lower Public Schools, expressive of the system, *Truth for the Few; Error for the Many*, will vanish. This must come of necessity, for many of the defenders of the old philosophy have reluctantly conceded

that they stand, themselves upon the basis of Evolution. True, they do this but occasionally, and as it were, by stealth; expecting that the masses will not become aware of it, if they do not manifest it in their religious schools. Thus they keep up two sorts of philosophy; one for themselves, the true one; another for their schools, the false one.

Let us be honest, and stalwartly side with truth. Let us stand there with both feet; not with one only, while the other still stands on the other side of the gulf. There is no escape from the alternative, "Moses or Darwin?" For there is no possibility of ever reconciling the two.

EITHER MOSES OR DARWIN!

ZURICH, March 18, 1890.

TRANSLATOR'S PREFACE TO THE AMERICAN EDITION.

THE separation of Church and State has, in this country, been accomplished to some extent, in theory at least; consequently the conflict between the doctrine of Evolution and the Genesis of Moses might be expected to lie entirely beyond the sphere of the Public School, and it would seem, *a priori*, to be improper and idle to agitate this school problem with so much gravity as is displayed in Europe. But upon closer inspection, we find ourselves actually facing the same dilemma: TRUTH *for the* FEW who receive a full common-school education; ERROR *for the* MASS OF THE PEOPLE who quit school after passing through the lower four or five grades. As the children of the laboring class do not attend school longer than

until they have attained twelve or fourteen years of age, and as a majority of them are sent to the parochial schools for the last two years, to receive instruction in the tenets and teachings of the respective religious sects, we need not wonder that the process of enlightening the masses at large is not nearly in keeping with the progress of this country in industrial and financial pursuits. A good deal of bigotry, ignorance and superstition is hovering over our citizens, as the last state elections in Wisconsin and Illinois amply illustrated. "The gentlemen of the cloth" may rest assured that their hold upon the masses has not been much decreased. Their display of political power and the ensuing results are rather indicative of a steady growth of the ecclesiastical undercurrent, and auspicious of the final supremacy of priestcraft and superstition, unless they be counteracted, in season and out of season, by the only proper and effective means: *Education of the MASSES*

upon the foundation of TRUTH and COMMON-SENSE. The author of this pamphlet struck the right key, and in due time, when he laid bare the present fallacious policy of the European governments in the administration of school education.

The most efficient remedy against the evils attending the sway of blind faith, ignorance and bigotry, is, in my opinion, the *INSTRUCTION of the MASSES IN THE SCIENCES, both IN SCHOOL and LECTURE-ROOM by a body of WELL-QUALIFIED and EXPERIENCED TEACHERS.*

It is a fact that the sciences in the public schools of our country are the most neglected branches, and, as a rule, not accessible to the children of the masses, because they are restricted, even in the best schools—those of cities—to those grades which are not frequented by them. And what is, moreover, an amazingly striking characteristic of the school instruction in the rural districts is the almost incredible fact that teachers in those districts where schools are

generally open but six months each year are not even required to know anything of natural sciences. The Wisconsin school code requires of candidates for a Third Grade County Certificate the ability to pass an examination given by the county superintendent in the following branches: Orthography, orthoepy, reading, penmanship, arithmetic, English grammar, geography and history of the United States, and theory and art of teaching.

For a Second Grade County Certificate: All the foregoing branches and also grammatical analysis, *physiology*, *physical geography* and elementary algebra.

For a First Grade County Certificate: All the foregoing branches and also higher algebra, *natural philosophy* and geometry.

Mark: Nothing of botany, zöology, mineralogy, geology, or any of the kindred applied sciences. Nothing of art education, as singing, drawing; nothing of gymnastics, that surest of all branches for training a

sound body for an equally sound intellect; no political economy or other civic science branch, so essential for the preservation of political and social happiness and independence. Mark also: Children who have attended European schools have in general the chance and the actual obligation to receive more scientific, physiologic, art, and civic education there, even in monarchical countries, in spite of all the cramming with dogmatic and religious matter, than have our own children who have grown up and been educated in our republican schools, which are alleged to exclude so-called religious instruction. The task of remedying these defects is, to the friend of public and social progress, a most serious problem.

Although Church and State are theoretically independent of each other, we must not for a moment think that they can exist in neutral juxtaposition for any length of time. The Christian Church, ever since she usurped part of the State authority, has ever

acted the part of the wolf in the fable, and the State that of the lamb. And so she will continue, if the State consent. The State is a political organization, so is the Church, no matter what her denomination. Which of the two is to be supreme? This question is still an open one in our country, and demands, with increasing urgency, a solution. The arena upon which the contending parties will encounter each other will be the *school*. The party that controls the education of the intellects of the rising generation will carry the day.

The political powers friendly to the interests of the State—that is, the so-called political parties, *per se*—are, sad to say, indifferently careless of her true interests so far as our country is concerned. The consequences are that the Church has gradually increased in strength, whereas the State has neglected her means of attack and defense—so much so, indeed, that both the Republican and the Democratic parties, time

and again, have become the armor-bearers of the Church.

Our public schools are not returning adequate results in the education of the masses. We have abundant reasons to wonder why we do not stand in a worse plight than we actually do when we compare the activity of the Church with the stagnant condition of the public school. In the course of a few decades, the parochial schools, over which the State heretofore waived control, will likely outnumber the public schools in the state of Wisconsin, if the increase of the former continue in the same ratio as it did in the last three or four decades.

What then? Who will then exercise any control over the development of the intellects of our citizens, if not the Church? What will become in the end of the much-boasted liberty of thought, of press, and of speech?

The author defines clearly the interest

of the State in regard to the mental faculties of the citizens. The intellectual and moral essence of the citizen, he says, is part of the commonwealth, and, therefore, ought to be controlled by the State, whereas the metaphysical wants of the citizen may be left to the care of the individual. This is, in my opinion, the only remedy for the present calamitous state of public education.

Nothing short of a thorough reform in the sphere of public education—that is, especially the insertion of instruction in the sciences into the curriculum of the public schools—will efficiently secure the final ascendancy of the State *over all the schools, both public and parochial*, and over the Church. For these ends there are necessary, however, several preliminary legislative measures of great importance, which must alleviate some of the evils under which the present public-school system, and especially the teaching-force of the present day, is suffering. These evils I beg leave briefly partly to re-

capitulate and partly to specialize, the limited space of this work forbidding a detailed deduction :

1. The use of the Bible in the public shools, and the use of text-books in reading which contain surreptitiously incorporated religious and dogmatic tenets, is absolutely objectionable. There is so much religious reading matter in the public-school readers that the statute prohibiting religious instruction in the public-school has become *utterly nugatory*.

2. The compulsory-education laws limit the time of attendance at the public or any parochial or other private schools to the minimum of three months per annum for pupils between the ages of seven and fourteen years. This is considered insufficient in monarchical countries; it is still more so in a republic. The present compulsory-education laws are little better than no laws at all.

3. There is a general neglect of science

instruction throughout the public-school system, especially in the lower grades. Most of the reading lessons in these grades aim only to teach good morals in family and social life; beyond that and the linguistic exercises connected therewith, there is little of any material value to be gathered from these readers, and nearly nothing worth mentioning of natural science. The school code of Wisconsin (§ 447 R. S.) specifies as subjects to be taught in the public schools: Orthography, orthoepy, reading, writing, grammar, geography, arithmetic, the constitution of the United States and the constitution of this State, "and such other branches as the district board may determine." And what other branches do the district boards generally determine? *Generally none*; so that actually the conscientious and highly qualified teacher commits an offense if he or she presumes to teach anything outside the above-named branches. Is not this a most deplorable

state of affairs—an outrage against the blessings of political and social liberty and independence, the maintenance of which is entrusted to the voters of the republic, when we consider that the weal and woe of the nation absolutely depend upon the enlightenment of the masses? Some of my readers will perhaps object that the school of the masses amply does its duty when it imparts the “three R’s” to the young generation, and that the enlightenment of the adults is the office of the journalistic press. To them I have nothing to reply at this time.

4. In the aggregate, the so-called best public schools—those of cities—benefit a small portion of the masses only, because the children of the laboring class withdraw from the schools before reaching the upper grades where certain science branches are being taught.*

* It gives me particular pleasure to testify to the eminently progressive and highly advanced state of the

5. The establishment and maintenance of a system of comparatively excellent normal schools in most states is not sufficient in itself to accomplish the *maintaining of a body of qualified teachers* who make teaching a *profession for life*. Our legislators wisely provided facilities for *training* teachers; but they sorely *neglected to provide for their well-being after entering into practical life*. The thorny and wearisome road a teacher has to travel all his life has, in our republic, been disregarded, and so illy replenished with attractions, that half the number of graduates from normal schools prefer to quit the profession, on the average after four years of practical teaching, and to enter some other one which is more remunerative and pleasant. The fact is that the social position of the teacher is utterly despicable, some

city schools of Milwaukee, under the superintendence of Profs. Wm. E. Anderson and H. O. Siefert, and that of the city schools of New Ulm, Minn., under the control of the enthusiastic Prof. R. Nix.

exceptions to the contrary notwithstanding. The results show that the average teacher is anxiously looking for chances to change his or her profession, and this accounts for the scarcity of experienced and trained common-school teachers.

6. In many cases the supervision of the public schools, as exercised at present by county superintendents, is very defective and almost worthless; this is largely due to the fact that the office of county superintendent is too frequently filled by politicians of little or no pedagogical knowledge.

7. The professional requirements of teachers are fixed too low: they are, what might be called on the "territorial" scale—*i. e.*, such as were required in territorial times, two hundred years ago, when applicants for teachers' positions were "few and far between."

8. The salaries of teachers actually paid are, on the average, inadequate to the expenses and the time spent for professional training and education.

9. The transient character of the average teacher is a great drawback to the progress of the school. Transient teachers cannot be expected to foster and nourish professional spirit and efficiency; there is no *esprit de corps* in them, that keen sense of professional excellence and worth, that feeling of interest in corporate advancement. Transient teachers are not qualified to procure for the profession a recognition in public and social life that would otherwise be granted it.

10. The current method of engaging teachers in the rural districts is, as a rule, an utter abomination. The teacher whose scientific and professional attainments are far superior or ought to be at least, to those of any untutored farmer or hustling town-politician who may have taken a fancy to board the teacher, is, by the present system, entirely dependent upon the good-will of one or two members of the board, which generally consists of three members. This

dependence smacks too much of the good old territorial times and of backwood refinement.

11. The teacher's engagement being thus stamped, right in the start, as a matter of little consequence, the position cannot obtain that social esteem and independence which of right appertain to it. In ancient Rome, the teachers were mostly slaves, who were eventually freed from bondage by manumission if they had given satisfaction, and pensioned, by their patrons. In our country the teacher's lot is worse than that, at least in rural districts, not only for lack of social independence and steady employment, but also from the impossibility of laying up any savings in the event of his having a family to support. Truly, the European teachers are socially better recognized than the American teachers, who can, according to law, never be engaged for more than one year at a time.

It must not be understood that there

are not exceptions to the above remarks, nor that in general the teachers' condition is not much better in some few cities than in others, and in some few rural districts than in others. But these criticisms hold good throughout the country as a whole, in some states with more, in other states with less, rigor. The remedies for these evils are very easily obtainable, provided the state legislatures consider them important enough and worthy of notice. I shall briefly point out a few of them as being highly conducive to the progress, both of school and state, and which have actually been in operation for many decades in several states of the Swiss republic with excellent success, and are to-day ardently discussed in the professional press of this country:

1. The text-books used for secular instruction in public and private schools should be uniform throughout a state, and the controlling power of the state in respect of the secular instruction supreme, as

regards both methods and subject-matter in certain branches. To ensure the very best text-books, the assistance of the State Teachers' Associations should be required, and the publication of all secular text-books by the state at cost price enforced.

2. An extension of the time of compulsory school education to nine months per annum, from the seventh to the sixteenth year of all the pupils, in either public or private or parochial schools, should be enacted.

3. The incorporation of the instruction of the science branches—physiology, natural history, physics, astronomy, chemistry, geology, based upon the latest researches, together with practical experiments and illustrations, besides singing, drawing, and gymnastics—into the curriculum of the common school, arranged organically in concentric circles through the entire course, should be insisted upon.

4. Greater and more general attendance

of the school-age population, especially in the higher grades of the common school, should be rigorously enforced for the above-cited reason—that the science branches are mostly reserved to the upper grades for pedagogic reasons. (See Huxley's *Critiques and Addresses*.)

5. The subject-matter of teachers' examinations is consequently to be increased, especially in regard to the science branches, with a view to practical knowledge and efficiency in the school and lecture-room; the examinations should be conducted by professional men of scientific attainments.

6. The supervision of all schools in respect of the secular branches should be entrusted, not so much to unprofessional or political officers, but to the combined care of a body of qualified laymen, elected by the voters of a county and state, and the county and state teachers' associations, proportionately.

7. The legislatures should fix the mini-

mum salaries per annum for common-school teachers at such a rate that, through a more efficient competition on the part of trained and experienced teachers, the efficiency of the schools might be increased.

8. To wipe out the transient character of the average teacher, the legislatures should pass laws stimulating teachers, by gradual increase of salary, to be paid them directly from the state school funds, to continue in their profession, and to enable them to support a family from the salary so increased.

9. Teachers should not be *appointed* by the exclusive action of the boards, but *elected* by the voters of each school district. Since constables, poundmasters, roadmasters, etc., are deemed sufficiently important to be made elective officers, I do not see why a teacher should not be in as high esteem as are those "limbs of the law." Free the teacher from the bondage of two men, and make him responsible to all the voters: it will

benefit the children, the teachers, and the parents.

10. The teacher, if he or she be a professional person, should not be exposed to the risk of moving every year and securing the costly services of teachers' agencies, but he or she should, by law, be entitled to hold a position at least as long as a post-master—for four years, or less, if a majority of voters demand resignation.

11. The larger number of American teachers being of the fair sex and consequently more liable to "quit the profession," besides being naturally prevented from taking a prominent interest in other than internal school affairs, it follows of necessity that their influence upon the enlightening of the adult population in rural school districts is greatly diminished, and their action upon the social progress of their neighborhood is inferior to that of male teachers. To stimulate the numerical increase of male teachers who wish to make teaching their profession

for life, the legislatures should adopt proper measures for this purpose, either by awarding them comparatively greater salaries or greater premiums for experience. The lady teachers of our country deserve our honest and hearty admiration and respect for their enthusiastic conduct, and untiring perseverance *in the school-room*. Nevertheless they cannot fill the place of male teachers, *as they should be, outside the school-room*, in the rural districts, where their office is not merely to teach in the school-room, but to enlighten and refine the circles of young men and women in field, wood, club and *lecture-room*. If a change for the better is to come at all, it is to come by the strenuous combined exertions of all public - school teachers, and for the male teachers especially.

In reviewing the above specified evils, and the corresponding remedies which have been proposed for their alleviation, I hope to obtain forgiveness for my frankness and

for the timid wish that here and there an attentive reader will approve of my naming things by their proper names, and that one or the other among them will gladly contribute his share of political and social influence toward a

GENERAL REFORM.

The plea of traditional neglect of the sciences in the common schools is no valid excuse for leaving this state of things as it is. We may boast of fine and costly school buildings, of good methods, of excellent text-books, of the best of school furniture, and of a general desire of the public for good schools—can we boast, too, of the best results obtainable, when we allow half the teachers of normal school-training, after an average of four years work in practical teaching, to quit the profession from sheer disgust with the present condition of things; when we provide accommodations for instructing the masses in sciences, but fail to reach their ear on account of the general

withdrawal of the children of the masses from the upper grades?

But the outlook at present is favorable. The struggle between State and Church for the control of all school education has been inaugurated; the Church gained the preliminary engagement in last fall's elections in two states; nevertheless, the auspices are good, though pregnant with more temporary mischief; but if evolution is not a chimera only, there can be no doubt about the final success of the progressive party.

F. W. DODEL.

MILWAUKEE, Wis., March, 1891.

I.

MOSES OR DARWIN?

LADIES AND GENTLEMEN:

I HAVE been invited to discuss before you a problem, in which many, if not all, friends of social progress are highly interested. In obedience to your invitation, I take pleasure in drawing your attention to this most important and significant characteristic of our time, which engages, and will continue to engage, the earnest meditation of every philanthropic mind; that is, the great fundamental incongruity in our educational and school work, that disastrous inconsistency in the intellectual culture of the entire contemporary civilization, which

may best be signalized by the alternative, Moses or Darwin?

There exists an inconsistency between the *education of the masses* in the public school, on one hand, and the *education of the few* in the scientific and higher schools, on the other.

This inconsistency is a fact; it existed, and has always been acknowledged to exist by the most reputed authorities, during the last half century; but there was nobody to set on foot a *successful* reform. The antagonism between Faith and Knowledge seems to find no end; on the contrary, the gulf between the two spheres is gradually expanding; the prevailing confusion is sinking its roots deeper year by year, and peace is vanishing into the remote future.

For this reason, every honest and thoughtful parent should devote the gravest meditation to this subject, view it from every point, acquire a thorough understanding of its consequences, and honestly think of reme-

dies with which to effect a cure of this fatal disorder.

For these ends we shall have to search after information in its past history, and we must dive into the dark recesses of antiquity to learn the origin of the conflicting factors.

The two essential systems that at present oppose each other throughout the civilized world may best be styled:

1. THE MOSAIC CONCEPTION OF THE CREATION; such as, in the long period of 3,000 years, has been promulgated to generation after generation by Jewish and Christian priests as an unassailable divine revelation.

2. THE SCIENTIFIC CONCEPTION OF GRADUAL AND SLOW EVOLUTION OF MATTER; the Doctrine of the Progressive Development of the Organic World by Virtue of the Everlasting Forces of Nature alone. This doctrine has victoriously maintained its ascendancy in the learned, scientific world, especially through the agency of Darwin's

works. An important part of this system is the doctrine of the Origin of Species.

I propose to deal first with Moses, whose historical importance nobody can question.

MOSES AND HIS DOCTRINE.

About 3,500 years ago, so General History tells us, the Semitic nation of the Hebrews was languishing in Egyptian bondage. In spite of the gross oppression to which this intelligent people was subjected under the torrid African climate, they multiplied rapidly. They cannot have been badly fed, for, after their exodus from the Nile-country, they pined after the flesh-pots of Egypt, and, hungry in the midst of ample leisure, overlooked their former suffering. The rapid increase of their oppressed progeny is by no means a striking or strange occurrence; we find it repeated in all ages and all nations. A hard-working, oppressed population, suffering in servitude, is, as a rule, prolific. Omnipotent nature seems to offset in this manner the conditions which

voluptuousness, hyper-culture, and refinement have produced in higher states of civilization.

When the poor and despised children of Israel multiplied in Egypt at such a high rate, the kings on the banks of the Nile became alarmed. The Pharaohs began to entertain fears lest the Egyptians might one day find their now subjected invaders siding with some alien foes. One of them ordered that at intervals all the new-born male Israelites should be drowned.

But the execution of the royal mandate fell so heavily on one of the Jewish mothers, Ichabod by name, that she concealed her last-born son for three months, until the boy, on account of his strengthened voice, could no longer be concealed except at the risk of discovery. Then she had a little basket woven, of the light porous stalks of the papyrus plant. In it she placed her little offspring, and carried him out to a shallow place of the muddy Nile, exposing him upon the tranquil waters in some

secluded spot, and placed for a guard her daughter Miriam (Mary) behind some rushes near by, to watch the fate of the poor little fellow.

Soon after, the princess royal—Josephus mentions her name, Thermoutis—came near the spot to bathe in the river. In due time she noticed the snug papyrus basket, and ordered it to be brought to her and opened. The sight of the healthy boy, who was crying at the top of his voice in his desolation, filled her with sympathy. Presently the crafty and watchful Miriam came up, offering to find a nurse, and managed to have the boy's own mother appointed for such service, to whom, indeed, the foundling was entrusted. Thermoutis adopted the boy and named him Moshe, Moses *i. e.*, drawn out from the water.

Nothing is known in history of Moses' boyhood; but according to tradition, as related by Josephus, the youth, Moses, was of a ravishing beauty. Princess Thermoutis

had him instructed by her priests in all the learning of the Egyptians. She also lent him her protection against the king, when the priests predicted to her father all the evil that would befall the Egyptians from the hands of this intelligent and energetic stranger. One day, young Moses, while playing with the king's crown, cast it upon the earth and stamped upon it with his feet. An adopted son who acts so indiscreetly is evidently an ungrateful child, and cannot but inspire apprehensions for the future. The priests who informed the king of the circumstance effected nothing against this protégé of the princess, and thus it happened that Moses continued in his court-education.

According to the written testimony of Manethon, Moses was, for some time, a priest in Heliopolis. When of age, says Josephus, Moses led an Egyptian army against the Ethiopians who threatened the frontiers. He vanquished the enemy and pursued them

as far as the royal city of Sabah (Meroë) which he laid siege to. Here he encountered a truly human fate. Tharbis, the daughter of the besieged king, fell in love with Moses. She offered him her hand and surrendered the invested city. He married the princess and conducted the victorious army to the North again.

Everybody knows from the subsequent history of Moses that he was obliged to flee into the Arabian desert because he had committed man-slaughter upon an Egyptian; that he then lived with Yethro, a Midianite prince and priest, of whose seven daughters he selected one (Sephora) for his wife; that for many years he watched Yethro's herds; and that he spent much of his leisure in deep and sorrowful meditation over the sad misfortune of his Israelitish kinsmen, whose condition, he learned, had not improved, but was aggravated by daily increasing sufferings and oppressions.

In this protracted period Moses conceived

a plan to deliver the Jewish people from the Egyptian servitude, in the name of the God of their ancestors, Abraham, Isaac, and Jacob. He returned to Egypt together with his brother Aaron, and found a new Pharaoh upon the throne. At this time Moses was eighty years old. Performing many magic acts and miracles that the Egyptian priests knew but in part to imitate, the two brothers at last succeeded in intimidating the king, and in obtaining from him permission for the Jews to leave the country. Is there anybody unacquainted with all the charming stories and legends that originated before, during, and after the Exodus, and which so gloriously magnify the exploits of Moses?

Indeed, the sacred account of the deliverance of the Israelites from Egyptian bondage is a genuine Oriental epic, adorned with all the finery of poetic imagination. It still enraptures even us who do not credit everything that Poesy's rosy fingers

have written down in the books of tradition.

Upon this occasion, however, our attention is not so much centered in the accessory episodes and legends connected with the Exodus and the migration across the desert, as in the Mosaic legislation, and especially in Moses' capacity as author and originator of the Creation-Myth. From Moses, it is alleged, proceeded the Jewish legislation. The five books of Moses (the Pentateuch) which bear his name have become the inexhaustible source of the glory of the early Israelites. Yet, scientific research, and the criticisms of the learned Bible interpreters, have shaken their reputation for *genuineness*; and about one hundred years ago there originated among the learned doctors of divinity a long and often very passionate dispute concerning the *authenticity* of the books of Moses, a dispute which even at this date cannot be considered as terminated, although there are a few theologians who still hold everything

to be true that is contained in those five books. Reticent, conservative and strictly devout divines have of late been constrained, though, to admit that those records are not, in every part, true and infallible. Most of the biblical scholars of to-day are convinced that Moses did not compose all that has been accredited to him, and that the Pentateuch was composed by several authors. It is only in accordance with this assumption that many chronological absurdities and discrepancies, repetitions and modified reports of one and the same event, the different appellations of God (Gen. i, Elohim or God; Gen. ii. and iii, Jehovah Elohim or Lord God; in other chapters simply Jehovah or Lord) may be explained and understood; that, furthermore, the various styles of language and the abrupt changes in style in the books of Moses are palpable to our understanding, and that the language in the Pentateuch is exactly the same as the vernacular of about 1,000 years after

Moses. This last circumstance is especially worthy of our notice, inasmuch as there is no language on earth that does not undergo considerable change in the course of 1,000 years, and the same must be true of the Hebrew language.

Notwithstanding all this, there are weighty reasons for maintaining that the first book of Moses (Genesis), at least, was, for the greater part, written by that ingenious Israelite himself. (See S. Munk, *Palestine, Description Géographique, Historique et Archéologique*. Paris, 1845).

Thus Moses became the founder of a religion by means of his legislative acts and of his peculiar conception of the creation.

All the more important founders of religions coincide in certain features of their character: they are deep thinkers, highly talented for speculative philosophy, shrewd connoisseurs of human frailties and virtues, and, in a majority of cases, thoroughly imbued with all the culture of their age.

Moses, too, possessed an eminent mind, and his physical appearance must have been truly phenomenal, perhaps of a kind, indeed, as Michel Angelo represented it in his statue of Moses.

Mastering all the treasures of Egyptian and Oriental knowledge of his age (Egyptian priests, who were simultaneously necromancers, ministers of state, physicians, and professors, had been his teachers), having accomplished the deliverance of his people from oppressive servitude, he was fully qualified to lay the foundations of a cult that through thousands of years preserved its superior merits.

It is well-known that Moses preached and acknowledged only one God: Jehovah Elohim. He was a monotheist. This unique God, who raised the Israelites to the dignity of his "chosen people," is, according to the instruction that we received from our Christian priests and teachers, a specifically Jewish God, endowed with all the

alleged divine virtues and real human passions. He is the personification of the Hebrew divine ideal, although in a rather primitive conception: powerful, jealous, wrathful, unmerciful to his adversaries, cruel toward his enemies, full of spite and scorn against those who, though his inferiors, were opposed to him; he visits the iniquity of the fathers unto the third and fourth generations.

This unique almighty God created the whole universe out of nothing, simply by his divine command, Let there be! Such is the account of Moses.

And the Hebrews have professed to believe this and they taught it for 3,500 years, and the Christians did the same for over 1,800 years. We have to take this inheritance into account, and neither overlook nor under-rate it.

We should become guilty of gross wantonness, if we were to treat lightly of this cosmogony, which has been imparted to us

as an inviolably true revelation, and which is still being taught in most common-schools of this civilized world, with the exception, perhaps, of France, Italy, and the United States.

As narrated in the Bible it is a myth, a fairy-tale full of oriental beauty, but nothing more than a fiction, which conformed itself to the then existing culture; a fantastic conception, which has no stability in the light of critical science and cannot lay claim to credibility; a conception of a creation that stands in the grossest contradiction to the results of modern scientific research.

When Moses composed his account of the creation, he could hardly claim that in all subsequent ages it should be given unexceptional credence. But Christians have become infatuated with it, and now the Occident is obstructed by it so disastrously that it can find an escape but with great difficulty.

According to the Pentateuch the entire

universe is the result of a six-days' labor of God.

Let us examine this account somewhat closer, and I propose to submit a few notes referring to the details:

Gen. i, 1: "In the beginning God created the heavens and the earth."

The scientist of our day would say, The universe (*i. e.*, heavens and earth, of Moses) has neither beginning nor end; it is infinite in time and space. From nothing can nothing come, and that which is can never vanish into nothingness. The universe was, and will last, forever. The axiom of the indestructibility of matter, and of the persistence of force, as found in every text-book of Chemistry and Natural Philosophy is the correct expression hereof.

Verses 2-5: "And the earth was without form, and void, and darkness was upon the face of the deep. And the Spirit of God moved upon the face of the waters. And God said, Let there be light; and there

was light. And God saw the light, that it was good, and God divided the light from the darkness. And God called the light Day and the darkness he called Night. And the evening and the morning were the first day."

Of this it must be observed that science knows of no other light than that which originates from luminous *bodies* which produce light of their own or reflect that of other luminous bodies. Light in itself is but a mode of force originating in molecular motion manifesting itself in minute undulations of molecules and atoms. Physics informs us of the exact length and velocity of these molecular undulations. Light is not a substance or matter, but simply a certain peculiar manifestation of substance or matter. No mortal, therefore, can construe or comprehend what was the import of that light of the first day. Day and night are both impossibilities.

Verses 6-8: "And God said, Let there be

a firmament in the midst of the waters, and let it divide the waters from the waters. And God made the firmament, and divided the waters which were under the firmament from the waters which were above the firmament, and it was so. And God called the firmament Heaven. And the evening and the morning were the second day."

Here we encounter a signal contradiction. In verse one we learn that God created the heavens in the beginning, and now the heaven is created a second time on the second day. This is utterly absurd—incomprehensible. Here is a horrid confusion. Hebrew linguists have applied all their ingenuity to explain this abstruse point, and some of them have convinced themselves that verse one has not been transmitted to us as Moses had shaped it, but was corrupted through a mistake in copying. For the word whose translation is "heaven" reads in Hebrew "haschamajim," while the word "water" is placed for the

Hebrew word "hamajim." Thus by a mistake in copying, the word "hamajim," alleged to have been the correct word in verse one of the original account of Moses, was rendered "haschamajim," which mistake was transmitted and propagated through all the succeeding ages. Consequently Moses is, by them, alleged to have written in verse one: In the beginning God created the water and the earth. (See J. Stern, in *Menschenthum*, No. 34, 1886.)

Let us proceed to the third day's labor:

Verses 9-13: "And God said, Let the waters under the heaven be gathered together unto one place, and let the dry land appear: and it was so. And God called the dry land *Earth*; and the gathering together of the waters called he *Seas*; and God saw that it was good. And God said, Let the earth bring forth grass, the herb yielding seed, and the fruit tree yielding fruit after his kind, whose seed is in itself, upon the earth: and it was so. And the earth

brought forth grass, and herb yielding seed after his kind, and the tree yielding fruit, whose seed was in itself, after his kind: and God saw that it was good. And the evening and the morning were the third day."

The *origin* of the vegetation before the sun stood in the sky is a physical impossibility. But the *preservation* of the green vegetable world without a sun is a still greater impossibility, especially during a long period, to which some of the rationalistic Bible exponents are prone to extend those creation days.

Verses 14-19: "And God said, Let there be lights in the firmament of the heaven to divide the day from the night; and let them be for signs, and for seasons, and for days, and years: And let them be for lights in the firmament of the heaven to give light upon the earth: and it was so. And God made two great lights: the greater light to rule the day, and the lesser

light to rule the night: he made the stars also. And God set them in the firmament of the heaven to give light upon the earth, and to rule over the day and over the night, and to divide the light from the darkness: and God saw that it was good. And the evening and the morning were the fourth day."

Contradictions upon contradictions, one impossibility after another. We shall show in the second lecture of this work that earth, sun, moon, and stars originated in a chronological succession entirely different from that of Moses' account. We shall show that the sun existed long before the earth, the earth before the moon, and the innumerable stars existed millions of years previous to our sun, our planets, and the moons. It is superfluous to add that Moses again contradicts himself when he tells us that God divided the light from the darkness (verse 4) after there were already three alternate successions of evenings and mornings or nights and days.

Verses 20-23: "And God said, Let the waters bring forth abundantly the moving creature that hath life, and fowl that may fly above the earth in the open firmament of heaven. And God created great whales, and every living creature that moveth, which the waters brought forth abundantly, after their kind, and every winged fowl after his kind: and God saw that it was good. And God blessed them, saying, Be fruitful and multiply, and fill the waters in the seas, and let fowl multiply in the earth. And the evening and the morning were the fifth day."

On the fifth day, then, God created all aquatic animals and the winged birds. Paleontology teaches us that the animal world co-existed with the vegetable world, and that the birds in the air were preceded by land animals, whereas Moses wishes us to believe that the latter did not enter into existence before the sixth day.

Verses 24-31: And God said, Let the earth bring forth the living creature after his kind, cattle, and creeping thing, and beast of the earth after his kind: and it was so. And God made the beast of the earth after his kind, and cattle after their kind, and every thing that creepeth upon the earth after his kind: and God saw that it was good. And God said, Let us make man in our image, after our likeness: and let them have dominion over the fish of the sea, and over the fowl of the air, and over the cattle, and over all the earth, and over every creeping thing that creepeth upon the earth. So God created man in his own image, in the image of God created he him, male and female created he them. And God blessed them, and God said unto them, Be fruitful and multiply, and replenish the earth, and subdue it: and have dominion over the fish of the sea, and over the fowl of the air, and over every living thing that moveth upon the

earth. And God said, Behold, I have given you every herb bearing seed, which is upon the face of all the earth, and every tree, in the which is the fruit of a tree yielding seed; to you it shall be for meat. And to every beast of the earth, and to every fowl of the air, and to every thing that creepeth upon the earth, wherein there is life, I have given every green herb for meat: and it was so. And God saw every thing that he had made, and, behold, it was very good. And the evening and the morning were the sixth day."

On the sixth day followed, according to the Bible, the creation of the land animals and of man. Moses is correct in placing the creation of man last. But he is again in error when he reports that Adam was made of the dust of the ground (Gen. ii, 7), and Eve of a rib of Adam (Gen. ii, 21 and 22). Upon this capital error I shall speak later. It is also erroneous to say that man was made in God's image, after

his likeness. Just the reverse is proven to be true. Man created God after his own likeness. "As man is, so is man's God" (Feuerbach).

All of us know the story of the Fall, and man's exile from Paradise. The speaking serpent has caused much vexation to the theologians, and a great deal of fun to the dear school children. It was generally accepted throughout the Christian Occident, and still maintained by most believers that Moses wished by it to personify Satan or the Devil. But this interpretation is again erroneous, because Moses had no conception of either Satan or Devil. This East-Asiatic conception of a demon does not make its appearance in the Hebrew demonology until many centuries after Moses. In well-defined outlines, impudent, and of a striking shrewdness, Satan enters upon the stage for the first time in the Book of Job.

A speaking serpent led the first parents to the knowledge of good and evil, and

yet we are told over and again that in consequence of the Fall we are tainted with inherited sin, and that Cain murdered Abel. The horrible account of the first murder is again connected with a monstrous inconsistency. The murderer Cain fled into the land of Nod, to the east of Eden. "And Cain knew his wife, and she conceived and bare Enoch. And he builded a city, and called the name of the city after the name of his son, Enoch" (Gen. iv, 17).

We observe here the son of the first parents fleeing into a foreign country, where he enters into wedlock, begets children—and, perhaps, with the aid of workmen, builds a city. In this land of Nod, then, there must have been people begotten and born without the family of Adam. Therefore Adam and Eve cannot have been the first parents. And yet this is what we read in the Bible.

Nor does science know a first man, Adam, and a first woman, Eve, as we shall exhibit in the second lecture.

All of us know the Mosaic account of the Flood. One day God said (Gen. vi, 7):

“I will destroy man whom I have created from the face of the earth; both man and beast, and the creeping things, and the fowls of the air, for it repenteth me that I have made them.”

This is the naïvest representation of the Most High—Jehovah acting exactly like a frail human being: it repenteth him that he had made man. But it is as the learned theologian M. J. Savage justly states: “The Jehovah of the Old Testament dwells in a certain place, like a man; he appears in the temple; he walks and talks like a man; he deliberates and plans like a man; he loves and hates, turns wrathful, revengeful, and again alters his resolution, after the manner of an Oriental tyrant.” We need

not wonder at such anthropomorphism,* for the idea of God is the product of the human brain. As man grows and develops, so grows and waxes his conception of the Deity.

“And Noah found grace in the eyes of the Lord.” The great Flood, *the* catastrophe of the earth, broke in, a spectacle such as had never been witnessed before. We have, while still sitting in the forms of the school-room as children, listened to this account of the Flood with eagerness, and painters have glorified this tragedy in magnificent works of art. The children of to-day read this story over and again with renewed interest; and why should they not? Is it not adorned with all the beauty of Eastern legends, and in some verses of an elysian imagination?

Who is there that in his younger days has not nursed his infantile soul with the

* The representation of Deity under human form, with human attributes and affections (Translator's note).

tale of the righteous Noah and his family: of the floating ark, three hundred cubits long, fifty cubits wide and thirty cubits high, with all the numerous couples of beasts, where the wolves slept beside the sheep, the giraffes by the side of the lions, where ferocious beasts would content themselves with hay, and where a Sabbath-peace dwelt over all the creatures in the ark; of the dove with the "plucked-off olive leaf," of the abandoned ark, after it was stranded high upon the mountain side of Ararat, of Noah's offer of sacrifice, and of the rainbow in the heavens? How we did rejoice over the covenant that "neither shall all flesh be cut off any more by the waters of a flood; neither shall there any more be a flood to destroy the earth" (Gen. ix, 11).

All this we were taught as an inviolable truth and we believed it, and believed it with delight, for it was too beautiful not to be true. And now, shall our children

continue as we did and believe it, too?
We say, NO.

We would not, perhaps, encounter so stubborn an opposition at the hands of the learned divines, had not the Mosaic account of the creation become a kind of *dogmatic keystone* for Christianity.

The dogma of the Birth Sin or Original Sin, together with that of Total Depravity has engendered the doctrine of Salvation and Redemption by means of supernatural, celestial and divine assistance. Thus originated in Mosaism the dogma of the Mission of the Son of God from heaven and of his redeeming sacrificial death on the Cross on earth. Christianity is the legitimate daughter religion of Mosaism; it is the mystic solution of the problem of Man's Fall and Original Sin.

I intend to show in another page of this book that the men of science of our day recognize and accept a kind of birth sin in the human species, although

they reject the Bible account of the Creation. Should the preservation of a progressive religious system necessitate the assumption of an Original Sin, we scientists do not object; on the contrary, we will join hands with all those who work in earnest endeavor for the welfare of our race, that we may assist them in man's deliverance from his Birth Sin.

As we progress in the historical sketch of our religious system, we must state that the Hebrews of the Old Testament did very little, indeed, for the advancement of natural science. This is an important fact, for the religion of the future race will have to base itself upon the truths of natural science, and it will attain vitality and influence only if it harmonize with scientific evidence.

The Judaism of the Old Testament was in no way friendly to general knowledge; but that intelligent, though till then down-trodden nation, after being led into the

Promised Land by Moses and Joshua, was yet capable of enjoying the life of this world. They found pleasure in the possession of worldly riches—gold and silver, herds of sheep and cattle, fertile gardens and vineyards; they took delight in looking upon the flowers in the field, and praised the lily in its splendor; in high raptures they composed beautiful poetry, comparing man's beauty and woman's loveliness with the delicate forms of plants that grew upon the mountain sides of Lebanon, and on the banks of the river Jordan.

"I am the rose of Sharon, and the lily of the valleys" (Song of Sol. ii, 1).

"A bundle of myrrh is my well-beloved unto me. . . . My beloved is unto me as a cluster of camphor in the vineyards of En-gedi" (*Ibid.* i, 13 and 14).

"As the lily among thorns, so is my love among the daughters.

"As the apple-tree among the trees of

the wood, so is my beloved among the sons" (*Ibid.* ii, 2, 3).

"My beloved is like a roe or a young hart" (*Ibid.* ii, 9).

"His countenance is as Lebanon, excellent as the cedars" (*Ibid.* v, 15).

What writer of our day would depict the coming of Spring more beautifully than did the poet of the Song of Solomon in these lines (Song of Sol. ii, 11-13):

"Lo, the winter is past, the rain is over and gone. The flowers appear on the earth; the time of the singing of birds is come, and the voice of the turtle is heard in our land.

"The fig-tree putteth forth her green figs, and the vines with the tender grape give a good smell. Arise, my love, my fair one, and come away."

"Who is she that looketh forth as the morning, fair as the moon, clear as the sun?" (*Ibid.* vi, 10).

We all know and love, at least a part of

the Psalms, with their flowery language; and many other specimens equally manifesting a strong love for the beauties of nature might be quoted from the Old Testament, were it not for sheer want of space.

But with the birth and growth of Christianity, *the doctrine of contempt for, and detestation of, world and nature* commenced to prevail.

It is not within the compass of this lecture to point out the real bearing of the teachings of Christ, for the interpreters of the New Testament disagree to this day upon this point. In fact, none of the four Gospels was written in Christ's life-time, and all of them merely rest upon tradition; the Gospel of St. Mark being generally accepted as the oldest (A.D. 70-80), and the only one written within the first century. (See *Jesus Nazareus*, by Prof. Volkmar. Zurich, 1882.) Neither is it necessary for me to enlarge on the causes which en-

hanced the growing importance of the new religion. It is sufficient to state that with the promulgation of Paul's conception of Christianity, a general contempt for all real objects of life began to predominate, and the flight from the worldly bustle was being praised as the remedy for all its evils. The Christians of the first few centuries turned away from the pleasures and enjoyment of this world; everybody seemed to take interest only in the supernatural and transcendental; Faith alone was taught as sufficient to sanctify man. What did human wisdom, the science of nature, and every other science amount to as compared with Faith?

St. Paul has been cited thousands of times (Rom. 1, 22):

“Professing themselves to be wise, they became fools.”

Such sentiments as these are cheap indeed, and have become a consolation for all those whom nature has but scantily

endowed with reason, or who were too diffident to believe in their own understanding. Surely, no other single verse of the whole Bible has had such a paralyzing, reason-confounding effect, in the Occidental development of scientific knowledge, as had that single word of the apostle to the heathens.

Less repulsively than his zealous apostle has Christ expressed himself in this regard (Matt. v, 3):

“Blessed are the poor in spirit, for theirs is the Kingdom of heaven.”

The following extracts from St. Paul's writings will fairly illustrate their tendency against science:

Rom. viii, 13: “For if ye live after the flesh, ye shall die; but if ye, through the Spirit, do mortify the deeds of the body, ye shall live.”

I Cor. i, 19-20, 27: “For it is written, I will destroy the wisdom of the wise, and will bring to nothing the understanding of the

prudent. Where is the wise? Where is the scribe? Where is the disputer of this world? Hath not God made foolish the wisdom of this world? God has chosen the foolish things of the world to confound the wise, and God has chosen the weak things of the world to confound the things which are mighty."

I Cor. iii, 19: "For the wisdom of this world is foolishness with God."

I Cor. viii, 1: "Knowledge puffeth up."

We other people experience exactly the reverse: Knowledge does not puff up, but is conducive to modesty. For, the deeper we penetrate into science, the more do we recognize how little we possess of knowledge, and how far backward we are yet in science. The most self-conceited heads and the most arrogant minds we find, as a rule, among those self-contented enemies of science who are filled with ecclesiastic superciliousness, and who abound with those Bible quotations that flatter their mental im-

becility. Clerical pride has ever been the inheritance of the "poor in spirit."

True, there have been glorious exceptions to this rule in all ages. I know some of these personally, and cannot but love them with all my heart, but these exceptions tend only to prove the rule.

II Cor. iv, 17, 18: "For our light affliction, which is but for a moment, worketh for us a far more exceeding and eternal weight of glory; while we look not at the things which are seen, but at the things which are not seen."

II Cor. v, 7: "For we walk by faith, not by sight."

I John ii, 15: "Love not the world, neither the things that are in the world."

The contempt, thus inculcated, against nature and world, went so far, even, that matrimony was declared a necessary evil, a kind of contemptible institution, based upon bestial propensities. This conception has been adopted by many Christian sects,

and the celibacy of the Romish clergy is but in keeping with it.

The respect for woman was not augmented hereby, but rather the reverse.

These are a few authentic quotations, promulgated by the founders of Christianity, to teach contempt for nature and science.

This religion which enjoins contempt for nature and retreat from the world was to become the religion of the Occident, instituted and sustained by the authority of the state.

The Greeks and Romans—Heathen nations, both of them—had made a good start in descriptive science, when the religion of the cross invaded them.

Aristotle (384–322 B.C.) left at his death several scientific works, among them a system of zöology and botany, which had many defects, because his knowledge of natural objects was defective in many respects, and consequently his system contained many childish and superstitious

views. But it is worthy our notice that his system was held in the highest esteem late in the Middle Ages, and maintained its reputation so powerfully as to be made the basis of all natural science till the beginning of this century.

In those distant ages, about 2,000 years ago, Greek and Roman philosophers discussed the most sublime problems that involve the interest of mankind: the origin and decay of things; the essence of the gods and the office of man. In Grecian and Roman mythology the numerous gods are, in general, but poetical personifications of natural powers, human virtues, frailties, and even truly human passions. The supreme god, Jupiter-Zeus, was one of the most amorous fellows that a poet's imagination has constructed and glorified with legends and myths. And his entire household of demi-gods, goddesses, and favorites, (the entire Olympic rabble) was, of course, not in the least better than Zeus himself,

Envy, malevolence, love and hatred, jealousy and fanaticism, love of pleasure and luxury, every imaginable human passion and folly, were exercised by the divine dwellers of Olympus, exactly as they are upon the earth by mankind. But in all their mythology ruled beauty. The works of art in sculpture that have been exhumed entire or in fragments during the past century are gazed upon to this day by Jew, Christian and Heathen with rapture, and esteemed the best that skilled hands have produced.

I do not intend to describe how this Grecian and Roman splendor in art, the beginnings in science, the sublime relics of thought and ideas, were trodden down by a fate simultaneously with the fall of the Roman Empire. The latter would have decayed without Christianity for reasons that continue to cause the decay of nations and empires to this day.

Nor can it be my task to depict the process of events that brought about the

establishment of the Christian state-church. But it may be briefly stated that through many centuries the meritorious Christian church manifested a *persistent fanaticism against learning and for ignorance*, in perfect harmony with the teachings of the New Testament, with the early church-fathers and with the bishops. Father Eusebius (in the fourth century) proclaimed in clear words:

“It is not from ignorance that we think so little of science, but from contempt against all its useless labor, inasmuch as we apply our souls to better things.”

In the year A.D. 301, the most famous of all then existing libraries, that of Alexandria in Egypt, containing on its shelves more than 700,000 volumes, was fired by the incensed Christians, led by the Archbishop Theophilus. One of his contemporaries was Hypatia, a Greek lady of a high reputation for beauty, moral purity and learning, who had traveled to Athens to pursue certain studies. On her return to

Alexandria she taught the Aristotelian and the New Platonic philosophy united. In a revolt of the Christians, who were inveigled into hostility to her by the Patriarch Cyrillus, she was cruelly murdered.

In like manner spiritual darkness began to prevail throughout the world. The fragments that escaped the fanaticism of the intolerant Christians in the Occident were afterward collected—by whom? By the *Mohammedan Arabs!*

Mohammed, though holding Moses in great esteem, was a steady friend of philosophy. It is said of him, that he deemed the ink of the learned more valuable than the blood of martyrs, and reason the best part of God's creation. (Strange is Luther's opinion of the value of reason, to which this reformer bestowed a name that decent persons generally decline to utter in ladies' society.)

While under Arabian rule the learned schools in Spain began to flourish in a

manner never witnessed before nor afterward, Christian Europe was involved in the shroud of ignorance and spiritual contempt. In the beautiful province situated between the lake of Constance and the lake of Geneva, and bordered by the Alps and the Jura, the clergy were unable to read, and much less to write, for centuries. A learned historian mentions that neither Abbot Conrad of St. Gall, nor any member of his chapter, were acquainted with the art of writing when the famous Walter von der Vogleweide (1170-1230) paid a visit to his abbey.

It is erroneous, or, at least, a gross exaggeration, for anybody to claim that cloisters were the nurseries of culture and the favoring patrons of science. Evidence is afforded us by the fact that in the cloisters of many countries and provinces writing material was entirely unknown to their inhabitants. When the Italian poet Petrarch (1304-1374) visited Liege in Belgium, he

discovered an ancient copy of the orations of Cicero, and, upon demanding ink and pen for making a copy of them, he was unable to procure a single drop of ink in any of the convents of Liege.

Such being the state of things, we shall have no cause to wonder when we read that the great Ecclesiastical Councils, at Tours, 1163, and at Paris, 1231, passed resolutions to the effect that it was sinful and punishable to read physical books. Pope Boniface VIII (died 1303), that shrewd originator of the papal jubilees and farmer of indulgences, all of which so often relieved the holy see from financial embarrassments, prohibited the dissection of human bodies by surgeons and students of medicine, for fear of infringing upon the dogma of the resurrection of the body, a proceeding similar to that of the present pope, who declared against cremation.

Pope John XXII prohibited, in an especial bull, the study of chemistry. Those

who disobeyed and applied their ingenuity to the investigation of natural objects, and the visible world in general, were rigorously persecuted, tried for heresy or leaguings with the devil as wizards or witches, and sentenced to execution in one way or another. This systematic persecution of knowledge and research was made use of by the advocates of the Church for many centuries, and it brought about a universal spiritual disease, which possessed the whole Christian population of Europe, and deprived innumerable thousands of men of their lives. It was that spiritual epidemic, the belief in witchcraft, that, *e. g.*, in the year of our Lord 1659 caused the burning of 1,200 people in the bishopric of Bamberg, and that of 6,500 persons in the archbishopric of Treves. Even republican Switzerland did not escape the fury of this delusion. In 1652, a woman of eighty-five years, living in Lucerne, having been tortured into confession, was burned alive. In the same year

one Kate Schmidly, a little lass of eleven years, says the minute-book of the city council of Lucerne, was strangled in a dungeon without previous announcement, put into a sac, and burnt—for what? for making birds, and “because there was little hope for amendment.”

A record in one of the fortress-towers of Lucerne, dated 1659, says:

“A little body of seven years, called Katrinette, who denies the Godhead, was strangled at the post in the dungeon and afterward burned under the gallows.”

How universally the entire spiritual life of the Christian Occident was affected by the supremacy of ignorance is best illustrated by the fact that, even at the seat of Lutheran learning, the love of nature was considered a sure sign of intercourse with the devil. A dissertation dated 1644, read and defended at a graduation exercise at the university of Tübingen, enumerates among the questionable things from which

Christians should positively abstain the "intercourse with nature," and declares the "knowledge of natural phenomena to be unbecoming a Christian."

Indeed, it is written (I Cor. 1, 19): "I will destroy the wisdom of the wise, and will bring to nothing the understanding of the prudent."

And for this argument hundreds of thousands have been sacrificed alive upon the fagot-piles, so that the stench of witchcraft is yet being wafted through the inaccessible mountain valleys of the Christian world.

After the early Church fathers and bishops declared the traditions of the Old Testament to be inviolable divine revelations, and after the same early teachers of Christian faith had, according to their own views and intentions, corrected and sanctioned a large collection of various other religious writings which had been composed long after Christ's crucifixion, nobody

was permitted to abrogate or question these foundations of Christian dogmatics.

See Volkmar, *Jesus Nazarenus und die erste christliche Zeit*. Zurich, 1882: In this work is shown to what degree, and with what audacity, the early fathers moulded and altered that "intractable" but, most of all, reliable Gospel of St. Mark.

The Christian church based its conception of the universe entirely upon the Mosaic record of the creation, and, in accordance with it, taught *that the earth stands firm in the center of the universe, and is the first of all heavenly bodies; that sun, moon and stars revolve around our earth.*

This error is denominated the doctrine of the *geo-centricity*.

The *Ptolemaic System* adapted itself to the biblical tradition, received the sanction of the Church fathers, and was accepted in the Occident for fourteen centuries.

It taught the existence of seven heavenly spheres, within which sun, moon and

stars are moving around the earth. Above these seven spheres, the believers in Holy Scripture imagined, was the Heaven of the Saints, the Mansion of God and the Realm of the Heavenly Host. This part of the universe was called the *Empyrcum*.

In looking back upon this conception to which we clung in our childhood, we cannot help recollecting all those fantastic dreams connected with it, and smiling over our delusion. How often we sat—and I suppose many of you did the same—at the dawn of night, near the frozen windows which were covered with ice crystals that joined to form leaves and flowers upon the panes, then blew our warm breath against the beautiful ice figures until they would melt, and then looked out into the star-glittering night, dreaming away of untold wonders of the semi-globular cupola, whose blue base rested upon the earth. In this structure, we believed, were numberless holes of varying sizes through which

the light of the heavenly splendor penetrated down to us upon the earth; that we might obtain a faint idea of the plentiful light and brightness of heavenly spaces. In our childish imagination we took the innumerable stars of the nightly sky for so many small holes, which were to furnish a means of communication between God's mansion and the abodes of mankind.

Not much less childlike was the Ptolemaic conception of the universe, which retained its ascendancy in the Christian Occident as late as 1543.

The History of Errors has, in most instances, to pass over very extended periods. The greater an error, the more readily it is believed and the more long-lived it proves to be, for humanity is, in its greater part, still in an infantile state, where illusions and phantasmagoria exercise their greatest charms upon ignorant minds.

In 1543 there appeared the revolutionizing work of the Polish astronomer Coperni-

cus, in which he unhesitatingly pronounced and with scientific rigor proved:

That the Earth is not the center of the Universe, but revolves around the Sun.

It was astronomy, the most exact of sciences, which gave the first deadly stab to the Mosaic cosmogony. Astronomy has deciphered the heavenly motions, and established with mathematical accuracy that our earth floats in the universe, a small planet, an atom.

At the present time every school-boy of eleven or twelve years knows that the earth rotates upon its axis once in twenty-four hours, that it revolves round the sun once each year, and that, like Mercury, Venus, Mars, Jupiter, Saturn, Uranus and a number of smaller heavenly bodies, it stands in a certain subordinate relation to the sun; that the moon is a satellite of the earth; that the planet Jupiter is circled about by several moons; that Saturn has a system of rings and two satellites besides; that the

substance of Saturn is but seven-tenths as heavy as water—*i. e.*, of about the density of basswood; that the revolution of Saturn (a Saturn year) takes about twenty-nine terrestrial years, etc.

With their instruments the astronomers penetrate into the most distant recesses of the universe; they compute the orbits of the planets, and foretell, for centuries to come, the eclipses of sun and moon to the day, hour and minute. They calculate the gravity of the planets and their weights; they weigh, upon the scales of mathematical balances, the earth and the incandescent globe of the sun; they draw into the sphere of our understanding the laws of cosmology, and illustrate them with accurate arithmetical figures; they, first of all, have substituted the bright daylight of scientific knowledge in the place of childlike belief and fantastic illusion.

But this the CHURCH would not tolerate. Through fear of this hostile institution,

Copernicus delayed the publication of this work, which he had completed in the year 1507, until he was old, and death approached his weary body. He kept his knowledge for thirty-six years a secret, well knowing that in case of untimely disclosure he would have to undergo tortures and be mercilessly surrendered to the faithful servants of the Holy Inquisition. This astronomer from the city of Thorn died during the same year in which ~~his~~ his book was published. His natural death was a blessing to him, for the Church, at once, declared his system an "execrable heresy," a heresy that most obviously contradicted the belief of revelation. The Church never thought lightly of such scientific questions and manifested her earnest intention fifty-seven years later, when, on the 17th of February, 1600, a fagot-pile was set ablaze in the city of Rome for burning alive the greatest man and savant of his time, Giordano Bruno; a man as renowned for his learning and po-

etical genius as he was for seeking after truth and justice, a man who had committed no other heresy than that of glorifying in his writings the system of Copernicus.

And ninety years after the publication of Copernicus' works, the Church dragged another of the most reputed scientific men and astronomers before the bar of the Holy Inquisition in Rome, Gallileo Galilei, who had to recant his scientific convictions—to recant and abjure in the face of priests and cardinals and judges of the Inquisition who hardly understood the meaning and significance of decimal fractions. Ignorance prevailed, and her confessors knew well how to gain advantage thereby for their own sake, as they believed.

But scientific truth is mightier than ignorant belief, notwithstanding. And after the lapse of two centuries, Copernicus gained the victory over Moses, so that all the school children of Christendom may now

hear day by day what Giordano Bruno glorified with his death on the pile.

The *Church was compelled to submit* to this "sinister" condition; she had to acknowledge the Copernican truth against the Mosaic illusion.

And yet she has not perished, as everybody knows. But she has continued in her negative resistance against the progress of science, endeavoring time and again to curtail knowledge, and to enlarge the domain of belief and ignorance, as much as she could. This policy has lessened the esteem in which she was held, and must, as a consequence redound to her disadvantage.

It is not in the province of this lecture to delineate more minutely the course of scientific progress during the last centuries. The invention of the printing press, the discovery of America, the Reformation, the renaissance of the classic studies, and the impetus given to logical thought as manifested in the Occident—all these and

other factors finally led to the increasing application of criticism and logical reasoning to all natural phenomena, so that the material world, as far as it is accessible to our senses, is being investigated in a much more extended manner than it ever was before.

These redoubled researches into all natural objects were initiated with great success in the last century. Science was strengthened, though continually persecuted or hemmed in by the stronghold of prejudiced belief as late as the middle of the nineteenth century.

Thus in the beginning of this present century, which may justly be called the Century of Scientific Enlightening, rose Lamarck, who, however, failed to gain adherents for his theory of natural evolution, perhaps on account of a general religious prejudice against evolution, but more so on account of a defective construction applied to his system. His works were published

in France in 1809, entitled *Zöologie Philosophique*:

As late as 1830, during the July Revolution in Paris, the French Academy of Sciences was divided between adherents of Revelation and those of Reason. Both parties were antagonistic to each other. The leaders were Cuvier, the professor at large of the Mosaic record, who advanced that there had been many floods which had destroyed the world, and Geoffroy St. Hilaire, who maintained a contradictory opinion. The discussion was carried on with such violence that it attracted the attention of most journals and magazines. The Academy decided once more in favor of the old system; it was the last notable victory of the Mosaic tradition in a learned scientific corporation.

For, in the same year, June, 1830, appeared in England the first edition of Chas. Lyell's "Principles of Geology," wherein he showed with overwhelming force that there

had not only *never* been such a thing as ONE great flood, but that there had *never been any* floods at all, *viz.*, in the meaning of the Mosaic record, and that a progressive evolution of organic life had manifested itself in the various geological periods.

Between 1830 and 1840 this book was republished six times, and it exercised an unprecedented influence upon the further progress of geology. It was generally acknowledged that the earth's crust had a history of natural evolution, that in the past the same agencies had been at work as at present, that science has no need of miracles to explain and interpret the course of natural events upon the earth; that, on the contrary, everything in the early history of the earth, as well as in the present, may be interpreted completely with the aid of the actions and effects of natural forces.

Meanwhile, the number of scientists who more or less inclined toward the theory

of evolution multiplied without exciting much agitation, and the Church prudently remained silent, because she recognized that there was no danger for her as long as these heretical ideas were agitated among the learned only, and as long as the masses at large pursued peacefully and silently their accustomed ways.

DARWIN AND HIS EPOCH.

The idea of evolution, which occupied the minds of the early Grecian philosophers more than 2,000 years ago, and which was brought to light again by Lamarck in 1809, though not rightly construed and acknowledged then, was becoming the universal topic of meditation. It made its entrance into the scientific world as though by accident, flashing now and then, here and there, at first without destructive effects or enduring manifestation of its power. But a storm was brewing in the atmosphere and was ready to break quite unawares. But it did not break out until the fall of 1859,

about thirty years ago. Then appeared in print Darwin's principal book, *On the Origin of Species by Means of Natural Selection, or the Survival of the Fittest in the Struggle for Existence*.

This work of Darwin represents the results of thought and research obtained in the course of twenty-two years. Its publication is an historical achievement equivalent to that of Copernicus' dissertation.

In fact, Darwin is the "Copernicus of the organic world," as Dubois-Reymond, President of the Academy of Science, in Berlin, aptly styles him.

That higher organisms descend from lower ones, and that the more perfect beings rise from less perfect ones, had been demonstrated and affirmed by numerous thinkers and inquirers before Darwin; but this doctrine of evolution could not possibly attain any impelling and inspiriting effect ere it was accompanied and illustrated by an ingenious theory that showed the

agencies by and manner in which evolution takes place. It may be said that Darwin's doctrine of Natural Selection, of which we shall speak in the third lecture, was the gold setting of the great diamond of evolution. This splendid setting of pure gold of scientific argumentation was the cause of this brilliant jewel acquiring its full and just valuation.

Darwin's book appeared in the book markets on a forenoon in the fall of 1859. In the evening of the same day the book was out of print. Edition succeeded edition, and it was translated into every language of the civilized world. His disquisition on the origin of vegetable and animal species, which were, heretofore, held to be constant, flashed like irresistible lightning into the laboratories of the scientists, where many an old gentleman was still dozing away in the sweet belief in Moses. And now a spiritual cyclone appeared in the heavens and

burst over all civilization, sweeping over the land with hail and lightning.

With the aid of thousands upon thousands of naked natural facts, Darwin proceeds to prove that the higher organisms descended from lower forms; that every organized being, plant, animal, or man, originated from the simplest organisms, and that in the process of immeasurable periods of time they gradually developed to higher orders of organic life, obedient only to the natural law of the Survival of the Fittest in the struggle for existence.

This system is so simple and self-evident (I shall show it in the third lecture) that I think it an easy matter for every boy or girl of fourteen years to comprehend. But the Church and her advocates together with all her countless friends, oppose it with the same vehemence they displayed against the Titanic idea of Copernicus.

With the year 1859 commenced the era

of a struggle, the like of which had never been witnessed since the days of the Reformation.

Among the scientists then living, were, as I have observed before, still a good many old gentlemen of the old school who based their philosophy, if they had any, upon Moses, and they honestly believed in a creation by miracles. These savants arrayed themselves *against Darwin* at once. There were those, too, who studied his works with great zeal and application, in order to fortify and arm themselves against the new gospel and to discover its mistakes or inconsistencies—and—owned themselves *converted*. Many of the former opponents became warm friends and adherents of evolution. Others remained unreconciled and died opponents of evolution.

All eminent scientists who were unbiased by matters of religion, and all the younger savants possessed of an independent judgment, agreed with Darwin. The

struggle between the friends and enemies of evolution continued among scientists for about twenty years. The opponents decreased in number and the adherents multiplied until the victory of the Darwinian school was manifestly complete. Even those authorities who denied the general efficiency of natural selection in the struggle for existence (perhaps for the reason that the assistance of an arbitrary personal God was no longer needed), and even religious opponents of evolution, could not help admitting that evolution was a fact. One of these pious supporters was my predecessor at this university. Professor Oswald Heer, whose scientific authority is as unquestionable as was his piety, managed to accommodate the doctrine of evolution to the belief in a Creator. Oswald Heer presumed temporary interpositions of the Deity in such a manner that Almighty God occasionally modified, quasi improved, the plants and animals that had been existing during

each of the different stages of evolution. But this modifying process of the types is fundamentally nothing but evolution, higher beings descending from lower ones, and, with this interpretation, the ancestors of man would have to be declared lower animals just as well as according to Darwin's doctrine.

The propaganda for Darwin's theory during 1860 to 1870 was, in German Universities, mainly led on by Professors Haeckel in Jena, Naegeli in Munich, Koelliker in Wurzburg, who declared openly for evolution. Many others published popular treatises on the subject, as, *e. g.*, Dub, Seidlitz, L. Büchner, C. Sterne; in Italy, Canestrini of Padua, Huxley in England, etc.

About 1870, I, too, ventured to lecture upon evolution at this university, and at the polytechnic school of Zurich. I experienced enmity from the one side and won applause from the other. (See Dodel, *Die neuere Schoepfungsgeschichte*.) But since that

time Darwinism has been frequently lectured upon at this university and at the polytechnic school, and even the Protestant professor of theology made it the subject of a course of lectures at the university, which were not altogether unfriendly to the subject.

Without exaggeration, it may be asserted that since 1870 the theory of evolution has been taught and lectured upon in every German university. With the scientific inquirers whose province is the investigation of living and extinct species, evolution is no longer an unsolved question, open to dispute; any one who would regard it so would be stared at in any scientific congress with as much curiosity as a living fossil from the Jurassic period.

Even the French Academy of Sciences, the most learned as well as the most conservative corporation of France, which for a long time kept on the negative side, against Darwin, now adheres to evolution,

and Darwin lived long enough to be made an honorary member of that institute.

The same can be said of the Academy of Sciences of Berlin, whose president, Du-bois-Reymond, was one of the first apostles of the new faith. The academies of sciences of St. Petersburg, Munich, Vienna, are supporting it—corporations of highly religious states. Italian scientific societies have professed the new theory. It is not accepted by the College of Cardinals at Rome, as a matter of course. Nearly all of the English learned societies honored Darwin with honorary memberships. This we would naturally expect, when we consider the high-minded noble spirit of the English scientists. This change of opinion among scientists took place within the last twenty years.

Altogether differently was the new doctrine received by the Church, which, with scarcely an exception, sided from the beginning with the opposition. There was

one cry of alarm throughout the army of spiritual shepherds.

“What! The scientists dare in earnest teach the descent of man from animal ancestors? What! Mankind, divine humanity, originating from lower beings, from ancestors resembling apes?”

There was a great din in all Christendom and the sacred guard of Zion rushed forth, shield upon arm and battle-axe in hand, to wage war against the Darwinians “in the name of the Lord.” The Church opened the campaign against the naturalists: a flood of books was raining down upon the public.

It is but fair to state here, the battle was very one-sided: the weapons used were as little matched to each other as they would be if, in our days, the Children of Israel under Joshua were besieging the well-armed and garrisoned fortress of Strassburg, intending to take it “with a long

blast with the trumpets of ramshorns" (Josh vi, 6).

The *scientists* arrayed themselves and fought upon the ground of incontestable facts and reason. They offered none but scientifically proven truths, countless observations from Nature's unbounded realm, by means of experience and scientific experiment—weapons of defense unknown to the students of divinity.

The warlike *theologians*, on the other hand, restricted themselves to the exclusive use of the blunt arms of belief, tradition and dogmatic definitions. The "trumpets of rams-horns" sounded well-nigh as powerfully as they did before Jericho. Even the battle-cry was impressive enough. But the walls of the New Jericho did not fall down; nay, instead, the aggressors themselves lay prostrate, covered with wounds, here and there, or fast making their surrender to those they had assailed.

Very queer things might be witnessed by the lookers-on, especially on the occasion of that first struggle between Moses and Darwin, between inherited theology and evolution. Many a religious Anti-Darwinian discovered, as soon as the heat of enthusiasm had passed away, how ignorant he was of the forcible arms of his antagonists, and how bare of natural science was his mind. How ludicrous was the aspect of many a combatant! But now many another theologian took pains to penetrate into the vast realm of science, by way of private study—and then turned Darwinian! Others, again, recognizing the inferiority of their stronghold, laid down their arms because they foresaw the victory of their antagonists; they grew silent and became convinced that Faith had to accept the result, and adapt itself to the circumstances. Of this species of theologians there is already a great

number, and they will multiply until they are in the majority.

It is amusing, yet also well worth the trouble of reviewing some of the incidents in that memorable struggle between Faith and Science, because they are both instructive and full of promise.

There was the eminently critical theologian, David F. Strauss, who, about the year 1870, in his book, *Der Alte und Neue Glaube*, declared frankly and with joyous enthusiasm for Darwin. He founded his "New Faith" upon Evolution. His followers of yore, it is true, left his ranks in numbers. Each of his meritorious writings appeared twenty years in advance of its time, and Strauss underwent an actual martyrdom, as do most apostles of spiritual deliverance. But, like Giordano Bruno, he obeyed the impetus of his innermost conviction. Another theologian of the liberal party was the eminent pulpit orator, Henry Lang, pastor of St.

Peter's in Zurich, less versed in scientific literature, but imbued with so much reform spirit that he did not enter the lists of the clerical opponents of Evolution. In his pamphlet, *Religion im Zeit-Alter Darwin's*, where he takes issue with Strauss, he expresses himself clearly enough:

“I do not recognize why religion and faith can object to the doctrine of Evolution, in the event that science should succeed in proving, with multiplied arguments of increasing strength, cosmogony to have taken place in one or the other way.”

One of the oddest incidents happened to my revered teacher and friend, Professor Carl Naegeli, in Munich. From the 18th to the 25th of September, 1877, between 1,500 and 2,000 learned scientists assembled in the Bavarian capital. It was the memorable Fiftieth Diet of German Scientists and Surgeons, where in three general meetings, long discussions

on Evolution and Natural Selection, were held by the most prominent representatives of science. Professor Haeckel, the German Darwin, spoke upon the modern doctrine of Evolution in its relation to science in general, and it was the first occasion that offered itself to proclaim the necessity of introducing that doctrine into the public-school system. Professor Naegeli enlarged upon the "Limits of Philosophical Inquiry," and demonstrated—basing his arguments on the doctrine of Evolution—that the entire visible world discloses itself to inquiring man as a *unit*, subject to natural (not supernatural) laws, and that the so-called intellectual faculties are but natural phenomena, which can as well be made the objects of scientific inquiry as can chemical and physical changes of matter; that, therefore, research and inquiry into the human intellect and consciousness must be conducted in a strictly scientific way, with-

out the aid or assistance of religious views. Naegeli had ever been an acknowledged opponent of the clerical phalanx. What was the result of the debate in this congress?

That strictly ultra-clerical gazette, *The Vaterland*, published the treatise, without any abridgement, thereby declaring it an eminent achievement of human intellect. Thus acted the warlike hierarchic gazette of notorious fame. The hierarchic knights of St. George did not even wink. What could this mean?

Still less intelligible, and more remarkable, was the spectacle that the English clergy displayed at the death and interment of Darwin, April 19, 1882.

There have always been many among the English divines who were prominently engaged upon scientific problems, an occurrence by no means so frequent on the European continent as in that insular commonwealth. Many an English

clergyman stood on intimate terms and kept up an amicable correspondence with Darwin; but the majority of them, during the latter's lifetime, manifested an utter dislike of him.

What came to pass, however, at Darwin's decease?—at the death of the great infidel naturalist, who, in 1877, wrote to a student in Jena these words: "So far as I am concerned, I do not believe that a revelation ever took place." The English clergy possessed themselves of the corpse of him who in his lifetime was hated by them as an antagonist of blind faith and theology. This same Anglican Church prepared for agnostic Darwin such a pompous funeral and solemn burial as in orthodox England is granted only to especially renowned dignitaries, or influential friends or protectors of the Church. *Against his will*, Darwin was buried in the venerable Westminster Abbey, the English Pantheon, by the side of Sir

Isaac Newton. And at the same hour four devout clergymen of London discoursed, in four different churches, upon the great loss which the English nation, nay, all mankind, had sustained through the death of the great scientist.

What was the meaning thereof? From the mouth of priestcraft issued forth the great Darwin's unlooked-for glorification!

The whole world saw in amazement how the clergy honored an unbelieving investigator, an apostle of scientific truth. It seems us as though we must exclaim (1 Sam. x, 11), "Is Saul also among the prophets?" It did not even suffice them to bury Darwin with the honors of a prince spiritual; they were among the first also to agitate for the erection of a Darwin Monument; to collect contributions for a statue, and "Darwin Funds" for enabling poor young students of biology to pursue their studies in the direction of Darwin's doctrines. The cir-

cular regarding it is signed by the Archbishops of Canterbury and York; the Bishop of Exeter; the Deans of Westminster, St. Paul's and Christ Churches; by the strictly orthodox dukes and earls, peers and members of Parliament; by the dignitaries of the four English Universities; and by a vast number of English scientists. That circular was signed also by the ambassadors of the great powers of Europe and America. Thus was Darwin stamped, and most justly, too, as a grand cosmopolitan character. The whole intellectual world became Darwinian at Darwin's death.

This ought to be remembered in these days, when the Catholic secular clergy, and the Protestant hypocrites of every shade and color, break out in clamor and lamentation, because scientific truth is to be taught to the masses of the nation as well as to the cultured class.

What does this signify?

I think that these occurrences at Darwin's death and funeral are an unequivocal manifestation of the progressive spirit of this age. Science is become one of the great powers in the world, to whose energy and blessing even the clergymen in St. Paul's testify and submit.

Humanity cannot persevere in opposition to the power of truth, and this is a consolation. Confide and put trust in Science! is the watchword of our age.

What do all the execrations from the Vatican amount to compared with the assurance of modern science? What can the ignorant stubbornness and furious fanaticism of the Protestant and Calvinist hypocrites accomplish against scientific truth? The march of the doctrine of evolution will pass over them, unmindful of their brazen-faced malignancy or wayward stubbornness.

In the meanwhile there arose in other countries, in America as well as in Ger-

many, brave and honest clergymen who were painstaking enough to study thoroughly the evolutionary doctrine, and to honestly search for an outlet for those adherents to religious thought who wanted to free themselves from the theological faith-labyrinth, and to assemble upon the sunny heights of science. Two of the most prominent representatives may be mentioned here: The American pulpit orator M. J. Savage, who some years ago published a remarkable—nay, splendid—book, *Religion of Evolution*, and the German theologian R. Schramm, D.D., pastor of the Cathedral in Bremen, who translated the above-named book of Mr. Savage into the German (published in 1886). This book is born of a gallant spirit, which I cannot characterize better than by the words, “Nazarene veracity.”

There you find a sincere acknowledgment “that the doctrine of evolution is accepted by scientists as *a fait accompli*, not

only as a subordinate theory for the interpretation of the origin of species, but as the main principle for the interpretation of all animate nature." This and the following quotations are literal extracts from said book:

"Its propagation even among the large mass of the people is obviously only a matter of time, whatever clamor the high priests of ignorance, prejudice and superstition may raise to prevent its spread."

So says the German divine, the brave Dr. Schramm. I cannot but express my admiration for the just and correct admission of facts, so seldom witnessed at the hands of the theologians of our present age.

I cannot at all agree with the American pulpit orator Savage, in regard to the first cause of all things and events, but am constrained to respect at least his standpoint, and will cite but a few quo-

tations from his preface, that you may judge for yourself:

“I believe it to be the office of both science and religion to seek first and always for the truth; for the truth only leads to God. I further believe it to be waste of time to seek to reconcile assumed truths. Truths are already at one and need no further reconciliation. *The truth-seeker is the only God-seeker.*”

“The curse of both religion and science in all ages has been the thought that there was somewhere an ultimate—a place to stop. Here we are, finite minds in the midst of infinity; there is nowhere a place to anchor, but only the privilege and the opportunity of endless exploration. Beneath all the various widespread and disconnected labors, discoveries and experiments of the great body of scientific workers, there is the common belief that all scientific truth is one; that the universe is all of one piece; that distant truths are

only different parts of one divine pattern that runs all through the whole visible garment of God. *This scientific faith is grander than any that the religious world has yet attained.*"

I read Mr. Savage's essay, shortly after its publication, with great interest, and found in him actually a theologian who seeks truth and does not shun it; who loves truth and does not hate it; who acknowledges, freely, truth so far as he seems to have comprehended it; and does not cling to error like a dissembler, because there are more believers in error than there are lovers of truth. Such theologians are rare, especially in our days of conventional falsehoods. Permit me to express here my warmest sympathy with the brave American, albeit that we do disagree upon many questions. His book, it gives me joy to add, may be recommended to all thinking Christians, Jews, Heathen, and even to Freethinkers. All of us, with-

out exception, will profit by reading it. I say this repeatedly, for I have read it once and again with increasing interest. Mr. Savage is convinced "that all scientific truth is but one, and that the universe is but a unity." We are of the same opinion; and it behooves us to remember here that the latest discoveries in chemistry and physics demonstrate, with almost certainty, that which ingenious minds heretofore only anticipated—that there is but one original kind of matter, and but one original force.

You see, ladies and gentlemen, extremes are nearing each other, and there will come a day when all disputes about religious problems—hostilities between creed and infidelity, between theism and atheism—will come to an end. Then man will revere God—*i. e.*, truth—not only along the waters of Jordan or at Babylon; on the banks of the Tiber or on the shores of Salt Lake; not only in the dim mosques,

temples and prayer-halls; but truth, which alone is God, and beside which there are no other gods, will be adored upon every hill and mountain of the globe; upon the pinnacles of the Himalayas as well as in the blooming valleys of the Alps and the Andes; along the shores of the Pacific and near the Polar sea; under the palm trees of Ethiopia and upon the barren declivities of the Scandinavian mountains. Mankind will then comprehend the unity of all beings. To *Monism* belongs the Future; monotheism was the last round of the ladder which leads to the highest prospect of the speculative philosopher.

It is a frequent occurrence that ignorant opponents of scientific enlightening upbraid us *with having no religion, and with attempting to annihilate it. Nothing is more unfounded than this imputation.*

It must be stated beforehand that the word "religion" has been sadly misused by the would-be representatives of genu-

ine faith. In their child'sh narrowness they declared, and still declare, that *they alone* have religion. They use the word "religion" for their jugglery, as some other people do the word "liberty." "To have religion" signifies, with them, to be narrow and proud, to be stupid and ambitious, to utter words of peace and use the dagger for stabbing, to preach love and practice hatred, to profess toleration and act intolerance, to pass for God's children and serve Belial. They are fond of passing themselves off as the knowing and exclusively instructed ones regarding the divine will, and mean thereby the glorification of their own little—very little—ego. Upon the same road they travel in regard to liberty. To be free, signifies, with those very same saints, to have the right to persecute, torment, torture, oppress and rob their human brethren. To be sure, that is the kind of religion, and liberty, after the heart of the—egotists.

But we, too, have religion.

“You do not mean to say so? A scientist of Darwin's school have religion?”

Let us inquire into the meaning of this word. Originally it denoted a binding together, and we understand by it the acknowledgment that we are dependent upon the material world, upon our fellow-men, upon nature and the universe; that we are not absolutely free, but connected with the whole through natural relations. To be conscious of this dependence upon the world without us, and the peculiar manner of viewing and thinking upon our relations to our fellow-beings—this is, in our opinion, the conception of religion. Some religious conceptions of the Christian churches are very crude, as, *e. g.*, the belief in witchcraft, in Satan, in ghosts; the belief that an unbaptized infant will be eternally damned; the criminal lunacy that other people, who do not exactly believe all that we do, must go to hell, etc.

We stigmatize some of the heathen religions as barbarous, because their adherents worship wooden blocks, monsters, and beasts. The Christians characterize Mohammedanism as a sensual religion, because Mohammed promised his believers well-equipped harems in a life to come. Mohammed called the Christian religion a nonsensical one, because it put three divinities in the place of one. The Jews condemn the Christian religion because Jesus of Nazareth was not the genuine Messiah; and Christians in return reproach the Jews with having crucified their own Messiah. Each of the Christian sects asserts that it alone and exclusively possesses the genuine religion. The Romish church claims that it is the only sanctifying church. And how many streams of blood were spilled for the sake of these religions? The most detestable cruelties have been practiced in the name of religion. And yet all those who talked and acted so in the past claimed to have

religion; and all those who so talk yet and would like to act so again, *claim to have religion.*

Let us now undertake a counter-test. Having ever been a friend to open language, and an enemy to all kinds of hypocrisy and dissembling, I do not hesitate to proclaim before you the religious creed of a Freethinker, who forms his ideas merely on the basis of science, and who adapts himself to the exterior world in such a manner that he can live to the end of his life in harmony with his fellow-men—so far as they deserve that appellation—and with the essence of his own little self:

1. The supreme essence which we revere is Truth, as it reveals itself in the material world. Every one who strives to acquire it travels on the same road with us, and is welcome as a brother or sister, regardless of birth, of implanted religion or philosophy, of nationality or race, of po-

litical opinion, or degree of culture. For, he who seeks Truth seeks the Supreme Essence, and in that endeavor all earnest seekers are equal.

2. Taken as individuals, we are dependent upon one another and upon the world around us. Man is the product of procreating Nature and of his education. By virtue of this axiom, we accept every fellow-man as the naturally grown being, which indulges in hostility to us only when it disobeys natural laws.

3. Whence have we come? In like manner as the whole animate world, in the course of millions of years, slowly and gradually evolved from lower forms to greater perfection, by way of natural selection in the struggle for existence, so has man evolved, in infinite periods, from lower species up to his present superior grade. There was as little a first man as there was a first German, or a first Frenchman, or a first Spaniard. What is, is grown;

issued forth from other beings by way of natural, gradual evolution.

4. The further evolution in the direction of higher perfection is a universal phenomenon of all living nature. It existed in the past, it exists to-day, and will continue in the future. It is the expression of a natural law, exceptions to which tend only to corroborate its existence. The progress toward perfection takes place as an inherent natural necessity. Whoever violates this law perishes. Experience shows that whatever stagnates forfeits existence; its destruction is but a matter of time.

5. We accept the idea of an "original sin," not in the Mosaic sense, but from the standpoint of scientific inquiry. It is that occasionally observable tendency of every individual of the animate world to return to the state of more lowly organized ancestors. In every man exists a greater or lesser portion of animality, inherited from ancestors of a lower type.

This "original sin," which no modern scientist will deny, is a very fit conception to take the place of the mystic "first sin," and might, in accordance with experience, become the foundation of a new philosophy of morality, and of a new ethics.

6. There is also an absolute justice, superior to that administered by the present humanity, a Nemesis of the violation of natural laws. He who kills another may be considered to have returned to an earlier state of evolution; from a growing human being he returns, as it were, to the state of bestiality. Science denominates such a retrograde development *atavism*. Everywhere in the kingdoms of animals and plants the scientists discover that atavism, that peculiar "original sin," is followed by extinction. Nature exterminates at once these atavistic individuals, whereas we, merciful humanitarians, have of late commuted death sentence on this sort of "animal turned" men to simple

or aggravated imprisonment. Whoever enslaves a fellow-being, violates a law of nature, for "man is created free, free even though born in fetters" (Schiller).

7. All the so-called human virtues have developed by degrees in the process of human evolution. They are natural results, and can never be dispensed with. From social instincts they grew to the grade of human virtues; and virtues (the highest of which is charity) are apt to embody themselves in man, by moral education, in such a degree as to become inheritable.

8. Our *hope* is centered in the further evolution of all mankind. We, children of the present age, are better than our animal ancestors; succeeding generations will, in like manner, progressively and necessarily become better than we are now.

9. All our knowledge being but fragmentary, and each trifle of it having the inherent faculty of germination and growth,

we are of necessity restrained from looking down spitefully upon our fellow-men; and at the same time morally bound, in conjunction with others, to extend the dominion of knowledge.

10. All true knowledge, from its own nature, imbues its possessor with tolerance. Every one's religion is his own individual affair; to dispose of, and administer to which, no State officer and no State—much less the pope, who is but a fallible man—has any right. Whoever feels the metaphysical desire to become happy in another world is entitled to satisfy this want in his own way, be it upon Mount Gerizim, Horeb, or Sinai, at Mecca or at Rome, in the desert or on a luxuriant island, provided he does not infringe upon the happiness of others. But he who has no desire to learn anything of another world, because he *cannot*, shall not be prevented in his endeavor to create, for himself, and in conjunction with others, a

heaven upon earth in his lifetime, and to transform earth into an Eden for his own happiness and that of his fellows. The happiness of the individual can be perfect only when it is in full accord with the welfare of the whole. Hence, evolves of itself a natural, moral and ethical philosophy, which will radiate into the most distant future of mankind, and supersede all dogmatic creeds.

The doctrine of progressive evolution, which pervades the entire series of associative meditations on Darwinism—this law of steady, though slow, progress toward perfection—this is the glad tidings, the gospel of naturalistic reasoning.

Now you may judge for yourself if we of Darwin's school are irreligious, or whether we are religious. True, the kind of denomination does not signify; the essence, the intrinsic substance, is alone decisive. The mere letter is destructive; we

know it, all of us, no matter what we profess. "Name is noise and smoke."

WHAT DO OUR COMMON SCHOOLS TEACH?

I wish, at the beginning, to state an indisputable fact. *The common schools are almost the only institutions that have not been benefited by the progress of science. Leaving out of consideration mere exterior splendor and ornament, their essential features have not changed in this scientific age.* In all the Teutonic countries, and round about us in most other countries, the common schools still spread the errors of Mosaic cosmogony as a sacred truth.

In the decade between 1840 and 1850, when most of us that are here assembled went to the day schools in the German part of Switzerland, we were given a religious text-book entitled *Bible Stories*, by Christopher Schmid. There we read and learned the stories of the speaking serpent in Paradise, of Moses' miracles, of Daniel in the lion's den, of Jonah in the belly

of the great fish, etc. Miracles, miracles, miracles without end. But the textbook of C. Schmidt was well written. Children delight in such language, and we felt happy in that kind of entertainment. There was not much ground for objection to it either, then; for to believe in miracles formed part of the public conscience, and no Darwin had given his doctrine to the world.

But after Darwin's phenomenal works had appeared, year after year the book *Two Times Fifty-Two Bible Stories for School and House* was issued and re-issued at Calw. Ten years after the appearance of Darwin's work, in the year 1869, those popular stories had reached the 211th edition. They were *the* text-book for religious instruction in the Lutheran schools of many German states, and in the public schools of several Swiss cantons. The canton of Vaud had a French translation of it made expressly for the public schools. This miracle-book was hailed with such universal applause

by Church and State, that by 1869 it had been published in not less than sixty-four languages, even in the Chinese. It narrates a still greater number of miracles than the book of C. Schmid; and the most notorious of them were even accompanied by illustrations, to enhance the imaginative interest of the little children. I give below a list of some of the picture-stories:

The speaking serpent upon the tree of knowledge, and naked Eve; the angel with the flaming sword at the gate of Paradise; the great flood; the three angels hailing Abraham, and the laughing Sarah; the destruction of Sodom and Gomorrah (a stout plump peasant girl with two wings and spread arms brandishing a flaming sword toward the blazing city); Jacob cheating Esau of his birthright and blessing; the seven ill-favored lean kine in Pharaoh's dream; Moses' miracles before Pharaoh (rod and serpent); the manna-shower in the desert; the flaming Sinai (with three trum-

pets stuck out from the clouds); the quail storm; Moses striking water from the rock; the adoration of the serpent; Balaam's speaking she - ass, which cannot proceed because an angel stands in her way; Joshua commanding sun and moon to stand still; the prophet Nathan before the adulterous David (the book relates minutely the whole adultery transaction with Uriah's wife, surpassing itself by the naïve sentence, "God permitted that Uriah should be slain);" the prophet Jonah in the act of being vomited upon the dry land after three days (a splendid picture), the prophet Daniel in the lion's den. The miracles of the New Testament are illustrated in similar manner.

This religious text-book is still in use in many public schools in Germany and Switzerland, and its stories and pictures are taught as indisputable, eternal truths, to hundreds of thousands of children and adult persons.

Not much higher than the above text-book stands the one in use in the Evangelical Protestant public school in the Grand Duchy of Baden, which also commences with the Mosaic account of creation, and enlarges upon all the miracles of the Old and New Testaments, but is not embellished with such edifying illustrations.

Even the school primers of Protestant states, the sole and indispensable books of the five-or-six-year-old school children, are filled, with few exceptions, with the same miraculous accounts, which afterward the scientific instruction in the higher schools has to purge out of the minds of the young students, when the rigorous method of scientific research is to take root.

Our schools work after the very way of
OLD SISYPHUS.

Upon looking around us to see how things appear in the *progressive* cantons of Switzerland, we find that the canton of Zurich has in her public schools no com-

pulsory religious instruction ; that is to say, such instruction may be given the children if parents insist. But besides these public schools there are so-called "free" private schools, supported at the expense of religious funds, accumulated privately, for the special purpose of completing the school education of the children in a strictly orthodox character, upon the foundation of the Mosaic cosmogony. These "free" private schools exercise a rigorous competition with the public schools maintained by the state, and if the members of the Evangelical Society should choose to tax their purses but little more for these private schools, we may live to see half our school population instructed in the views and drift of the miracle - believing Orthodox ; for the same canton of Zurich has legally permitted, and sanctioned, the establishment of a private Evangelical Normal School, for the training and education of Orthodox school teachers, a considerable

number of whom are annually graduated and through the doors of the state public schools to obtain engagements to teach in them. This is the strategy by means of which the body of our state school teachers is gradually leavened with Orthodoxy, and in this way we may easily foresee the end. The situation is becoming interesting. Do but witness the Pietist Sunday Schools, shooting up everywhere like mushrooms. St. Ann's Chapel is actually being filled Sunday after Sunday, and the revival meetings in the Ton-Halle, and the sermons upon the nearing end of the world, and the re-advent of the Saviour, attract the masses in crowds.

And yet in the state public schools, whose teachers are educated in the renowned Normal School of Kussnacht (Zurich), religious instruction is administered only upon the request of parents; *i. e.*, the several school boards are empowered to direct the teachers to teach, or forego, religious in-

struction. In most schools such instruction is administered partly by orthodox teachers; in which case, of course, after the heart of the Evangelical Society; partly by enlightened teachers, who then, with more or less skill, avoid the stumbling blocks of actual Biblical errors. The State Board of Education has adopted no definite text-book of religious instruction, but simply recommends the use of either of two text-books. The one is a little book of three divisions for children of from nine to eleven years, which commences with stories from the Old Testament, and, of course, with Moses' Creation, and the Fall and Flood, and concludes with the travels of St. Paul. This text-book, written by a clergyman (Mr. Meyer) is in frequent use in the schools of the canton of Zurich. But besides this book there are other religious text-books in use, and the most orthodox of them, of course, in the so-called "Free" private schools.

Another progressive canton of the Ger-

man part of Switzerland (Thurgau) is noted for her good standing in the examinations of recruits for the militia. She had, and still has, obligatory religious instruction, based upon the text-book recommended in the canton of Zurich. Here, too, therefore, Moses is supreme.

Throughout the length and breadth of Germany, as well as in Switzerland (the little Kingdom of Wurtemberg has the best schools in Germany), in the countries most friendly to the progressive common-school system, in the most civilized provinces of Europe, everywhere we find the same state of affairs—*Moses, Moses, Moses forever*, as the foundation for every kind of religious instruction.

Verily, our public schools still stand with one foot at least in the middle ages.

But even this is a natural consequence of the evolution of our school organizations. The public schools were essentially an offspring of the Reformed Church. They were

necessitated by the Reformation. After the invention of the printing press, the sacred truths of salvation, in the Word of God, were to be spread into the remotest log shanties on the mountain-sides, by means of the printed book; and this could be accomplished only by instructing the masses in the art of reading and writing.

As late as the last century the principal text-books in the public schools were, *The Psalter of David* and the *Protestant Catechism*.

Since the beginning of this century other requirements, of a more practical nature, have made themselves felt. Between 1840 and 1850 the computation of interest was introduced into the public schools of Switzerland, also some geography. Of natural science I was taught (1850-60) in the nine grades of the public schools only these few general lessons: "Plants are divided into trees, shrubs, herbs and grasses" (Aristotle). Besides these there are also mosses, algae, mushrooms and lichens." (The latter ad-

dition was a clerical concession to the modern sciences.)

Every other kind of modern knowledge was withheld from the common schools as far as possible. Where efforts were made to advance with the age, there ensued a struggle with the resisting Church. Such was the case between 1850 and 1870, and in fact up to the present time; and with varying success, too, according to the different populations in the several cantons. The School strives to free itself from the Church. The latter being inclined to stagnation, the former to evolution, like a living organism, there is at present no prospect of mutual co-operation between them.

The emancipation of the School from the Church is still a long way from being accomplished. France is nearing that goal, and Italy is following in her wake; but in Germany, Austria, and Switzerland the idea of a total separation of School and Church is being frustrated, in such a manner that

the entire school organism is becoming asthmatic under the desperate urgency. Every close observer can testify thereto. It is a general observation that religious instruction occupies too much of the school time. It is committing an outrage against the law of evolution that tender children, who are unfit for abstract reasoning, should receive religious instruction in the very first school year; it is a sin against nature to use every opportunity for imparting to them ideas and teachings that can hardly be mastered by sound adults, and by them only through the application of all their mental faculties, without any assurance at all of obtaining a full understanding even then. *Our public schools are sinning against the natural development of the intellect by teaching metaphysics to children.*

And still more criminally do those parents act who, in their over-zeal, go further yet, and send their four-or-five-year-old children into those *canting Sunday Schools*.

What will become of them when on Sundays these little fellows, whose province should naturally be the free open air and sunshine, come home from school with pale cheeks and tell what this and that patriarch had been doing or saying, and how somebody by the name of John had gone to the desert, and when he returned he was covered with camels' hair? What shall we say of girls, from four to ten years old, who come from Sunday School and tell their mammas what the teacher imparted to them of the dogma of regeneration, asking their papas what the teacher really meant by saying that they must get a new heart?

I am far from denying the often occurring moral changes in men's lives and characters, as they occasionally happen through the agency of impressive events—those regenerations, as they are called. But I declare that it is a criminal folly against a child's mental growth to teach

the dogma of regeneration. Whither is this leading? The city of Zurich has had ample occasion to witness the regeneration preached by the Salvation Army.

Recapitulating the results of this pedagogic excursion, we may set forth in few lines what no man who is intimately connected with the public schools will attempt to refute, and what no honest man will deny, because it is the indisputable truth:

1. IN THE HIGHER SCHOOLS THE SCIENTIFIC TRUTHS OF EVOLUTION ARE BEING TAUGHT AS ETERNAL LAWS OF NATURE.

2. IN THE COMMON SCHOOLS, WHICH ARE MAINTAINED AND PARTIALLY SUPPORTED BY THE SAME STATE THAT HAS ESTABLISHED AND MAINTAINED THE HIGHER SCHOOLS, THERE IS BEING TAUGHT AS SACRED TRUTH THE MOSAIC MYTH OF THE CREATION OF THE WORLD, THAT NOTORIOUS ERROR OF 3,500 YEARS' STANDING, THAT POSITIVE CONTRADICTION OF EVERYTHING TAUGHT BY SCIENCE, AND BY ALL

THE FACTS OF EXISTING AS WELL AS OF
EXTINCT LIFE.

This is *untenable, immoral, monstrous*. There cannot be two sorts of truth, one of which is good for the Higher Schools, and another for the Common Schools. There is but one truth, and that one truth is good and sacred for *all*.

Nature, the Universe, has no special laws for the savants of this world, for the noble-hearted workmen in the laboratories of science, for professors and students of higher schools.

Nature, the Universe, has no special laws for the children of the masses, for the simple-minded, laboring and drudging citizen.

THERE IS NOT A SPECIAL TRUTH FOR THE SELECT OF THIS WORLD, AND ANOTHER SPECIAL TRUTH FOR THE POOR AND DE-
SPISED.

Our planet rotates each day upon its axis, and revolves each year around the sun. All of us, each and every one, savants

and laymen, must move along; and Copernicus has not left these truths to us that they should be taught only at the high schools, while in the schools of the masses the very opposite should be taught as a sacred revelation. The story of the stopping of the sun at Gibeon, and of the moon in the valley at Ajalon, has been refuted by astronomers throughout the thinking world as an error, an egregious fiction.

If Christianity has been constrained to acknowledge the truths of Copernicus, for all grades of the higher schools, then Christianity cannot allow that the two kinds of schools should be treated differently—the one kind taught scientific truths, and the other kind taught notorious errors.

For this is in opposition to the principles of the sage of Nazareth. It is contrary to justice. What? Stones for the common schools instead of bread?

In the recognition of this discrepancy—truth above, error below—there lies the

loadstone of prosperity and advancement of the school. It is my conviction that no true pedagogue will repudiate this fact.

I called this actual condition an untenable, an immoral one; and I know exactly the bearing and consequences of these grave charges. I am fully aware that in wide circles round about us there will be intense horror at such charges; not only with the clergy, but with many *teachers* also. I beg leave, therefore, to prove the charges. I will be brief.

Evolution is being acknowledged by the academic teachers of all the universities of Europe; and it is proclaimed in every noted magazine, either *belletristic* or scientific, and in all the daily press of note.

Every refined person who is accustomed to take cognizance of the labors and achievements of naturalists, every man of culture who prides himself on thinking without bias, and independently of the rigid formulas of faith and dogma, has

become an adherent of Evolution; either through the agency of the daily press, or of popular scientific literature. Nevertheless he permits his children to be taught in the common schools the direct opposite of what he considers an absolute truth.

IN FACT, THE ADULTS NOURISH THEIR INTELLECT WITH THE BREAD OF TRUTH, AND THEY THINK IT JUST THAT THEIR CHILDREN BE FED ON CLAY INSTEAD OF BREAD.

It is utterly immoral to consciously pass off error for truth. I say this not merely to parents, but to the face of those teachers, too, who prostitute themselves in teaching errors instead of truth, knowing and feeling, in their own innermost consciousness, that they do so. I say this undauntedly and without restriction in the face of school boards. It is sin committed against the sacred office of the schools, when they oblige teachers and pupils to

kill the precious time with teaching and learning evident errors.

Moreover, "every guilt calls vengeance down on earth," as the poet has it. The evil consequences will not fail to appear in due time. We can clearly see them approach; they manifest themselves already.

Upon quitting school and entering upon the hardships of life, into that struggle for existence where, by virtue of an eternal law of nature, truth will carry off the palm of victory over the lie, because it is stronger than error and carries in itself perpetual life, whereas falsehood is short-lived and cannot perpetuate itself—then the young cosmopolitan cannot but observe at once that he has been taught falsehoods in school—taught it intentionally and with a purpose.

Thereupon follow in his mind those internal struggles between reason and faith—conflicts of greater or less violence. The deeper those errors have taken root in the

young soul, and the more they have been assimilated into the moral and intellectual development of it, the more exciting will be those fatal struggles. I am speaking from experience, and conjure all honest persons of every class not to under-rate these occurrences, nor to regard them with indifference.

Skepticism wins predominance in this age of ours. It is true that doubt in itself is beneficial, because it is the spring from which flows truth. But this truism does not imply that in school we should consciously disseminate falsehood and error, expecting that skepticism will arise of itself, and consequently draw forth into light the good, the right, and the true. No. If the masses realize that the public school gives out in one part of its domain stones for bread, they will become suspicious regarding the high value of school education; and this suspicion will corrode and poison individual and social

morality, way down to the altar, and high up to the very bar of justice and law.

The fittest and most natural thing to do is to throw overboard all useless dogmas. But, unfortunately, in many cases, the moral and ethical truths, which have heretofore been mixed and linked with these dogmas, are also being threatened with disregard. For, it is an old experience that often the good is thrown away with the bad; and faith and trust in State, Church and School might be lost forever. This is the royal road to anarchism.

Who, then, is to save us from this fatal collapse? We hear the preachers lament in the pulpits of empty churches; while philanthropists exclaim against the demoralization of human character, against the lack of veracity, of truth to one's self, of manly courage, of honesty, of virtue, and of justice.

Hither we have been drifting in this

doleful period of strife and quarrel between barren middle-age dogmatism and modern scientific enlightenment. We are in the midst of the struggle between faith and science, between traditional error and painfully acquired truth; and the events of our time, considered in their various relations of cause and effect, present a picture of chaotic confusion, at the sight of which the soul of the faint-hearted is filled with trembling, while the imagination of the friend of light and truth bursts out into prophetic joy, and into sadness of heart, at the same time.

The chaos is here. The modern, the acquired, is conflicting with the inherited. We face the center of the awful hurricane, and the winds whirl from every quarter. The horizon is dark with clouds, and the sky above us is covered with them. Flashes of lightning break forth, and hail storms devastate the fields and meadows. But we know that after the

storm is past the atmosphere will be purified, and we must not despair.

The heavy, black and leaden cloud is the darkness of the conflict of the metaphysical systems, which disturbs the equilibrium of the whole public-school system. Truth in the upper regions, error and falsehood in the lower.

Upon this discrepancy rests the present lamentable state of the public school, and the confused sentiment concerning its defective results.

The public schools of most European states are left nearly untouched by the progress of science, and have sunk down to be mere tools for hemming in intellectual development. He who looks for the causes of this stagnation and comparative retrogression will easily find them; *they are in the defective education of our school teachers.*

There are established scientific schools for physicians and surgeons, that they may study the laws of health, disease and hy-

giene; that they may become able to preserve or restore the *physical* health of the nations. Costly laboratories have been established, and furnished with every imaginable instrument and apparatus; the most renowned savants are appointed to introduce the young students into the secrets of the healthy and of the diseased organisms of man and beast. And these institutions are the pride of these nations, a blessing to all humanity.

But for the *intellectual and moral* hygiene, for the preservation of the natural psychic development of the rising generations, the governments have failed to do their duty fully and honestly. The teachers of our schools, the guardians of the sacred treasures that a nation owns, are in most states withheld from the genuine sources of science. The normal schools are the plantations of semi-knowledge and bungling. A very few institutions of this kind are praiseworthy exceptions to the rule; among them

must be mentioned our Normal School of Küssnacht, Zurich.

It is a lamentable and painful sight to view the scientific instruction afforded to the majority of our public-school teachers.

It is no more than justice to state that there is a vast difference in the relative standing of the several normal schools in Switzerland: that there are states (cantons) whose body of teachers fully satisfy the requirements of the modern public schools; but it behooves me to state, also, that frequently young teachers from neighboring cantons, after having graduated at their home seminaries, upon coming to the university, notice for the first time that they really know nothing of the scientific branches.

I can furnish ample testimony for my statement. Some of these normal schools accomplish actually nothing worth speaking of, in regard to scientific instruction. They are in fact rather tending to counteract

scientific instruction; they are, despite this age of science, stupefying the intellects of their pupils, instead of giving the training that makes wide-awake teachers. I could tell you of occurrences that would make your hair stand on end. For the sake of illustration I will permit myself to be somewhat explicit, in quoting an analysis of a reading lesson, as published in the *Blätter für die Christliche Schule*, whose *redactor* or editor is Mr. Howald, Professor at the Normal School in Berne. This magazine is intended for the use of teachers, and is the official organ of the "Evangelical School Society of Switzerland." In No. 9, of 1889, you will find a lesson for the use of the teacher entitled, *A Walk*. Here is the literal quotation of what said Professor Howald has on tap for the teachers' benefit.

- a. Reading of the piece by the teacher.
- b. Reading of it by pupils in strophes.

c. Contents of each strophe.

1. Mother and child take a walk to the meadow.
2. A young pigeon is gathering food there.
3. Mamma points out that the pigeon looks up from time to time, toward heaven after each beakful.
4. She exhorts the children not to forget prayer at each meal.

Thereupon follow eliciting questions:

What is the pigeon doing? It picks food. It finds grain. After taking one grain it looks up. The pigeon is thanking for each grain. The pigeon may serve as a model. What are we to learn from the pigeon? We receive better food than it does. We know who is providing food for us. We should be thankful, too. How does the pigeon appear to be? It is thankful for the smallest bit of food. Do we know of other animals that are so thankful? The

quail pipes, "Thanks to God." The lark says, "We praise God as long as life is in us." The little chicken says, "We are thanking God for the good gifts he bestows upon us." What are we learning from the animals? We learn to be thankful.

Here follows the section containing applications of the "moral" of this lesson.

Vis-à-vis of such aids for the instruction of school children, as they are here presented to the teachers in all earnestness, we naturalists stand aghast and utterly mute. The moral of this fraud—for fraud this is—is an evident falsehood. It is untrue that pigeons invariably look up after taking a mouthful; this is an illusion of the would-be religionist. And when these birds occasionally turn their eyes away from the fodder-dish, they distort their eyes, and are manifestly thinking of objects quite different.

It is my firm conviction that many of my truly Christian, honest and beneficent friends and relatives will admit that such pedagogic abominations are anything but wholesome instruction. And they will agree with me when I say that such instruction will annihilate the last remnant of respect for the wisdom of public-school teachers and professors of normal schools. I must confess, though, that I feel real sympathy for this class of teachers in general. They are endeavoring to accomplish the good; and whoever is toiling for that purpose is my friend, no matter whether he walks in the right or not, provided he knows no better.

But I insist that no teacher who has been taught to observe, experiment, and think without bias, in any of the scientific branches, will dare to exert so criminal an influence upon the tender intellects of children as is actually done in thou-

sands of schools. And at the expense of whom? *Of the State.*

What an abundance of true instruction could the public school not administer to the young generation, if teachers *knew* the various flowers and animals in field and wood. Ah, what a buzz would there be if a teacher of real knowledge, when rambling in the fields with his pupils in May or June, could tell them the secret beauty of each flower, shrub, stone, and unravel the laws and mysteries of every-day nature. Would not every lesson in school become an anxiously looked-for, edifying moral lesson? Would not the bright eyes of every keen and observant child light up with the sacred joy of enthusiasm and inspiration?

Who has seen, as I have, the tears of joy and gratitude of those who have been led on, truly and honestly, to discover the mysteries of nature and the universe? Who has, like me, felt that greatest of

satisfactions, when parting students came up to the teacher to tell him how grateful they were to him for aiding them in thought and research, happy that they had learned to understand the accessible portion of this world of ours? They were those that afterward became teachers who had drunk from the springs of science, and were able to penetrate into the spirit of unbiased inquiry and thought.

But the public-school teacher is intentionally withheld from frequenting scientific auditories. The physician, the lawyer, the pulpit-orator, the engineer, the chemist, the architect, the forest warden, the farmer, the veterinarian, the dentist, the stage-actor—all of them are, mostly by law, required to pursue certain studies at the highest schools of the country, and to become acquainted with real science. But the teacher of the public schools is deemed to be qualified enough, if he has fed on

the diluted wisdom of antiquated textbooks, and obsolete cloister learning.

There is plan and method in this stratagem, but it is a truly detestable system. Falsehood and error can continue to be propagated among the masses, while the few only are blessed with the fruit of truth.

The obstructionists, with the aid of this defective system of training teachers, and profiting by the absence of manly characters in our own ranks, so well succeeded, that in several States (cantons) of this republic, where a revision of the school codes was about to take place, the campaign cry was raised by them, and taken up by the masses, "Out with the science branches from the public schools! Back to the old simplicity of the three R's!" And we need not marvel that this cry was actually taken up and repeated in our age of scientific progress! Most of the children of the masses receive but the common-school education. And all these chil-

dren of the nation at large, these future citizens of our country, it is intended, shall learn nothing of natural science; they shall remain ignorant of the things of this world and of the laws of nature, so that they may be all the more easily impressed with the prophecies concerning another world. This is a return to the feudal ages, those good old times of witchcraft; to the era of fagot-piles and *auto-da-fes*; when naturalists were set ablaze at the stake, and children strangled in the dungeons "for attempting to make birds!"

Let us not lose patience, however, but persevere and keep our presence of mind. The fact that such campaign cries could become popular has a cause like every effect. Let us be honest and confess that, in many places, no instruction at all in science would be far better than the kind really afforded; for the reason that the method adopted is most pitiable.

Those who have had no opportunity

to learn the application of scientific investigation, and those who have neglected the requisite preliminary studies, and consequently remained indifferent toward science, will be inefficient teachers of science. The best text-books can be of no avail; and the best collection of natural objects and apparatus, accessible to young students, will be dead ballast for the teacher who is incapable of making the respective studies interesting and desirable. A teacher who feels no interest and enthusiasm in his heart for particular studies is a dead weight to the school in that branch; he will never bring forth sound fruit, and cannot but waste time and energy. His instruction will be anything but a blessing.

We are in a retrograde movement and shall continue in it until the teachers of the public schools are given a better education, in accordance with the requirements of the age; until we shall require

our teachers to teach nothing but truth, to the exclusion of errors and illusions and falsehoods; until the pupils are taught to use and rely upon their senses more than they have been used to do heretofore; and until the rising generation is taught to *observe correctly* in order to think correctly; in short until they *learn* by the natural method of observation and experiment.

It is but occasionally that we hear sporadic voices, from unlooked-for quarters, demanding proper and reasonable remedies, and asserting the supreme office of the public school to be to acquaint children with the phenomena of this world, and to qualify them for the enjoyment of happiness in this world.

In conclusion, I shall lay before you those demands which, in a thorough revision of the school code, I deem fit to be taken into special consideration by the respective legislatures.

I. EVERY KIND OF RELIGIOUS INSTRU-

TION IN THE PUBLIC SCHOOLS IS DETRIMENTAL TO RELIGIOUS PEACE, AND IS CONSEQUENTLY TO BE DISCONTINUED.

Religion is an individual affair for each individual citizen, and the State must not meddle with it. It is an affair of the heart, and every one has to dispose of it according to his own liking. But the *intellect* of the citizen, the brain of the voter, is part of the commonwealth, and constitutes its chief resource. Consequently it is the duty and right of the State to increase and develop it.

In States where religious instruction cannot for the present be safely discontinued in the public schools, it would be the most appropriate measure in the meanwhile to demand, at least, the discontinuance of the teaching of the Mosaic cosmogony, since it is an obvious error, and to require instead the teaching of truth, and nothing but the truth.

2. ALL PUBLIC-SCHOOL TEACHERS SHALL

BE REQUIRED TO HAVE A THOROUGH SCIENTIFIC EDUCATION, which will enable them to administer genuine scientific instruction, based upon observation and experiment, instead of mere theory and bookishness, in the common schools as well as in lecture halls, and to propagate the most important results of contemporary research.

This postulate is being accomplished by the abolition of most of those normal schools that are conducted with a view to medieval philosophy, and regulated in a convent-like fashion, and by enforcing the scientific education of teachers at universities.

I do not intend to manifest distrust against all existing normal schools. In our canton we have had for many years past, and still have, an excellently conducted State normal school in Küssnacht, of almost world-wide reputation. The director of that institute is a highly edu-

cated and renowned scientist, and eminent pedagogue. Sciences are taught there with great efficiency; and the same is true of the Female Teachers' Seminary of the city of Zurich. But these institutes are the rare exceptions; and their efficiency might be still more increased were they connected with the university of Zurich.

If it should be objected that the education of the public-school teachers in the universities would be too expensive, and that teachers with a university education would not stoop to teach public schools in the villages, I am enabled to make this reply:

In the first place, for far less important purposes than the education of teachers, there was always found abundant means; and the taxpayers are easily persuaded to understand that it is much more important to have efficient school teachers than to have efficient physicians, veterinarians, lawyers, pastors, etc., who are required to

prepare themselves at the universities for their professions.

In the second place, certainly school teachers, with even a university education, will accommodate themselves easily to the life in villages, as practical instances in our own canton will readily prove. Candidates for secondary schools have, during these last twenty years, been required to pursue university studies for at least two full years before they were allowed to graduate at the State examination for secondary teachers. Those that are fortunate enough to secure engagements in country secondary schools never hesitate to enter at once upon their duties, in the midst of country life; there are even instances where such graduates taught primary schools for years before they could be persuaded to accept of a higher school. There are many instances of graduated Doctors of Philosophy who are teaching at country secondary schools and who have won high

honors by their efficient work and scientific attainments. These instances prove conclusively that collegiate education does not disqualify teachers on account of either pride or exclusiveness, or bookishness, as some people would make us believe.

Nor can I clearly see why a teacher with a university education should become displeased with teaching in a common school. Are not the common-school teachers the most enviable of all teachers? Have not they the most precious material in their care and guidance? untrammelled, unspoiled infant minds, uncontaminated, provided the parents have been wise enough to withhold their children from attendance on canting kindergarten and Sunday-schools.

I am bound to say that I myself do feel happiest in the remembrance of those years when, twenty-five years ago, I was teaching a large village school; and, I dare add, that since then I never lost sight of

the progress and prosperity of the common school in general.

3. IN THE PLACE OF RELIGIOUS INSTRUCTION IN THE PUBLIC SCHOOL IS TO BE TAUGHT AND ADMINISTERED INSTRUCTION IN ETHICS AND MORALITY FOUNDED UPON SCIENCE.

The perpetual truth of progressive evolution is to the knowing teacher the true guide to felicity and virtue. Only brain-sick fanaticism or malign ignorance can allege that a better knowledge of science leads to the utter ruin of morality. This is an absolute misrepresentation, and applies at best only to that morality that ever conflicts with the laws of nature, as many teachings of several Christian sects actually do. That morality is no morality at all, but much more immorality. Seek in Darwin's works, or ask any one among the scientific pedagogues of our age, about the bearing of modern morality and ethics. It is my opinion that the social morals

of the present time cannot improve, unless the entire science of ethics be founded upon Evolution. True, if such an innovation is to take place at all, the naturalists and their whole school cannot be ignored, but will claim, of right, to be heard on this question among the first.

4. ALL INSTRUCTION IN THE PUBLIC SCHOOLS IS TO BE IN ACCORD WITH ACTUALLY DISCOVERED LAWS OF NATURE. DESPITE THE VARIETY OF SUBJECTS, THERE SHALL BE APPARENT THE UNITY OF TRUTH.

There shall be taught no miracles in one lesson and natural laws in the next. Order and law prevail in all nature. The belief in miracles implies the teaching of lawlessness, irruption into the laws of nature, and disorder unknown to science. Miracles have absolutely no room in the reformed future school; and the public school will not attain its full and healthy development, unless it destroys the general belief in miracles, leaving its nurture en-

tirely in the range of private and individual dilettantism; and unless it applies all its vital energy to solve the august task of leading the young to correct and unbiased observation, logical reasoning, and rational accommodation. Every scientist who honestly penetrates into the spirit of evolution is convinced that such a course of training will, and must, be entirely consistent with morality.

Ideals will of necessity form in accordance with natural and rational thought. The doctrine of evolution is so rich in truly sublime prospects, so pregnant with prophecies of real bliss, as is no other doctrine heretofore existing. It engenders no hope for anything that is fictitious and incapable of realization, but enhances the assurance of future progress and felicity with mathematical certainty.

It is puerile to contradict this exposition on the ground that it is impracticable to teach evolution to little children.

For when the Copernican doctrine of the instability of the earth entered upon its glorious career through the schools of Christian Europe, did any teacher pretend that he must demonstrate those astronomical laws to boys of six and seven years? And yet Copernicus, not Moses, is now the accepted astronomer of the public schools. The pupils of a good school are taught what they may naturally comprehend, according to their intellectual development; but a first and second grade do certainly not learn that two times two is equal to five or that three equals one. Mathematical instruction is the branch which shows unity and truth in all grades. Let instruction show the same virtues in all other branches, and Evolution will be the doctrine that will pour out its blessings to every mind; it will be immaterial when, and in what grade of school, this shall be effected.

But come it must and come it will.

I have now arrived at the close of this lecture, but am far from expecting that my remarks will take immediate effect, or inaugurate improvements at once. I was desirous to show you how we now stand, to fix your attention upon the desperate conflict threatening the public-school system, to prove to you that this state of things is intolerable, and to show in what manner a reform must come, if not in the course of this century, then most likely in the next.

Some of you, my friends, will perhaps inquire how I can entertain such a sense of certainty concerning the solution of so important a problem. The thing is simple indeed. In a conflict between error and truth the latter always carries off the victory. This is the conclusion which general history, as well as the history of the development of the human intellect and of the sciences in general, permits me to draw.

The Mosaic cosmogony is an evident

error; the doctrine of Evolution is a truth attested by myriads of proofs.

The next lecture will submit some of them to your own judgment.

II.

EVIDENCE OF EVOLUTION.

LADIES AND GENTLEMEN:

IN the first of these lectures on *Moses or Darwin?* we have seen that the doctrine of Evolution is accepted and taught at every university of civilized Europe.

It won its ascendancy through the combined labor of all independent, active scientists, who unceasingly and fearlessly employ their energy and enthusiasm in all the various fields of research, and who uninterruptingly register new discoveries day by day, compare and weigh their respective relations, and from them derive new proofs of the unity of Nature's laws.

We are now in a condition to point out thousands of facts, all of which prove the truth of Evolution, and that no phenomena known to us contradict it. It happened more than once that opponents of Evolution, in the act of searching for evidence against it, were so convinced of its truth that they became its friends and adherents against their will. So many a Saul was converted to a Paul.

Before I attempt to present to you some of the most striking evidences for the doctrine of Evolution, I propose to draw your attention to some wide-spread errors. Many even very learned people erroneously suppose that Darwin's conception of natural selection and of the survival of the fittest is identical with evolution in general, and that if the former doctrine fall, Evolution must also fall.

This is a gross, confusing error. The fact is that the doctrine of Evolution existed long before Darwin, though not gen-

erally accepted, and that this doctrine forms an independent unit, which cannot be refuted although Darwin's theory of Natural Selection be totally negated or displaced by any superior theory.

There are, even at this day, many superficial persons who will in joyousness wring their hands whenever they learn that here or there a scientist declares that the doctrine of Natural Selection does not suffice to prove the theory of Evolution. These good people will burst into a jubilee of rapture and glorification: "Ah, glory be to God, Evolution is played out now, and the Bible restored to its supremacy!"

This is but a foolish rejoicing, and yet how often it has burst over all orthodox Christianity since Darwin's first edition entered the lists against Moses. How many "glorious refutations of Darwin" have been published in volumes and pamphlets, and all meeting with the same fate! They could not shake and will never shake the theory

of Evolution, because this is not dependent on the theory of Natural Selection. We may well define the position of the two doctrines :

Evolution is a fact ; but the means and manner of evolution—that is, the process of natural selection—may be subject to doubt and discussion.

Another wide-spread error is the supposition and allegation that Darwin taught the descent of man from some known, still living species of ape. Smatterers of this kind claim that an ape remains an ape, and that no one has yet seen an ape change into a man. Persons engaged in attacking Evolution with such objections are either very shallow and silly, or else they know it better than they would make us believe; more likely they are sophists and dissemblers, whose vague moral sense permits them to sneer at a doctrine which makes them feel uneasy. It is, therefore, either simplicity and ignorance, or malignity, occa-

sionally both together, that underlie these objections.

The same class of opponents tax scientists with such tasks as, for example, raising potatoes from orange trees, figs from thistles, vines from hazel nuts, palms from acorns, etc.; and they desire us to breed elephants from rabbits, lions from foxes, parrots from bats, whales from trout, flax-haired men from tailed monkeys, and all this, moreover, within so short a period as a year or two.

Such imputations are really insane and must be so accepted; for a scientist, gardener, cattle-breeder knows well that Nature nowhere, and at no time, makes such alterations by jumps, but by very gradual and slow modifications. Ignorance in these things is so general, that even school teachers and professors of high schools take delight in such argumentation. They prove thus, with renewed energy, how sadly they lack a real scientific education.

The several hundred varieties of apples that year by year adorn our fruit dishes have sprung from the hardy or wild crab-apple tree, whose fruit is scarcely eatable. All the varieties of horses are descendants of one ancestral race; the manifold kinds of pigeons have been raised from the wild rock pigeon; and all the cabbage varieties have been produced from the wild cabbage (*Brasica*); but it took hundreds of years of close attention on the part of the breeders and gardeners. And it needed millions of years before our ancestors, who were covered with a dense fur and furnished with a tail, developed and diverged into what we now call mankind on the one hand and man-ape on the other.

Plants and animals variegate and improve very slowly, so imperceptibly, indeed, from generation to generation, that the successive types appear to be almost unaltered. Gardeners and cattle breeders can attest this fact better and with more authority than even professors.

In the free nature these changes are, for obvious reasons, slower still, than where the plants and animals are placed under the care and control of man. Thousands of years elapse before, here and there, a species of wild plants or animals generates a new wild variety or race; and millions of years vanish into oblivion before a new and different *species* of animals forms from a long-established older one. Nature produces new forms from previously existing forms only in the process of incalculably long periods. Millions of years are but days, and infinite ages but a night.

In comparison, then, a man's lifetime is a mere nothing. We are but ephemeral beings. A lifetime is too short, indeed, to be a measure for occurrences and cycles of events in the processes of nature. But science has enabled us to see and recognize with distinctness, and a certain degree of accuracy, what has happened in by-gone ages; to define the laws that governed

and still govern the diverse phenomena, and to assign with certainty the order of phenomena in ages of the future.

The doctrine of *evolution* is also called the doctrine of *descent*. The former term is more comprehensive than the latter, for it embraces the development of the whole visible world around us, whereas the latter applies only to animate nature.

Evolution manifests itself in fact as a truth, not merely in the natural events upon our planet, but as the one great law for the entire universe.

Let us first center our attention upon *astronomy*.

Our solar system has not at once become what it is to-day, but it has developed itself gradually, in indefinite periods of time, from the primeval chaos. Close examination of the glittering heavens has afforded us evidence for the theory that perpetual changes take place in the universe, that primeval matter undergoes con-

stant transformation in boundless space, and is in perpetual motion.

That which we see twinkling and glittering in the starry sky, in the evening, is a revelation of universal existences, which, without beginning and without end, at various distances in indefinite space, form themselves out of immeasurable matter and unlimited force, and upon decay return to the original chaotic state. Our eyes thus penetrate into the great laboratory of the universe, which, never resting, never was completed, but which has ever remained incomplete, creating, transforming, and destroying, perpetually changing, moving, varying. Our solar system, with sun, planets, and asteroids, and with their satellites, is but an insignificant group of stars in the universe. Every other fixed star—those visible to the naked eye number about 5,800—constitutes again a world of its own. The astronomers, aided by the best instruments, have counted not less than about forty

to fifty thousand millions of such luminous worlds. They find places in boundless space where such worlds are in the state of forming—we might almost say germinating—in the depths of the ethereal ocean, commencing to radiate light, and taking the shape of luminous gaseous fluids, forming what is commonly called *nebulae*, and then becoming incandescent and liquid, of definite form and shape. In other portions of space, astronomers discover worlds in a state of gradual decay, verging towards destruction and ruin, destined, perhaps, to be involved in a catastrophe and to enter upon a new career. The nightly heavens are to the eye of the astronomer what a flowery meadow, in a lonely mountain valley, is to the botanist. As the latter may simultaneously observe all the different degrees of vegetable development of different plants, in the same mountain pasture, from the microscopic germ to the blooming and fruit-bearing shrub, so may

the astronomer observe in the heavens all the different degrees of growing, decaying and dying, which these worlds have to undergo. It was in this manner that restless inquirers finally received a satisfactory answer to the question, How did our solar system originate?

Two of the greatest savants of the last century laid the foundation for a theory of the world's history which conforms closely to all the known facts of astronomy, and which, for this reason, has been generally accepted by the astronomers of the present day. One was Emanuel Kant, the great German philosopher who published the *General Natural History and Theory of the Universe*, in 1755; the other, the renowned French astronomer Laplace, who, in 1796, gave the world that great work, *On the System of the Universe*.

That part of the theory of Laplace which interests us most teaches, in a few words, about the following details:

Our sun and its planets were once a gaseous substance, distributed throughout the space of our present solar system; it was consequently of very little density, similar to the nebulæ which astronomers have recognized to consist of a cloudy or foggy substance, and which physicists, by means of the spectroscope, demonstrate to be gaseous.

The gaseous mass which, millions of years ago, composed our solar system, and must have formed a nebula, contracted to a single ball or spheroid, in a like manner as spheroidal drops form when gaseous water (steam) condenses in the air. During this process, physics teaches us, the entire fluid rose to a high temperature, which gradually increased as the gas molecules drew closer together. The luminous, gaseous nebula next formed an incandescent liquid sphere or globe, which began rotating as soon as it had formed. This rotary motion, according to physical laws,

accelerated as the mass contracted. Thus all the matter of which the sun and his planets and satellites consisted was one liquid, incandescent, rotating spheroid. Its rotary motion had the west-easterly direction then, just as to-day.

The boundless space having a very low temperature, the primeval sun-orb consequently lost some of its heat, and in the course of ages cooled and contracted still further. According to the physical laws of contraction, the rotary motion of the mass increased to such an acceleration that the centrifugal inertia at the equator caused parts of the rotating mass to separate, and to continue rotating around the central nucleus under the appellation of *planets*. This flinging-off process repeated itself several times. The thrown-off bodies remained within such a distance that the attraction of the solar orb was stronger than their centrifugal force, so that a further moving off was impossible, and there-

fore the new orbs must revolve in fixed orbits around the original solar nucleus.

In this manner all the planets were originated; some of them acting as did the parent sun, in flinging off lesser quantities of matter in the shape of rings or satellites (moons). [Some inventive genius contrived a machine with the aid of which the formation of these planets and satellites may be imitated *en miniature*. Thus a physical experiment serves as a test for the verification of this theory of Kant and Laplace.]

All of the planets of the solar system revolve in the same direction in their orbits around the central orb, in planes nearly coinciding with the solar equator. Even the motions of the satellites admit of no other interpretation than that of Kant-Laplace.

Thus the sagacious mind of man has succeeded in formulating the laws of the heavenly mechanics, or cosmic physics, from the phenomena observed in the star-

studded sky; and, in conformity with the history of other heavenly bodies, man construed the history and future of our earth and her celestial companions.

But few years have elapsed since natural philosophy, with the aid of the spectral apparatus, became enabled to prove that the solar atmosphere contains the same chemical elements as does now the earth—hydrogen, sodium, magnesium, aluminum, calcium, chromium, nickel, manganese, iron, titanium, copper, zinc, boron, silicon, potassium, etc.

These were glorious discoveries, which attested to the solar origin of our planet.

A long time before Science succeeded in adducing evidence for the doctrine of Evolution in the animate world, and long before she accepted this doctrine as a law, astronomy taught that, in the great universe, where innumerable worlds soar about in a seeming medley, evolution had been working and fashioning for thousands, and

thousands of thousands, of years. For, the star-lit sky of this evening tells you of events that occurred very long since. There you see new and old orbs, sending, through their beams of light, that penetrate infinite space, news of events that have passed ages ago. A ray of light passes over a distance of 183,000 miles in every second. For traveling over the distance between the sun and the earth it needs eight and a half minutes. Should, therefore, some day, a powerful explosion take place upon the sun, we could not see it on earth sooner than eight and a half minutes after the occurrence. But the fixed stars of the heavens are much further off than the sun. A ray of light from the polar star needs full forty-eight years before it reaches us; in other words, the white light radiating to-night from the polar star started on its journey to us forty-eight years ago. Sirius, another fixed star, will tell us to-night what happened upon it twenty-one years ago; Arcturus,

what happened twenty-five years ago, and so on. The smallest visible stars are coursing in their orbits at so great a distance from us that their luminous rays acting upon our eyes to-night commenced their journey to us one hundred and thirty years since. The more powerful telescopes afford us the possibility of penetrating into the remotest depths of space, so that we cannot see sooner than to-day what took place in the universe thousands of years back. The stars constituting the Milky Way or Galaxy have been estimated to be so distant from us that it takes five thousand years for a ray of light to reach us. Sir W. Herschel discovered, by means of his monster telescope, nubulæ so distant from us that light will need millions of years to travel from them to us. So it is literally true that the astronomer in his observatory sees phenomena in the heavens that took place ages ago. He sees the past in a literal sense; and he is the only

scientist who can prove with mathematical accuracy what has happened in bygone ages.

These are marvelous achievements worthy of every thinking man's admiration, and they afford us peace and satisfaction at once, assuring us that with the same accuracy as that obtained in the computation of future eclipses, so everywhere, in the infinitely great and the infinitesimally small, there is but one law, that of Evolution. Everything is changeable, everything alters and develops, grows and decays, in an uninterrupted succession of evolutions and dissolutions. Nothing is being lost, but everything takes new forms and shapes. Force, also, is one and everlasting, however various the effects it may produce. Force never vanishes or disappears, however often the modes are altered under which it manifests itself.

In the contemplation of such things our thoughts must consequently begin to wander,

and to grapple with the sublime conceptions of Eternity and Infinity.

We gradually feel the meaning of infinity in time and space. We begin to comprehend that there are no limits in the universe, that there was never a beginning of time and that there can be no end. We feel as though we ought to be ashamed of the childish idea that we, a handful of humanity, should have eternal, unalterable existence, to the exclusion of all other animate beings.

After the earth had been cast off from the sun, it retained for a long period that high temperature which did not permit any plants or animals to take root, or get a foothold, upon its surface. It had to cool down first, so that a solid crust enclosed a liquid nucleus. For thousands of years the condensed aqueous vapors of the atmosphere would rush down upon the earth's crust, and form seas of heated water covering the entire surface of the young planet. In the further process of cooling the crust

contracted, and in obedience to certain physical laws, continents and seas began to divide and separate.

With this epoch was inaugurated the *Circulation of Water*, that continual circuit, which gave rise to those perpetual alterations and modifications of the configuration of the earth's surface that take place to this day, and whose history is perpetuated in the very rocks and stones of the earth crust.

Geology (history of the earth) is the science which furnishes us to-day the illustrated history of the earth's evolution. It shows what rocks are of volcanic origin, and what rocks are formed of hardened lake and oceanic sediments; it shows how the climatological phenomena eroded, and carried into the sea, parts of the continents; how mountains were worn down and elevations were washed away; how on certain places at one time land was emerging, at another time the same land was alternately

submerged; why the debris of the eroded territory became the building material for new formations; what kinds of rock were formed in various ages, and how they came to lie in regular succession on top of one another; and why certain strata were dislocated or upturned. Geology educes evidence that the earth's crust is millions of years old, and that it is in itself a large book, wherein Nature has inscribed its history as in a well-regulated diary.

Through the perpetual activity of the circulating water, the fine detritus acted the part of the moulder. Plant and animal relics were occasionally imbedded in the soft mud of streams and rivers; and, after their consolidation to the hardness of rocks, became what in later ages are styled *petrifacts* or *fossils*. These petrifications tell us the forms and character of the organisms which populated the earth in those ages in which no man yet existed on earth.

It is comparatively recently that petri-

factions have been collected and compared with the corresponding types of still living generations. A new branch of science has been thus established—*Paleontology* (science of petrification), which easily and readily furnishes us with authentic illustrations of extinct plants and animals, of every geological period. The poet's verse becomes reality: "Where man is silent, rocks and stones will speak."

With the help of geology and paleontology the relative age and position of each formation has been ascertained; those sciences have brought to light what plants and animals lived first on earth, and which genera followed in relative succession. Those sciences bear evidence, by the instrumentality of fossils, whose authenticity and argumentative strength is unquestionably superior to Moses and all the prophets of the Bible:

1. That the organic world began with the appearance of the lowest orders of marine plants and animals.

2. That the organized world was at first represented by but very few different genera.

3. That the plant and animal world developed itself very slowly and gradually, from a few genera of inferior organization, into highly organized tribes, by specialization and differentiation.

(The earliest land plants formed no fragrant blossoms; in the forests of the carboniferous age there was no odorous rose, and no butterfly flitted from flower to flower.)

4. That the animate world of bygone ages was enriched with strange and grotesque genera, now extinct.

(There were gigantic monsters, stranger than any child's imagination could depict. There were transitory genera, as, for example, intervening species between fishes and lizards, and again between lizards and birds. From strata in the Jurassic period, when the Jura mountains [of the same formation as the Black Hills, the Sierra Nevada, the

Wahsatch and Humboldt mountains—*Tr.*] were formed by marine exuvia or sediments of dead animalculæ, have been dug out the petrified relics of an animal that was in part a lizard and in part a bird, with teeth in the beak, and with a tail resembling that of reptiles, but covered, like a bird, with feathers.)

5. That the organic character of the animate world of antecedent ages approaches progressively that of the present age; that is, the progress of successive specialization has been continuous from the remotest times to the present age; and the more recent a fossil is, the nearer does it approach the present character of the corresponding species.

6. That the species and genera peculiar to each of the successive periods are related to one another by a succession of intervening species, so-called differentiations.

7. *All now known and registered facts of geology and paleontology bear upon the question*

of evolution. They teach the descent of the higher organisms from lower ones, and that there exists a blood relationship through all the organic world.

These conclusions and facts can no longer be shaken or questioned; for they are sustained by myriads of petrified documents. You find authentic evidence in the paleontologic collections of every museum in the civilized world, in such abundance that every sound and sane observer must become convinced of the truth of evolution, even against his own will. It is utter insanity or sophistry to repudiate it in view of all this evidence.

The rocks and stones, then, have testified that the Mosaic account of creation is a mistake. Every mountain in the land reveals that the very reverse of what the children of the Bible class learn is true. Our mountain ranges, and the low plains, testify against that account, that Bible version of creation. How long shall the mis-

takes of Moses, stored and fondled in the memories of the masses, crowd away the truth of science as revealed by rocks and stones?

Another branch of science, *Comparative Anatomy*, has for its province the study of the interior structure of the human body, and its comparison with that of animals, as well as the comparison of the animal anatomy of different tribes.

This science affords new evidence in support of the doctrine of Evolution, and not one of its discoveries or conclusions contradicts it.

In remote centuries, thinking men had been struck with the similarity between many apes and our own genus. Even the religious scientists of the old school have given a group of apes the appellation of man-apes, or anthropoid apes.

This striking similarity in the anatomy of ape and man has been of great service during many centuries to the science of med-

icine; for the Christian church of the Middle Ages prohibited the dissection of human bodies, for the sake of the dogma of the resurrection of the body, and students of medicine and surgery had to resort to the cadavers of monkeys in order to study *human* anatomy. The Church silently acknowledged thereby that the interior structure of monkeys was essentially one with that of man; that, therefore, the body of a monkey was but a copy of the human body, and *vice-versa*.

In fact, comparative anatomy teaches that the structure of the trunk skeleton, as well as that of the extremities, in both man and man-ape (for instance, Gorilla), discovers such a resemblance that we cannot but arrive at the conclusion that there exists a consanguine relationship between the two, inasmuch as there must have been existing common ancestors of both man and monkey, in very remote periods.

We find, for example, analogous bones

in man and gorilla, both in number and position. And the same may be said of other organs; so that the renowned Professor T. H. Huxley forms this inference: "Let us view whatever system of organs we please, the comparison of their alterations in the monkey tribe leads to one and the same conclusion, viz., that the anatomical differences which distinguish man from gorilla and chimpanzee are not nearly so great as are those which distinguish the gorilla from the inferior monkeys."

For this harmony in the anatomies science has no other interpretation than that of common origin. And the same results are obtained when we study the anatomy of any two groups of closely allied organisms, and compare the results with those obtained from the anatomical comparison of other closely allied groups of the same tribe.

Comparative anatomy further demonstrates that all the mammals have de-

scended from common ancestors, and that only after innumerable generations were higher mammals developed from lower ones, by gradual differentiation and specialization.

The lower order of mammals, anatomically and morphologically compared with the reptiles, demonstrate, with convincing force, that the earliest mammals descended from reptiles of antecedent ages.

The same is shown by paleontology, and by the comparative anatomy of plants. Every known circumstance and new discovery testifies for Evolution.

Another branch of science is styled *Comparative Biology* or *Embryology* (History of Germination). This science investigates the entire evolution of animal or plant from the very germ-cell to the state of maturity, when the organism generates new germ-cells.

This comparatively young science has afforded the most unequivocal additional evidence for evolution. Here you face an end-

less succession of phenomena, that produce admiration and conviction in the most scrupulous doubter. True, these facts are stumbling blocks to the religious, and divers other opponents of Evolution, so that they would rather evade them in silence than enter upon their discussion. But some of us other people are less discreet, and intend not to let them escape so easily; they are forced to halt, stand, and express their judgment, in view of such phenomena as, when even unborn infants, long before birth, give evidence that we are of animal origin, and that our ancestors, in slow progression, changed to human beings from having been animals.

Comparative biology has led to the discovery of a law which it is impossible to express without the assumption of evolution at starting. With such an amount of cogency is Nature manifesting her laws that the naturalist is no longer able to express those laws when he repudiates this doc-

trine, which alone is the true interpretation of hundreds and thousands of incontestable facts. I am impelled to repeat that Nature forces the naturalist to recognize evolution as a truth. One illustration will exemplify this:

By virtue of evolution our direct ancestors in the preceding epoch have been highly organized mammalia, descending again from less differentiated mammals. These, again, originated from reptiles in more remote periods; these, in their turn, descended from fishes. The ancestors of the fish types, according to the generally accepted assumption, were worm-like beings, which had their origin in still lower forms, and the earliest ancestors of the human race must consequently be looked for among those low types known to exist at the present day upon the borders between plant and animal organization.

It is safe to say that the history of the human genus—that is, the tribal history—

in the meaning of the doctrine of Evolution, commences with the history of microscopic animalcules, progressing slowly and gradually through the history of worms, and, after the lapse of millions of generations, successively through the history of fishes, reptiles, the lower mammals, up to the history of the specialized quadrumana and bimana.

I propose now to exhibit the development of a human individual:

Man begins his existence as a germ in the human ovum, which grows and becomes impregnated, like the ovum of any higher or lower animal, and shows the same type of structure. In the first stage of its development the young being resembles the germ of one of the low invertebrate animals. Then it progresses through several stages of development to vertebrate animals, of low organization. It forms, for instance, gills, as though it were to develop into a fish; that is, organs whose substance,

at a later stage, is absorbed and transformed, and which are to the young being of no service whatever; but which afford evidence whence we descend, and of what kind our ancestors have been. The brain of the foetus passes successively through all the stages of brain formation, from that of the lower vertebrates to that of the highest. The heart of the foetus is at first a kind of pipe, as is the case with other animals; later, two ventricles are formed (stage of the reptiles), and for a considerable time the human foetus possesses an elongation at the farther end of the spinal column, as though it would develop into a tailed monkey.

There is no organ in and about the human body that does not, in the course of its development, resemble the various stages of the corresponding organ of the less perfectly organized animals. Professor Haeckel, of Jena, the best hated and best abused German Darwin, has clothed this

law of progressive specialization in the following terms:

“THE DEVELOPMENT OF EACH HUMAN OR ANIMAL INDIVIDUAL IS A RAPID, AND PARTIALLY ABRIDGED, REPETITION OF THE DEVELOPMENT OF ALL ITS ANCESTRAL TYPES.”

Man passes through all the evolutionary stages of his animal ancestors in the uterus.

At his birth man has thus already passed over such a space in the history of his development as nobody would have believed in former years. Man is born like an animal, and as a suckling babe he is a very clumsy little animal. The faculty of thinking, his consciousness and his speech, in short every thing that distinguishes him from beasts, must be acquired by the child later through study and imitation.

The little child nurses, cries, and evacuates just like an animal, it is speechless and thoughtless like an animal, it is re-

ardless of shame or decency like an animal. After having outgrown its swaddling clothes, it imitates everything ("aping"): in the cradle it plays with its feet, uses them like hands for taking hold of spoons, bottles and toys, it sucks its toes as occasion offers, and exercises all its limbs with such comparative ease as though it were growing to be four-handed. All these are well-known facts, and have an intrinsic argumentative strength in support of the doctrine of Evolution.

Occasionally, when education and the influence of surrounding conditions are obstructive to the natural development of a child, it remains in the characteristic stage of a real animal. Examples of this kind have frequently occurred, in several European countries.

Like evidence for the doctrine of Evolution has been brought to light by *botanists*. But as the time I have allotted myself does not admit of giving many

illustrations, I shall briefly mention but a few instances.

The large-leaved mosses, during germination, resemble so much the green filaments of algae, that they are, in these stages, often mistaken for real algae. They doubtless took their origin from algae-like ancestors. The ferns, during their early life, resemble the lower types of liverworts, from which they evidently have descended. The conifera demonstrate in their primary stages that they have descended from the cryptogamous types of the club-moss (*Lycopodiaceæ*).

Morphology or *organography* (science of organs) is another recently developed science, that furnishes us innumerable facts bearing upon the question of evolution, and testifies in its favor, without any exception. From among the vast number of morphological facts of striking cogency, I will mention but one order, appertaining to the chapter of *rudimentary organs*.

The man-apes (orang, chimpanzee, gorilla) in contradistinction from the other monkeys, do not possess a visible tail; the rudiments of a tail may be noticed with them, nevertheless, and the like may be said of man.

Such facts cannot be reasonably explained except by evolution. These rudimentary organs have degenerated for the want of exercise, which was discontinued for lack of opportunities. Organs which are no longer of any practical use, habitually degenerate from generation to generation until they finally vanish altogether. But the presence of the rudimentary tail with the anthropoid monkeys is an argument for their descent from tailed monkeys. In analogy with this fact concerning monkeys, I may add that existing birds have a rudimentary tail, consisting of insignificant bones, while their ancestors possessed well-formed tail vertebræ, analogous to those of lizards. This has been demon-

strated by the discovery of various fossilized bird-skeletons from the Jurassic period.

Nor is man altogether free from encumbrance of rudimentary organs. He still possesses rudimentary muscles for moving his scalp, which were comparatively well developed with his animal ancestors, as shown in certain monkey species. His canine teeth are rudimentary, projecting considerably higher in his animal ancestors than in the present human race. Many individuals occasionally manifest still a truly bestial custom when in a state of rage and fury; they curl their upper lips, uncovering thus their canine teeth, evidently indicating unconsciously their readiness to fall upon the antagonist and attack him with their teeth. This gesture has become hereditary, although the teeth have degenerated and are no longer fit for that purpose. You will readily see that what the religious call total depravity, or birth-sin,

is still active in us, although our conception of it is somewhat altered.

The hairy coat of our skin is another instance. It is a rudimentary fur, descended from our animal ancestors, and degenerated.

In our abdomen we carry about us rudimentary organs. The vermiform appendix at the entrance of the large intestine (colon) is an instance; it is not only of no apparent use in our bodies, but occasionally endangers our lives, when we have accidentally swallowed the kernels of cherries, and these settle in that appendix. In various animals, such as sheep and rabbits, this organ is of some definite use, and with them it is normally developed.

Snakes have one rudimentary, and one normal lung. In birds one of the two ovaries is normally developed, the other remains rudimentary. With many species of birds the wings are rudimentary (ostrich and casuary) and no longer of use for flying; with other species the feet remain more or less un-

developed. There are species of animals with rudimentary eyes, others with rudimentary wings (insects). In many parasite species all organs are rudimentary except those of progeneration. There is none of the higher organized animal species that is not encumbered with rudimentary organs of one or another kind.

But countless are the instances of rudimentary organs in plants. There are plants with rudimentary roots, others with rudimentary stems, others with rudimentary leaves; flowers may possess rudimentary petals, stamens, pistils, or ovaries. Every teacher of scientific attainments will know of thousands of similar instances in his botanical excursions on summer days. And each instance is new evidence for evolution. Those that take delight in thinking and expressing their doubts, and proclaiming that God made these defective organs according to a well-formed plan, and that "he intended thereby to test our faith in

him," commit sheer blasphemy; for the above - mentioned instances admit of no other interpretation than that afforded by evolution; and but little glory can redound to a God who for such trifling ends resorts to so singular a stratagem.

Another science, that of *Physiology*, treats of the functions of the organs. It likewise registers countless facts in support of the doctrine of Evolution. The physiology of plants, as well as that of animals, directly tends to prove and demonstrate its truth.

The science of *Pathology*, which treats of the diseased state of the body, furnishes still additional evidence for the *consanguinity* of animals among themselves. Lack of space induces me to quote but a few illustrations: Mankind and monkeys are subject to the same diseases, and display the same symptoms. Like medicines affect their bodies in like manner. The use of alcohol intoxicates monkey not less than

man; and the symptoms of "Katzenjammer" are alike in both. The science of infectious diseases has been entirely revolutionized in the course of the last twenty years by the startling results of microscopic research, and it has been demonstrated beyond a doubt that consanguinity exists between man and the higher vertebrates; inasmuch as for the investigation of the causes of infectious diseases and the methods of curing them, *animals* have been experimented upon whenever pathologists wanted to learn in what manner diseases originate, and are curable, in *man*. Mr. Pasteur's experiments of inoculating hydrophobia upon rabbits is a well-known instance.

I may add that the experiments have been a blessing to all humanity without any exception; to the friends of Evolution not less than to the opponents; to the scientists as well as to the high priests of ignorance, who so often sound the signal of attack in biological controversies and always

“get left.” I wonder whether this latter sort of people would really choose rather to suffer death than have themselves vaccinated with animal lymph, whose curative, that is, preventive power has been discovered only by means of experiments, founded upon the consequences drawn from the doctrine of Evolution. I think we may safely expect them to say that they will test the assistance of the infidel operator, before surrendering unconditionally to certain death. In such urgent cases these gentlemen will generally *act* more reasonably than they at other times *talk*.

I shall adduce two more branches of natural science which afford not less incontrovertible evidence for evolution, namely, the *Geography of Plants and Animals*, treating of the distribution of plants and animals on the earth, and the *Comparative Psychology of Animals*.

The latter science, one that is right in its ascendancy in regard to scientific research,

has already become a rich mine of arguments and evidence for Evolution. A careful comparison of the psychological faculties of men and animals rewards careful inquiry with some startling revelations. It shows that the so-called mental faculties of man are in general not essentially different from those of animals, that is, that they are different only in degree, not in kind. In man the rudiments of his mental faculties are inherited from his animal ancestors. Those of my hearers who would like to learn more about this subject will find ample evidence in Darwin's work, *The Descent of Man*.

In concluding and summing up I wish to repeat that there is not a single branch of natural science, no matter whether it treats of living or extinct species, which does not afford ample proofs of the truth of the Evolution theory. And this fact signifies no less than that—

The Whole Animate World is One Absolute Proof of Evolution.

It is not the merit of this century that this doctrine has been universally acknowledged and accepted, nor is it the merit of any one particular individual. The conception of this thought was an outgrowth of the progress of the sciences, and it was naturally ripening toward maturity, until the latter were advanced enough to raise the hypothesis to the dignity of a proven truth. The metaphysical speculations of man are subject to the laws of Evolution not less than his material organs; and the development of a simple hypothetical thought to the state of a recognized entity, or of a glorious truth, is certainly a natural phenomenon. Scientists need add nothing to a truth; they are mere discoverers and exponents of truth.

III.

DARWINISM PROPER: VARIATION AND NATURAL SELECTION IN THE STRUGGLE FOR EXISTENCE.

LADIES AND GENTLEMEN:

HAVING learned that the naturalist of the present day cannot be any longer in doubt about whether he is to adhere to Faith or to the recognition of Evolution; that of necessity, he must profess the latter; and that everyone must do so who devotes himself earnestly and conscientiously to any branch of natural science; it still behooves us to show by what means, and in what manner, Darwin supported this doctrine and procured for it universal acknowledgment. We shall, therefore, center our attention on

Darwinism proper; that is, *Natural Selection in the Struggle for Existence.*

I must repeat once more that whether this latter theory stand or fall, the process of Evolution remains a stable fact and truth.

It is likewise worthy our notice that a biologist of the present day cannot suffer himself to blindly accept the theory of Natural Selection as an established truth, but that he must be ready at all times to accept of anything *better*, provided it be intrinsically worthy to be a substitute for the *good*, or in other words: We await with serenity the rise of new ideas and new theories or hypothesis, and are ready to give up Darwin's theory of Natural Selection as soon as a better, more rational, and more generally acceptable theory makes its entry into the scientific arena. Such has not occurred up to this time, although attempts have been numerous to substitute other theories in the place of Darwin's.

But up to the present day Darwin's theory has always come off victorious, and it is consequently well worth while to subject it to our contemplation.

Like every true naturalist, Darwin ever started from known certainties, and proceeded then to set other facts which appeared to him unintelligible and enigmatical in juxtaposition to the former for the purpose of comparison. First he studied the phenomena of artificial selection, as practiced in the art of breeding plants and animals. From the results so acquired he formed conclusions in regard to similar phenomena in free nature, and ultimately fell upon the idea of Natural Selection in the struggle for existence, in obedience to which new varieties and races are forming in free nature, in a like manner as horticulturists and stockbreeders are able to produce them under their own control and direction.

In his theory of the Origin of Species Darwin starts from the fact that all ani-

mals and plants manifest a faculty of varying in a greater or less degree in the development of characteristic properties. Of this faculty every one may have knowledge in various instances, and that it is a fact you may yourselves ascertain, provided you use your senses without bias or prejudice, and employ them in acute observation.

Upon looking around us in a large public assemblage of people we shall search in vain for two exactly equal persons; for each individual is distinguishable from all others by certain marks or properties, by which one man differs from another, one woman from another, one child from another. These various marks or properties by which individuals differ one from another are called *Individual Characteristics*.

In the face of each person there are some individual features, which in each succeeding generation vary to a greater or less degree, but which give each individual

a peculiar distinctive expression. It is said that Napoleon I, after having but once looked into one of his soldiers' faces, would identify that face after many years, from among hundreds of thousands of soldiers who wore the same uniform of his army.

The same kind of individual characteristics may be noticed in animals. Thus stockbreeders will distinctly know one horse from another, one dog from another, one bird from another. Bees are distinguished from other bees, sparrows from other sparrows, ants from other ants. Despite the similarity of lambs, every shepherd will tell you one from another; what particular lamb he has lost, or bought from another flock. Every hostler knows his nag from among thousands of cavalry horses. It must be a fact, then, that each animal has its distinctive characteristics. Such is the case with plants. There is not one plant that resembles another plant of the same species and variety in all particulars. In the most

extensive pinery you would in vain look for two trees which are alike in all attributes, and no insignificant moss plant exactly resembles any other moss plant in a hundred thousand specimens.

When you walk across the fields you easily distinguish spelt plants (*Triticum Spelta*) from wheat plants (*Triticum vulgare*).

The distinctive properties by which we tell spelt from wheat, and which belong to all individuals of the same species or kind, are called *specific characteristics*. They are more or less enduring (constant) more or less unchangeable, and pass from generation to generation for hundreds and thousands of years. But in the wheatfield you will look in vain for two exactly equal wheat stalks or wheat ears; and each individual plant distinguishes itself from all other plants by those easily alterable individual characteristics, which in each generation vary more or less.

Again, take a glass full of polluted water for examination under the microscope. The microscopist will look in vain for two exactly equal animalcules, though there may be millions passing across his lens.

We may thus in safety repeat that there are, among all the living plants and animals of to-day, no two individuals of absolutely the same characteristics; in other words:

All animate beings—men, animals, plants—are variable.

True, the distinctive properties are mostly so minute that it requires a skilled eye to recognize and analyze them. A little child imagines that all sheep of a flock are entirely equal, so that one might be mistaken for another; but the shepherd smiles at such want of discrimination.

The *Variability of all Organisms* is a fact, and no man of common-sense can question it anymore. Darwin founded upon it his theory of Selection.

Another fact is the *Heredity of Individual Characteristics*.

It is a popular saying, "Like father, like son." Common people intend to express thereby that parental characteristics are being transmitted to descendants by virtue of inheritance.

Stockbreeders and horticulturists have observed this tendency and acted for centuries in accordance with it. Wild animals have been tamed by them, and in the course of many generations the minute variations of particular individuals have been multiplied by way of heredity. New forms, new races, and varieties have been formed by careful attendance to the process of procreation. Certain individuals were either admitted to procreation or excluded from it, according to the purpose had in view. Thus new kinds of pigeons have been raised, so extremely different in their specific properties from the common ancestors (rock pigeon) that they might be

taken for new species, or even new genera.

These occurrences of heredity, which have been examined more closely of late, have led to the formation of the so-called *Laws of Heredity*. I have neither time nor space to enter fully into all of those laws here, but shall quote a few of them, especially those that are requisite for the comprehension of Darwin's doctrine of Natural Selection.

In the first place, I must draw your attention to a group of instances that elucidate the law of *Conservative Heredity*, by means of which long existing characteristics, transmitted through many generations, have become constant. It is a general fact among plants and animals that those properties which have been transmitted through many generations are almost certain of being transmitted to succeeding generations. As an instance, you find fingers and toes of man transmitted for thousands of years, beginning from his early

ancestors and continuing to the present generation; the same is to be said in regard to the erect gait, the nudity of his body with the exception of few spots, the faculty of thinking, the power of imagination, the use of tools, etc. The fox transmits to his offspring his gait on four legs, his pointed nose, his bushy tail, and his proclivity to piracy. The oak tree transmits to its descendants the peculiar shape of its lobate leaves, its knotty bark, its peculiar cup and acorn, the littleness and insignificance of its blossoms, with as much certainty as the little snow-drop perpetuates its onion-shaped stock, and the white, trembling corolla with its six petals and its six epigynous stamens.

In the second place you will notice a group of instances of *Latent Heredity*. Here we observe that certain individual characteristics are not directly transmitted from either of the parents to the next, but to the second or third generation. The char-

acteristics descend in a state of latency through one, two or three generations, and appear only in the fourth, with seeming abruptness and in full development. In some plants this kind of heredity is manifested so regularly that the periods of interruption are scientifically computed, and the reappearance of a characteristic in a subsequent generation may be foretold with more or less certainty. But in most plants and animals such instances of latent transmission are of frequent occurrence, and the like may be said of man. Certain talents and faculties may descend for a long time from parents to children, then vanish abruptly in one, two, or three succeeding generations, and make their reappearance in grand-children or great-grand-children, who then resemble their early ancestors in those particular faculties or talents. Musical talents descend very often from parents to grand-children, failing to appear in the children,

in whom they remain only latent. The same observation has been made in regard to mathematical genius, to inspiration for scientific research, etc. Charles Darwin's grand-father, Erasmus, was a renowned naturalist, whereas his father was not particularly fond of scientific studies; but Charles Darwin outshone all his ancestors. In like manner mental defects and diseases descend, often with a latent intermission of one generation, from parents to grand-children; and similar intermissions occur with regard to consumption, and other physical diseases. The physician who enters upon the treatment of a consumptive person, inquires not only into the physical health of his parents, but also into the causes of the death of both his grand-fathers and grand-mothers, because he recognizes latent heredity to be not a mere hypothesis, but an absolute certainty.

It is a fact of not infrequent occur-

rence that divers characteristics remain latent in one family, through a long series of successive generations, whereby those properties seem to be totally extinct, until they make their appearance suddenly, without any warning, affording new evidence of what the *early* ancestors, have really been. This sudden reappearance of seemingly extinct characteristics is called *Retrogression* or *Atavism*.

The numerous instances of atavism in both plants and animals are among the most interesting evidences of evolution. Such cases often point back into a very remote past, to a much lower stage of organization of a species. Some examples will demonstrate this.

Our horses are whole-hoofed animals (solidungula); that is, they have but one toe on each foot, in contradistinction from the ruminants with two toes, and from the many-hoofed animals (pachidermata). The primeval ancestors of the horse type had

five toes on each foot. Gradually, in the course of millions of years, the five-toed horses (*Eohippus*) of the lowest Eocene deposits of western North America evolved into four-toed ones (*Orohippus*); these again into three-toed ones (*Mesohippus* and *Protohippus*). From the latter form evolved by further differentiation the one-toed horse, such as it is in our day. The transitory forms have been discovered in a fossil state in North America, and to-day most horse breeders know that the present horse type has not always been as it is now, and that its ancestors possessed first five, then four, and afterward three toes on each foot, and that by gradual disuse and consequent atrophy of the first and third toe, the three-toed horse evolved into a one-toed one. Or, in other words, that the ancestors of our horse were never possessed of two toes only, and that the one-hoofed animals do not descend from two-hoofed (ruminant) ones. To this must be

added that occasionally atavistic forms are born, that is, individual horses with supernumerary toes on their feet, which appear organized like those of the many-toed ancestors in the Tertiary period—that period when the Alps and the Rocky Mountains were rising at last from the sea, and were receiving their final configuration.

The human body is not less likely to return to atavistic forms. Observations have been made that, for instance, the canine teeth developed to an uncommon prominence above the neighboring teeth, as in the dentition of the monkeys. Great wonderment is occasionally excited by the birth and development of so-called hairy individuals, whose whole bodies are covered with a dense and long fur, such as must have adorned our primeval animal ancestors.

I may here mention another sort of atavistic recurrences that not infrequently happen. Some human embryos, which up

to the third or sixth week of their development are always possessed of an easily observable tail, do not lose that appendage, but retain and develop it, so that such individuals, in their mature state, have, in fact, at the lower extremity of the spinal column, a still visible tail, covered with a tuft of hair (*Cosmos*, vol. x: Die schwanzartigen Bildungen beim Menschen).

Of comparatively frequent occurrence are the atavistic forms in cultivated plants and domestic animals. People call this a degeneration.

In the wild-pigeon varieties, which have been bred for the last two thousand years, and which have been proven to descend from one single form, we often meet with characteristics that belonged to the primitive ancestors, and descended latently through whole centuries; as, for example, the dark stripes across the feathers of wings and tail. In horses and asses stripes sometimes appear upon

the body, reminding us of the striped common ancestors of those species.

Of the countless instances of atavism in the kingdom of plants may be quoted but a few. Most of the higher species of plants have androgynous blossoms, that is, their blossoms contain both kinds of sexual organs, pistils and stamens. But some of these species have differentiated to such a degree that at present one portion of the blossoms produces only pistils, and the other portion only stamens, as, for example, the nettle, hemp, Indian corn, the sedge grasses (*Carex*), the palm trees, the catkin-bearing plants, *Lychnis diurna*, and *Valeriana dioica*. The careful observer, however, notices very frequently in some blossoms the pistils and ovaries in full development, but at the same time some stamens in a rudimentary form, while in staminate blossoms he may notice all the stamens in full development and the ovaries in a rudimen-

tary condition. These rudimentary organs alone go far to prove that these species descended from hermaphrodite or androgynous ancestors. In addition, however, we may occasionally observe in such species fully developed hermaphrodite in the place of one-sexed flowers. These are actual and incontrovertible evidences of atavism, and are demonstrative of a return to the primitive ancestral type.

In many colored flowers, especially the labiates, the petals form irregular and differently shaped masks, sometimes with honey-spurs at the rear end. Occasionally specimens are met with in which the ordinary lip-shaped petals form regular corollas having all the petals uniform. Such formations have been noticed in the Toad-flax (*Linaria vulgaris*), in some orchids, and in certain other plants. The irregularly formed blossom, therefore, occasionally returns to the primitive shape of its ancestors.

Of much greater significance, however, are the phenomena of *Progressive Heredity*, that is, the transmission of recently acquired individual characteristics and peculiarities to succeeding generations.

Some people acquire short-sightedness by intense and long-continued exertion of their organs of vision. I know an instance of this kind within my own experience. A normal-sighted boy of fifteen was taken from field work and sent to a high school in 1859. He was set to study most unreasonably, so that after half a year's strenuous application to his studies in school and at home, the youth became remarkably short-sighted. This defect was a consequence of over-work in school; and I am sorry to say that the mode of hot-house forcing is gaining ground everywhere; so general has it become that short-sightedness exhibits a remarkable increase. Now it is well known that short-sightedness is not only acquir-

able by misuse of the eyes, but that it may also be transmitted by heredity. Both parents and grand-parents of the lad were normal-sighted, but the children are running the risk of becoming short-sighted by virtue of heredity, and for the reason that the pernicious custom of over-straining the eyes of the school population has not been abolished since 1859, but rather the reverse.

Similar observations are being made concerning the disposition of individuals to consumption. This terrible disease is the destroyer of modern humanity, and is especially the disease of the proletarians. It may be acquired through hard work and insufficient nutriment by everybody, but experience has proven that it is acquired also by heredity. These two facts call for proper measures on the part of the legislatures and other state authorities; for by heredity the predisposition of individuals to this disease is

growing steadily to such a degree that entire families and houses are on the point of extinction.

Moreover, everybody is acquainted with the heredity of the facial and cranial peculiarities, of the stature, of the muscular structure in regard to leanness, size, beauty, ugliness, etc., all of which may be inherited from generation to generation.

Intellectual endowments, moral and immoral propensities, of comparatively recent acquisition, are inheritable. Musical talents descended in the renowned family of Sebastian Bach, through many generations; mathematical genius in the family of the Bernoullis; linguistic talents in the family of the Schlegels; inclination for scientific research in the families of De Candolle, Darwin, and St. Hilaire; genius for painting in the family of Kaulbach; inspiration for belles-lettres in the family of Dumas.

Insanity in various forms, the consequence of cerebral imperfection, descends with facility, and often with a frightfully increasing intensity.

Nor are the passions of drinking, gambling, lying, fraud, etc., exempt from this law of heredity. The mania for swindling, theft, robbery and murder has been delineated through several generations in certain families, so that the most careful education often fails to bring about adequate improvement.

Here is a case of heredity, though the crimes of the first four are not specified:

Jean Chrétien, a Frenchman, had three sons: Peter, Thomas and John Baptiste.

1. Peter had one son who was sentenced for theft and murder to imprisonment for life.

2. Thomas had two sons; Francis, who was sentenced to the penitentiary for murder; Martin, who was sentenced to death for murder. Martin's son died in Cayenne,

whither he had been deported for theft.

3. John Baptiste had one son, John Francis, who married the daughter of an incendiary and had seven children from his wife: John Francis, Jr., who died in a house of correction where he had served for repeated thefts; Benedict, who was inoffensive; he died of a fall from a roof. F——, alias Clain, who died at twenty-five as a relapsing thief; Mary Regina, who died in prison, sentenced for theft; Mary Rose, who died in prison for same offence; Victor, still in prison in 1870 for theft; Victorine married one Lemaire, is mother of a son who was sentenced to death for theft and murder.

We see thus that from among the offspring of a single individual ten persons, sons, grandsons, and great-grandsons, were endowed with vicious propensities, that caused their ruin, and descended to them through three or four generations.

No class of people is more strongly

convinced of the law of progressive heredity than breeders of cattle, gardeners and farmers. They know that but for this kind of (progressive) transmission no new varieties and races would be bred.

The "very best" individuals for breeding purposes are generally but little different from the "good" kind; nevertheless these very best individuals are sold at comparatively extravagant prices. In the winter of 1873-74 a bull of the Simmenthal stock was bought at the price of 18,000 francs, (\$3,600); which proves that people believe strongly in the heredity of even recently acquired virtues.

Cattle breeders, horse dealers, poultry breeders, etc., are wont to build no air castles, but nevertheless pay exorbitant prices for excellent beasts; they would not do it were they not sure of profitable returns.

An English race horse, King Herod, won the day in divers races, and drew in prizes an aggregate of \$1,000,000, and was

father to no less than 497 direct descendants, all of which won prizes over other racers. Another race horse, Eclipse, had 334 descendants.

These few facts lead us to what may be defined as the

ESSENCE AND RESULTS OF ARTIFICIAL
SELECTION.

In what manner does the gardener and breeder produce new varieties and races? Man cannot accomplish any essential alteration in any single vegetable or animal individual, because it is but little variable. The hardy violet, transplanted into the garden, preserves its original form. The fox which is caught alive in the woods, and afterward imprisoned or chained to the barn, remains about the same beast that he was in liberty. But man has been able, in the course of successive generations, to produce new races or varieties simply by rational *selection of the individuals employed for procreation.*

The essence of artificial selection consists substantially in the following procedure: Among many plants or animals of the same kind, the breeder selects a few individuals, which he deems the best suited for securing a progeny that will answer his intention. They are those individuals which distinguish themselves most from all the rest, by some advantageous deviation of greater or less intensity. These the breeder uses exclusively for procreation, destroying all other individuals, or preventing them from breeding. In the second generation he proceeds in the same manner again, and repeats this selection with the utmost rigor in the third, fourth, fifth and all subsequent generations, until the desired race or variety is obtained, and has acquired the faculty of transmitting its valuable qualities in a greater or less degree.

The principal rule for obtaining certain and efficient results consists in selecting

the very best individuals for procreation, and excluding all the less favorable individuals from it. Breeding, then, is the simple preferment of some exceedingly good individuals and the extinction of the less valuable.

In this manner gardeners and farmers have succeeded in forming varieties of the following descriptions; plants bearing large fruit, or small fruit; plants bearing fruit with a thick peel, or with a thin peel; plants bearing sweet or bitter, mealy or juicy, early or late fruits; plants with large or small leaves; plants bearing few or many, long-petioled or short-petioled leaves; plants with thin or thick tap-roots, etc.

Rational and expert breeders have accomplished marvellous achievements. For example, Prof. Hoffmann, of Giessen, raised, in the course of a few generations, from the wild violet a variety whose flowers were four times the diameter of the original blossom. The currants which are raised in

England, with much attention, have attained a size that is ten times larger than that of one hundred years ago. The wild Scotch rose has differentiated into eight good varieties in the course of no more than ten years. The saccharine percentage of the sugar-beet increased in France to twice its former ratio since it has become a staple in that country. Peas have been raised that will ripen three weeks sooner than the former varieties. By means of artificial selection the wild pear and the wild apple have differentiated into many thousand varieties.

Exactly the same method is pursued by the breeder of animals. He selects the most beautiful or most useful young individuals of a kind, and admits them exclusively to procreation, taking good care that the rest of the family remain sterile or become extinct. In Saxony the young lambs selected for breeding purposes are examined and decimated three times be-

fore being used; and from among all lambs that have been weaned, only those are permitted to live that possess the finest wool; this fact being ascertained by the use of the magnifying lens or microscope. The selected animals are then marked, and after one year subjected to a new microscopic test, similar to that of the first year. At this second review only the best lambs are retained, and after one more year examined for the last time. None but the most favorable animals are admitted for breeding. The results were such that a variety of sheep was obtained whose wool was twelve times thinner and finer than that of the common stock. In a like manner man has succeeded in improving animals, not only in one, but in several directions simultaneously. Useful and profitable qualities may thus be accumulated and transmitted with increasing certainty.

Gradually, variations of little consequence evolve to such an intensity and importance,

that doubts may be entertained as to how the primitive form was constituted. In Darwin's life-time such was the case in regard to the original type of the pigeons. It was he who by experiments in breeding finally demonstrated with cogent reasons that all domesticated varieties of pigeons had descended from one primitive kind; whereas, before his time it was by many held that they were descended from different wild varieties.

While there exists no doubt that the diverse varieties of horses, the clumsy cart horse, the fleet racer, the active pony, the Arab steed, are descended from the same primitive horse, there are many theories as to whether the different *species* of other animal families also had but *one* original progenitor or if each of them had their special ancestor. Such is the question about the varieties of dogs and cattle. The discussion of this and of similar questions shows evidently that the faculty of variation of

both plants and animals has, in the lapse of many ages, resulted in the acquisition of enormous differences. It is in accordance with truth, when Darwin maintains that by means of artificial selection, man is able to produce marvellous results from the moment when a plant or animal has commenced to vary. The English horse breeders have surpassed all heretofore accomplished results, and there have been laid heavy wagers that certain new varieties could be produced. A breeder of swine demanded of his employees that they should breed only short-legged hogs, for the reason that the legs were not fit for storing lard in them. A few years later the market was filled with the required variety of hogs, which had legs so short that the poor beasts could hardly keep their bodies above the ground.

Intentions and purposes are so manifold in breeding that the surest way to success is to pursue but one at a time.

It is hardly practicable that cattle, for instance, should improve simultaneously in regard to both the accumulation of flesh, and the increase of physical strength and milk. Too many things cannot be united in one individual, as one special quality often precludes the acquisition of another. The rational insight into these relations has brought about the forming of totally divergent, even opposite, varieties. By way of artificial selection the following varieties of animal species have been obtained—short and long-legged dogs, cows rich and poor in milk, sheep with fine and coarse wool, other domestic animals with long and short hair, swift flying carrier pigeons and tumblers, very heavy and very light pigeons, etc. The fleshy sort of pigeons weigh five times as much as the smallest.

I must needs call your attention to a peculiar fact, viz., that breeders and gardeners will accomplish their projects all the sooner when they select their breed-

ing individuals from among a greater number than when they have but a limited number to select from. This is almost a matter of course; for there is a better chance of getting suitable individuals from among a great number than from among a smaller number. In sterile and poor districts we can hardly expect a good breed of sheep or cattle. A dog breeder's answer to an inquirer concerning the method of his success is remarkably indicative and to the point, "I raise many dogs and hang many." The stricter your policy in breeding, the sooner will you accomplish your purpose:

We now enter upon the most important inquiry: *Are there also new varieties forming in free nature where man's influence and selective policy is totally out of question?*

Darwin answers in the affirmative, and supports his answer with the doctrine of

Natural Selection in the struggle for life,
the latter founded upon

*The Great Power of Multiplication of All
Animate Beings.*

Every animal, plant, and human being has but a limited time to live. Ultimately the body dissolves; the atoms that have made up his organization scatter and enter upon some other office in the household of perpetually generating and dissolving nature. Many lament the imminent necessity of death, overlooking the fact that all of us who are living to-day and rejoice in life and light could not be in existence if death was not. Death is the end of the individual, but it is also the greatest benefactor of the universe. Without death there could be no progress; progress alone is life, and thus death of the individual is the main-spring of life in the universe.

Those who recognize Nature to be the universal mother can not possibly be

afraid of death. Life is conditioned upon death only. When our physical organization exercises itself merely in long-trodden tracks, like a well-regulated machine, and when our ability to change diminishes and is nearing stagnation, we shall have forfeited the right to longer exist. The ever-recurring phenomena of the exterior world become oppressive to us; we become antagonistic to almighty life, and should submit to the eternal laws of nature with placid resignation, and in the furtherance of our own individual happiness. Our individual life-time is a piece of eternity, our individual existence but an infinitesimal portion of the eternal Universe. As this latter is never subject to annihilation, so will our individual being, as part of the universe, never vanish into comparative nothingness. This contemplation will act upon us as a consolation when on our death-bed.

Eternal Nature, to thee my soul shall cling!
All that I am thou gavest me,
And givest still each day to me anew.
I will not deem myself as more than thee;
Let me return to thee in death,
Partaking of thy rest, and of thy regeneration.
—BALTZER.

In nature life is ever manifest, because it never rests. The forms it creates are ever changeable, crowding one another into existence and into death again. The dropping stone obeys the law of gravitation; so are birth, growth, and death but natural phenomena, brought about in obedience to the eternal laws of nature. Birth is necessarily superseded by death, and death is followed by transformation and regeneration.

This inevitable transformation finds its expression in the capacity of multiplication, which is inherent in all organisms, and constitutes such an inexhaustible treasure of vital energy that we can hardly form a just conception of its character.

It is a capacity common to all animate beings that when they have reached a certain size they begin to multiply. In the lowest types of life this process takes place by way of division into two equal parts, each of which develops into an independent individual, and afterward again divides. It has been ascertained that some schizomycetes (lowest kind of algae) double themselves under favorable circumstances (in the proper nutritive liquids and with favorable temperature) every twenty minutes; that is to say, that one germ multiplies within one hour to eight individuals, at the end of another hour to sixty-four, at the end of the fourth hour to 4,096, at the end of the sixteenth hour to above two hundred and eighty-one trillions. The fungi that infest rotten potatoes, those that discolor the vine leaves, and those that compose the rust on the leaves of corn, multiply so rapidly that a few weeks will suffice that,

from one rotten plant, these pests shall spread over whole counties, and the whole crop be spoiled or destroyed. My assistant, Dr. Overton, who examined into the process of reproduction of a minute alga (*Volvox minor*). in 1888, has computed the multiplying power of that species, and found that one individual specimen may have a progeny of 60,000,000 in the lapse of thirty days.

A single leaf of the common male fern (*Aspidium*) can form fourteen million spores qualified to germinate under favorable circumstances, so that a healthy fern plant, during one summer, can produce several hundred millions of germs for new plants.

Less excessive is the power of reproduction in the flowering plants (*phanerogamia*), and yet the number of seeds annually produced surpasses imagination; for example, a plant of the common poisonous henbane (*Hyoscyamus niger*) pro-

duced 10,000 ripe seeds in one year. A large pear tree has yielded 4,000 pounds of ripe pears, seven of which weigh one pound. The ripe pears of that tree amounted, therefore, to about 28,000, each of which contained on an average ten perfect seeds. That tree, then, yielded in one year above 250,000 seeds.

What an immense number of seeds does an oak tree, a beech tree, a lime tree, a pine tree, an alder, an ash, a juniper, a dandelion, a poppy or a thistle produce!

Wherever we turn our eyes, in the vegetable kingdom there are a hundred, or a thousand, or even a million times more seeds formed annually than there are living individuals that produced them.

And so it is in the animal kingdom. Many microscopic animalcules multiply at such an incalculable rate, that within a few days the progeny of a single indi-

vidual may amount to hundreds of thousands and even to millions.

We know of a species of the Holothuridae, which frequently infest the small intestines of children (*Ascaris lumbricoides*), that deposits as many as 60,000,000 eggs in one year. The codfish (*Gadus morrhua*) develops annually from three to five millions of eggs. A female carp can produce 200,000 eggs, and a herring 40,000. The more highly organized animals are less prolific. An ostrich lays annually not more than 20 eggs. But had all these eggs opportunity to develop into birds, and were these birds permitted to multiply at the same rate, it would need but a few generations before the entire dry land of our globe should be populated with them.

Many mammals are so prolific that, in consequence of their rapid multiplication, they occasionally become living plagues. You recollect certain occurrences

in your own life when, for instance, the field-mice increased in a disastrous proportion. Rabbits are so prolific that a breeder raised in one year between eight hundred and a thousand young from ten animals. These creatures were introduced into Australia by some colonists; but after some had escaped into the open fields, they became such a pest to the farmers that the legislatures enacted special laws for the purpose of annihilating them. In New South Wales alone there were bounties paid by the government, from 1883 to 1888, amounting to nearly 4,000,000 dollars.

Man multiplies but slowly, as experience tells you; much slower than he might do under more favorable circumstances. Should all adult persons of good health live in the married state (the fact that such is not the case goes far to prove that there exist social abnormalities and a partial decadence of morality), and

should each couple raise but four healthy children, who after attaining to maturity should do like their parents, we should experience the duplication of the entire human population on earth in every twenty-five or thirty years, provided there was no lack of sustenance. In fifty years the population would increase to four times the original number. The absence of this phenomenon indicates that there are obstacles and hindrances in the way of progeneration; the causes of which it is not our task on this occasion to examine.

Summing up and reviewing the results of the foregoing considerations we may safely form the following conclusion:

Nature has provided the whole living world with such a power to multiply that the whole globe is crowded with animate beings, though but a small proportion of the germs of life attain their natural development.

The consequent obvious waste of gen-

erative power demonstrates with rigorous force the existence of

THE STRUGGLE FOR LIFE.

This phrase has become the pass-word of civilization. All of us have heard it, and most of us have used it over and over again, painful and distressing though it be.

Darwin gave it out. Many did not acknowledge its verity, and urged its inappropriateness, incompleteness and clumsiness. I suppose they had just risen from the velvet cushion, or from a plentiful, delicious dinner, or breathed the mellow air of a palm-house, or been dozing away in sweet idleness, and dreaming of the joys of life. But I think they neglected to observe, reflect, learn; they are those fortunate ones who repudiate the idea of the struggle for life, because they have never struggled. Shall we envy them? I think not. Blessed be that idea, blessed the thing itself, the ever-acting

lever in nature and society, the ever-onward-urging force that propels, grinds and annoys, until each individual accomplishes the very utmost, and thereby contributes his share in the process of universal evolution! He who knows nothing of that struggle for life from his own experience has not obtained the fullness of human dignity, is poorer than the tramp and beggar, though he be seated with royal authority. To live is to struggle. Those who need not struggle cannot have a true conception of life.

The struggle for life is so diversified, and appears under such manifold conditions, that it actually requires intense mental application to recognize it in all its phases. It attains its most forced manifestation in a tragic encounter between two evenly matched contestants, each of whom stakes his life for the prize of victory, where but one is permitted to live. In such emergencies the

fight closes with bloodshed, and ends with the death of the defeated. In America the struggle for supremacy, and possession of the land, has been waged for four hundred years and is still going on, between the aborigines, the roving, hunting, followers of Nimrod, and the Caucasian race, the tillers of the soil. The Christian consciousness of the pale-face was not engrafted strongly enough to raise him to that sublime alternative which Abraham proposed to his kinsman Lot: If thou wilt take the left hand, then I will go to the right; or if thou depart to the right hand, then I will go to the left (Gen. xiii, 9).

In the time of the great migrations of nations in Europe entire nations fought successively in bloody strife for continued existence.

Asiatic and semi-Asiatic barbarity may in a near future challenge with brutish force the occidental civilization and hyper-

culture. Brutality and numerical superiority being aggregated on the one hand and refined strategy and intellectual superiority on the other, it is obvious that the ensuing slaughter will be the bloodiest ever recorded in history. No living man can foretell with certainty whether the Asiatic cyclone will or will not take its course over European culture. One thing only is certain, that mankind is yet far away from humane thinking and humane acting.

In like manner as the nations destroyed one another in their struggle for life, so, since life began to pulse on our globe, have plants and animals been in perpetual competition among themselves; plant species contesting with plant species, animal species with animal species.

Noiselessly the struggle goes on in the vegetable kingdom. Wherever there is to be found a vacant spot in free nature, wherever a plant dies and decays, there

gather a multitude of competitors for the vacancy; for we know that nature produces a thousand times as many germs as are requisite to replace the decayed individuals. On the sunny border of the pine grove you notice the centenarian pine tree, tall and slender, which annually scatters about it thousands of perfect seeds, all equally fit to develop. Many of them sprout during the life-time of the mother plant; but not before the latter dies, be it through a lightning flash, by a hurricane, or by the axe of man, can any of these daughter plants secure their natural full growth. But there have been thousands of germs equally competitive against one another, and against germs of different other species, all of which strive and compete for the same territory.

Which of these thousand competitors will vanquish all the others? A school-boy would reply that it certainly cannot.

be the weakest one; it must be the strongest and fittest.

At first there is a struggle for the vacant spot between the growing descendants of the same plant, among themselves, and each subsequent year some of them, of course the weakest, succumb. Gradually there will be a less number year by year, and the struggle for life will continue with the same constant display of rigor and obstinacy, until but one of the competitors is left, all the rest having been vanquished and destroyed.

In the silence of the shadowy forest, where scarcely a breath of air stirs the leaves of the trees, where Nature in a semblance of paradisaical luxury labors and cosily dreams, while a glaring sun makes the atmosphere tremble with heat, there die every minute thousands and thousands of individuals and germs in the competition for existence. The plants compete for the soil into which they force their roots; they

compete for the water that is retained in the soil; they compete for air and light. And if you will but apply your attention to close observation, you will everywhere notice innumerable phenomena expressive of the most rigorous struggle for existence, by virtue of which there is going on a perpetual process of correction, extermination, exertion of all the stored-up vitality, and formation of useful aids and substitutes—in short, a process of improving the few and exterminating the many.

Nor, in the animal kingdom, is this struggle for existence always combined with direct bloodshed, or with vocal utterance; but without all that it is not the less decisive. Death from starvation, by which millions upon millions of animals perish, is but one out of many forms of the end of this struggle. Lucky instincts, a greater measure of intellectual power, or some other favorable influence, is sufficient to preserve one or the other animal from

starvation, whereas thousands of competitors must inevitably perish.

You can easily form the conclusion herefrom, yourselves, and Darwin's statement of this process will doubtless meet your assent:

That in free nature, without the intervention of any premeditating, planning being, there exists a process of selection.

Of the innumerable competitors for existence none but the fittest survive; that is, the ones who are armed against the surrounding hostile circumstances. All those less fitted perish sooner or later; they are being exterminated in the impartial, cold, naked struggle for existence.

This is NATURAL SELECTION.

If we remember that all living beings have a tendency to variation, and that very frequently these insignificant differences may become hereditary, we apprehend at once that by natural selection, by the process of Nature's picking out, new varieties

and races may be formed as well as by artificial selection.

Victory in the struggle for life depends often upon minute differences. But by progressive heredity these minute differences may accumulate to remarkable quantities, which in the lapse of many generations accumulate to those typical differences that are known as *specific or generic differences*.

An instance from the animal kingdom will illustrate this. Let us suppose, for the sake of argument, that a certain number of birds of prey which live on small mammals have been driven from one country into another, where their chief article of nutriment, small mammals, is but scanty, so that they are reduced to live mainly on, say, mice. These birds have brought with them the habit of soaring high up in the air and spying thus for prey. Now, it is a matter of course that in this new country the birds armed with

the sharpest eyes are possessed of an important advantage, as against their hungry but less fortunate competitors. For, they succeed in catching prey, live on a rich diet, and multiply; whereas their brethren, with weaker eyes, are doomed to starve and die without offspring. As the survivors, which owed their survival simply to their better organs of sight, breed a new generation, their young will number a greater proportion of good-sighted birds than did the parent birds; although there may be some among them that are again possessed of medium eyes. Of this generation the best-sighted birds only can survive and generate young ones. According to the law of Natural Selection the subsequent generations will have eyes of increasing sharpness and strength, and consequently, in that country, simply by continued natural selection, without the interference of any higher intelligence, a new type is forming out of the old one.

We say of the new type that it has *adapted* itself to the new conditions.

In the *vegetable* kingdom the naturalist meets thousands of kinds of adaptation made in accordance with the law of Natural Selection, where the minutest variations have decided for or against survival. I need remind you only of the relation between flowers and insects. Insignificant flowering types have in the course of generations acquired sweet-smelling or splendidly colored flowers, for the reason that these were the oftener frequented by insects which determined their fertilization, the more they were provided with beautiful, or honeyed, or sweet-smelling flowers. The gorgeous coloring of certain flowers is not the product of a creator, who plans and creates in pursuance of certain aims and ends, but it is the result of the process of natural selection.

Volumes have been written and published treating of the marvellous contri-

vances in flowers by which their fertilization from without is facilitated, and of the ways in which natural selection takes place among flowering plants. Each week the botanical literature is enriched by additional descriptions of newly discovered accommodations and relations between flowers and insects. It is but recently that the botanist has become able to apprehend the "love secrets" of flowers, and to deduce from them practical hints for the gardener and florist. We are often struck with incidental observations of material importance, that occasionally are rewarded with substantial gain. I shall cite one instance: Numerous experiments have shown that the fruit trees (apple, pear, and quince) during their time of inflorescence have need, not only of sunny weather, but also of the visits of bees and bumblebees, in order to bring forth a rich harvest. Should there not be a sufficient number of such insects in a district for

fertilizing all the flowers, during the flowering period, a smaller quantity of fruit must be expected than might be otherwise. The application is obvious. The advancement of bee-farming in such staple fruit districts is not so much necessary for the sake of gaining honey, as it is for the pursuit of raising apples, pears and quinces. A single bee visiting an apple-tree at the proper time will cause an increase of apples by hundreds, whereas not one apple would have developed without the visit of that honey gatherer.

In consequence of the struggle for existence, and merely by virtue of natural selection, all the bright-colored flowers have evolved. Millions of flowering plants have died without descendants and became extinct, because they succumbed in the competition for attracting the visits of fertilizing insects.

Natural selection is exercised no less upon mankind.

For two thousand years the Hebrew people have been subjected to the most severe oppression. They have been scattered over all countries, deprived of home and of justice; they have undergone bloody persecution and every imaginable wrong that Christians could perpetrate either upon their fellow-professors or upon others. And what was the result? Those in power and authority entirely overlooked the fact that they were challenging the Nemesis of natural evolution. The oppressors and persecutors have accomplished by their exertions the very thing they most dreaded. The once despised race has surpassed all others in intellectual and moral culture. Those persecutors have turned the efficiency of the law of natural selection to the advantage of the Jews. Of the scattered descendants of Israel the least fit, least shrewd, have been exterminated, because they were not talented enough to make their living and escape, and conse-

quently perished without offspring. I do not know of a more striking instance in General History, one that could demonstrate more powerfully and convincingly the pernicious policy of oppressing a whole nationality, than that offered in the case of the Jews. If we wish to judge fairly we must admit that the superiority of the Jewish race is exactly what, in accordance with natural selection, might have been anticipated.

Another illustration of the influence of natural selection upon physical differentiation. It is a well-established fact that in many countries of the torrid zone, and especially in sultry climates, disastrous fevers (yellow fever, malaria, intermittent fever) predominate, and even bring to a full stop the immigration of the white race. Nevertheless the whites attempted with renewed vigor the settlement of such countries. Hundreds of those immigrants perished, while a few survived. Those

fevers are generated by minute algae, which rise into the air from the rank drying soil and perchance penetrate into the lungs and blood of man. If these algae remain within the human body and multiply, it must of necessity fall a victim to the disease. Now it has been ascertained that the black and the red races are much better qualified to resist infection than the white race; and of this latter it is also established that some individuals are less disposed to infection than others. It is self-evident that the microscopic organisms attack equally all residents of those fever districts, because they breathe the same air. But by the death of those whose predisposition favors the growth and increase of the algae, there remain alive only such individuals as have blood less fit for the development of the germs. And consequently in such districts we find, after a few generations, a population acclimatized, and but little subject to infection.

Every day we are threatened with infection by microscopic organisms, which gain admittance into our healthy blood. Many of them are capable of generation in the blood of poorly fed people, and are able to destroy them. Sickly persons are, therefore, constantly threatened with extermination. The single fact that we, who live and enjoy life to-day, are still in good health, does not prove that we never inhaled any deleterious organisms, but simply that we possessed sufficient power of resistance to escape with our lives. We would say that our bodily organization has adapted itself to the surrounding conditions. But there are thousands and millions of others, who were born with us and reared beside us, who lacked the proper degree of adaptability, and consequently have been exterminated.

The discussion of natural selection in the struggle for life affords us reasons to form the conclusion:

That all the excellent contrivances in the now existing plants, animals, and men are but the result of adaptations formed, in the course of countless generations, by virtue of variation and by means of natural selection.

Nature has produced multitudes of diverse modes of adaptation, and has "experimented" upon millions and billions of individuals. By natural selection only the best forms of adaptation became accumulated and confirmed by heredity, so that to-day they raise the impression that they are of perpetual duration.

Thus every organism that at present exists has attained such a degree of perfection as, under the existing circumstances, could be accomplished, and was naturally attainable.

In free nature the *better* has prevailed over, and has superseded, the *merely good*.

This is the vortex of the new metaphysics, the focus of natural inquiry; but it is also the fuse, the office of which is

to shatter the entire fabric of the old philosophy, and to destroy the obsolete teleological views, according to which everything was said to be made surpassingly well and wisely, because a capricious, human-shaped ruler and governor was thought to have been its creator.

We have no longer need of that old childish philosophy; we must renounce it, because in infinite matter there dwells infinite force, in the sphere of which no supernatural being has cause or power to interfere. Whatever exists to-day is as it is because it could not become otherwise; it is a growth, not a created fabric. Were it the latter, nature would be in a higher state of perfection than it really is. Many organisms show defects in their organization, and their offspring will have to evolve and differentiate still further, unless they are to perish.

We notice that at the foundation of natural selection there is no need of a

mysterious, conscious, planning and creating being. It is merely a genetic system of *well-established and known natural causes*.

The modern naturalist may say with more or less approximation to truth, that with a globule of living plasma, which can be said to be neither plant nor animal, but has the faculty of assimilating matter from without, of growing and dividing into parts, each of which has the same faculty as the mother globule, the entire living creation may be repeated by him. *

But the opponents of Darwin's doctrine object with a semblance of truth: Though the origin of the perfect from the imperfect and simple may be accepted, where

* The warlike guardians of "true" faith have been startled at this remark to no small degree, and have expressed their unmitigated horror at the idea in energetic utterance. With what *naivete* they envelop themselves! In my opinion, it is shrewd in some people to pass for duller than they really care to be.

is the *origin of the first living being?* Quite *à-propos!* We have only to say that it has not yet been demonstrated that it is impossible to evolve living plasma from a mixture of inanimate matter. I propose to ask the chemist, the physicist, the physiologist of to-day, whether or not biologists have reason to doubt as to the forming of living plasma from inanimate substances. We are in the beginning of natural research, and can hardly anticipate what the next century may surprise us with in science and discovery.

We approach the end of this discussion. Let us but cast a glance or two at the problem of how mankind evolved to what we are.

We have no just reason to doubt that natural selection in the struggle for existence has been equally rigorous concerning the evolution of mankind from animal ancestors.

It cannot have been an evolution in

regard to increased physical strength, but must have been one in regard to intellectual and moral faculty. The fellow-creatures of primitive man, who was as yet half beast, half god, were ferocious beasts and monsters of surpassing force, with whom he met in fatal encounters; but he vanquished them by virtue of intellectual superiority, by common sense, by social propensities and affections. Brutal physical force could not but succumb one day to superior reason; selfishness, this ever active instinct for the preservation of self, gradually evolved to the instinct for the advancement of the tribal prosperity, and became subservient to it. Excessive individual *egotism* was supplanted by *altruism*, the care for the weal of others.

In this phase of man's evolution we stand right in the center. The knowledge of our past is an unerring guide for our future. The brutal struggle for existence

is transformed into the competition for the peaceable development of common sense and humanity. Where contrary events seem to disprove this noble law, where raw force and brutish power are in the highest esteem, there you notice a doleful tendency to retrogressive, atavistic degeneration, a return to the state of our ancestors, who stood in closer proximity to the brute than we do. Such tendencies can be but of a transitory character, for—

Upward points the course of man;
Crooked and winding though it prove,
Though for ages through gorges deep it lead,
Upward will his impulse draw him in the end.

—(GRAF V. SCHACK).

We must not forget that mankind as a unit cannot relapse for any great length of time. Some nations may stagnate, or even obstruct the progress of others or of the totality of mankind, yet in the end a general evolutionary progress has ever marked the course of general history.

And the progress of the totality acts beneficially upon the course of evolution of the individual, though often the reverse seems to be the rule. It is erroneous to affirm that Darwinism approves of an aristocratic policy, or of the formation of castes and classes, and that the doctrine of selection sanctions an aristocratic differentiation among the progressive nations. The contrary view is the correct one; for from the doctrine of Natural Selection, as formulated by Darwin, arise postulates of altogether a different nature. I propose to demonstrate this statement:

None will dispute that the scientific and industrial progress of our time is entirely owing to the labors of the most intelligent and ingenious men, who recruit not merely from the children of the upper ten thousands, but rather from the millions of the producing class; from that class in whose fertile body nature ever

evolves new talents, whereas many a genius of the upper class rots or perishes of luxury and voluptuousness. Deep-thinking statesmen have realized that the intellectual capacity of a people represents the most precious treasure of a commonwealth; and that the whole commonwealth is benefited when every prominent talent, no matter, whether it descend from the poor or the rich, is nursed to its complete evolution by means of education and instruction. The greater the number to choose from, the more rapid is the progress to relative perfection.

Those who comprehend this policy—and it cannot be hard to understand that which every experienced gardener and breeder has been governed by—can no longer maintain that the masses of a people shall lack the opportunity to have their talented children educated, because of the “costliness.” Those who are aware of the actuality of natural selection can-

not but arrive at the conclusion that every care bestowed upon education and instruction, upon all schools, no matter of what nature, and upon all text-books for the furtherance of developing talent, is due, and of right appertains, to the naturally *fittest* among *all* classes, without regard to condition or sex.

The leading educational authorities of the state of Zurich identified themselves with this view twenty-five years ago, in the life-time of that genial educator, Henry Sieber, by appropriating abundant means for free scholarships for poor talented pupils. In 1888 this state paid not less than 29,000 francs for scholarships to talented young men who attended the Teachers' Seminary of Kussnacht. This is evidently no proof of aristocratic policy, but much more of the contrary; namely, a well intended and enacted application of natural selection in a strictly democratic conception of political economy, so far as

public intellectuality is concerned. This is the result of a conviction that progress is the more productive and constant the larger the number of those from among whom the process of recruiting for intellectual workers is carried on.

We have accomplished a great deal in this direction, but much yet remains to be done. Most of the medical and law students are recruited from the well-to-do classes, because the prosecution of these studies requires a great deal of time and money. I believe the mental *niveau* and the scientific attainments of the medical profession would be greatly elevated and augmented, if the most talented youth of the whole commonwealth were enabled, by the aid of the state, to become competitors in every branch of science and art.

In the first lecture I set out with the question, Moses or Darwin? Permit me to conclude with a comparison of those two powerful thinkers.

The *Mosaic Cosmogony*, as taught in most schools in Europe, is a *Doctrine of Despair*. It gives us in the beginning a perfect, sinless couple, whose entire progeny degenerate and become demoralized in consequence of the fall of their first ancestors. This teaching is contradicted by science.

The Doctrine of *Evolution* is the philosophy of gradual progress from the primitive to the perfect. It is supported by incontrovertible arguments, based upon observation and experiment. Not one fact contradicts it. It expresses the dawn of a better future. It is the gospel of encouragement, and is suggestive of a high educational inspiration.

Here is Hope and Prospective Bliss!
There Despair and Woe!
Now choose for yourselves!

Eleven years ago I spoke before this audience upon Darwinism in a series of lectures; and for the kind and cordial

reception which you accorded me then, and have now again given me, I tender you my hearty thanks. I owe you all the more because the attention you have bestowed upon my arguments is the greatest compliment that can be afforded to one in my position. Let me conclude with the expression of a wish that I may be permitted to appear again before you after another eleven years, and talk to you again of Moses and Darwin; we shall then write

Anno Domini 1900.

IV.

AN EPILOGUE TO OPPONENTS AND FRIENDS OF THE DOC- TRINE OF EVOLUTION.

THE manner in which these lectures have been commented upon in the journalistic press relieves me of the obligation to enter the lists separately against each individual opponent. A couple of the worthies among the leaders of Reaction disdained to restrict themselves to the facts and the bearing of these lectures, choosing rather to prevaricate and calumniate. This stratagem is not novel, nor has it taken me by surprise. It has come into frequent use, in the absence of veracity and sincerity, in a great number

of the spokesmen of the conservative and would-be liberal daily press; and we should show ourselves guilty of an excess of *naïveté* should we feel abashed at our treatment. With honest opponents we shake hands or exchange salutes; but to consider the others worthy of special replies were bestowing upon them too much honor. And I propose to say a few words only to those who stand on an altogether different philosophy. One of the most respectable of these opponents is the Rev. Von Ah, an honest, true Catholic, a supporter of the public school, and a man of merit in public education in the Canton of Unterwalden. He says, in a polemic article upon the superscription of this work:

“We protest against the contra-position, as though Moses, like a grudging professor, placed himself in opposition to Darwin. What is related in the Books of Moses concerning the creation of the

world and of man is not the fiction of a savant, nor is it the doctrine of Moses; it is the Word and the Revelation of God Himself. We permit no bartering nor cavilling; in the Holy Writ we accept, and give credence to, the word of God. We—not the ultramontane secular priests, popes and bishops only, but the Protestant and Anglican Church, the Hebrews, in short the whole civilized world, (?) together with the critics of by-gone centuries, have raised and swelled this firm belief in an infinite ocean, an Ocean of Faith and Adoration, an ocean that a few learned sceptics will not so soon drain with their spoons of starvation. Whither should we be drifting with these new church-fathers, Darwin and Co?"

What he further adds concerning the struggle for existence is almost touching. Surely, if the supporters of Evolution were teaching what Rev. Von Ah is erroneously insinuating, many an honest

man might have reason to despair. But he is mistaken. If he is a friend to truth, and I have no reason to doubt it, let him read a book written by his spiritual brother, the Rev. A. Wysard, *Ein Gang durch das Alte Testament* (Zurich 1877). If he shall then still have ground for alarm in regard to Evolution, because we put no more faith in Moses' record of the creation, then—well, then there is no real salvation for his tender heart. We have but to add:

The Romish Church had to yield to the Copernican truths, and she has yielded, and actually adapted herself to them, although it was surely hard enough for her. For, the Romish Church burned alive Giordano Bruno on account of that Copernican doctrine, and the Romish Church is ashamed of that mistake or iniquity to this very day. This same Romish Church must and will yield and adapt herself to the doctrine of Evolution,

unless she is determined to be trodden down and crushed by the progress of science and culture. To us others—there are not a few of us, but we are numbered by hundreds of thousands—it is indifferent which position the Romish Church shall adopt in regard to the results of scientific research; for we intend to work steadily onward in our laboratories, and in the open fields of living nature, despite her anathemas and provocations. We have read that all the opposition of the Church availed nothing against the discovery of America. History relates that the Spanish clergy declared as damnable and heretical the conception of the rotundity of the earth, and of the planned circumnavigation by Columbus. The Ecclesiastical Council of Salamanca bestowed upon the brave Genoese who entered upon that adventurous sea voyage, in search of India, the most awful execrations instead of blessings; because the

Books of Moses, the Psalms, the Prophets, the writers of the New Testament and the early Church fathers, all testified against that enterprise. But permit me to ask, What has been the use of all those ecclesiastical execrations? And what has been the harm resulting from those execrations? America was discovered notwithstanding, and we, sundry people of Switzerland, eat bread manufactured of American flour. You see, most reverend Sir, the Church is making mistakes again and again, when she thinks it is for her interest to discredit and oppose the progress of human thought, the labors of thinking navigators, and the logical conclusions of naturalists. Science is progressive, not stagnant; it never rests, but evolves as long as humanity endures. Science has become the greatest power in the world, because it has rewarded mankind with the supremacy over nature; because it creates happiness—here upon

earth, in this life, not beyond the grave, in the hereafter. Even the Church disdained not to make use of the innovations set afoot by the heretical scientists. Your altars will before long glitter in the radiance of incandescent lights. You have been authorized by the "Holy Father" to hear the confessions of the dying by telephone, and you may have been authorized by him to grant them remission of sins by the same vehicle. The heretics invented the telephone; they were physicists who made electricity subservient to mankind; physicists of the type of Galileo and Volta. Oh! yes, most reverend Sir, the Church has very often sinned against Science and holy Nature. It is high time that she yield and become tolerant. No honest Catholic will henceforth suffer other people to be put to the rack, or pinched with red-hot tongs, or roasted alive upon a grate, because of their science or their infidelity. Those

who would vent their rage in this manner, in this age of ours, would draw upon themselves unlimited notoriety and ridicule, for they would place themselves on a level with barbarians. There is no bliss in atavism, but there is ruin; and atavism this would be. There is but one alternative, reverend Sir, *adaptation* or *destruction*. I am well aware that among the Roman Catholic clergy there are enlightened thinkers, even Freethinkers, who no longer abide by the letter of tradition, but penetrate into the spirit of the time and the progress of science. But they have not the courage to express that which they have recognized in their innermost souls, thinking that blind faith is exactly the right thing for the vulgar people. They do not confide in the understanding and moral sense of the people, and they reason in the fashion of Prof. Virchow: Scientific truths are good for the educated and learned, belief and

ignorance are good for the vulgar. This is fallacious reasoning, because the vulgar are intellectually and morally much better than these gentlemen believe. And these people are *being* instructed on certain occasions, though the professors of all the world disdain to speak to them in meetings, on one or the other important problem of the times. But when these intelligent people repeatedly learn that they are tendered the stones of blind faith and ignorance, instead of the cheering bread of truth and science, then they will turn away from the clergy. This is a natural and just result; for the working man is as much entitled to the enjoyment of truth as is he who lives without labor. Indeed he has even a better title to it; because the truths of science are the results gained indirectly through the agency of his work.

The preceding remarks addressed to the Rev. Von Ah hold good also for many

others of his calling, among whom I include the Protestant guardians of the faith and the Lutheran school boards. We cannot get over this school problem with ejaculations and lamentations. The problem is timely, and urgently demands solution.

Dr. Eberhard Dennert, Professor at the Evangelical Normal School of Godesberg-on-Rhine, read a paper against this production of mine at the Eleventh Annual Meeting of the Society for the Preservation of the Evangelic Public School in Essen-on-Ruhr. He may have been overlooking a great many truths or may have mistaken them; otherwise he would hardly have stated so many falsehoods and misrepresentations in his lecture upon the subject as he actually did. He concluded his paper in this remarkably strange way:

“Moses or Darwin? This is Dodel’s alternative. I answer, Neither of them, but the living God, the creator of heaven and earth.”

Is this an answer to the question whether in the state public schools shall be taught the miraculous record of the creation, or the scientifically demonstrated doctrine of Evolution? This was assuredly the question at issue. Dr. Dennert is not quite honest with this stratagem of his, if he declares that neither Moses nor Darwin shall be taught in the school, but the living God, creator of heaven and earth. Is not this living God no other than the Jehovah Elohim of the Hebrew leader Moses? Is he, though? Then Moses is yet to be taught in school, Doctor? This is mere jugglery.

But of all the opponents of the idea of evolution who formed themselves in battle array at the first publication of these lectures, the Protestant would-be believers exposed themselves most to ridicule. A tide of invectives of every kind rushed upon me. Tracts; pusillanimous letters without signature; lampoons; news-

paper articles, pregnant with imprecations and abominations, and full of the most ludicrous falsehoods. On they poured from all quarters of my dear country, but especially from the most hypocrisy-infected Canton of Berne. There is hardly any animal existing in this world of ours whose vulgar appellation has not been cast into my face. I thought of the Pentecost of Scripture and asked myself, Is this the Spirit of God, which you pretend is filling your hearts, divulging itself now in your "Blaetter für die Christliche Schule," under the editorship of Professor Howald at the Normal School of the Evangelic Society of Berne?"

Here is a sample of the "sweet milk" on draught in that paper:

"If the worshippers of the Darwin-Haeckelian Doctrine of Evolution, and their echoes, would keep their nonsense among themselves, we should think—Well, *other* maniacs must be allowed to nurse

their mania, too; let them, therefore, demonstrate their descent from pug-dog or tom-cat, hog or monkey, and let them wallow after their kind in the primeval quagmire; this is altogether their own business."

I acknowledge the perusal of this article and return thanks for the attention accorded to my pamphlet in submitting to him the following facts:

1. The "Blätter für die Christliche Schule" is the organ of the "Evangelic School Society of Switzerland," to which evidently belong the teachers of the Evangelical Teachers' Normal School of Zurich.

2. In this Evangelic Teacher's Normal School an able naturalist has been employed for about fifteen years as a teacher of sciences, who was convinced of the truth of Evolution, and did not conceal his conviction at all, either from his pupils or his colleagues.

3. The "religious" director of said

Evangelical Teachers' Normal School had cognizance of this teacher's adherence to Evolution, but retained him nevertheless as such teacher of sciences.

Now what say you to this, you guardians of Zion of the *Blätter für die Christliche Schule?*

You have Darwinians in your own ranks, and yet you wage war against Darwinism like the very possessed ones. Do you not conduct two diaries? one for the "children of the world" expressive of blind faith, and another for yourselves, the "chosen and sanctified?" You believe yourselves authorized to pronounce judgment upon others, while you are drifting in the same current for which you blame the others. Fair play, if you please!

It is, then, really the same thing, in what may be styled the church schools, and in the state or public schools—truth for the few in the upper circles, and error for the masses.

The foregoing remarks have generated a great commotion in the camp of the Evangelical Society. If you beat the bush, you will see or hear something. So in this case. Between the second and third editions of my pamphlet there appeared from the ranks of the "Evangelicals," independently of each other, two counter-pamphlets: one under the auspicious superscription, *Anti-Dodel*, by Dr. G. Beck, Professor of Natural Sciences at the Lerber Gymnase in Berne; the other entitled, *Moses or Darwin? Reply to Dodel's Pamphlet of the same Title*, by Dr. Eberhard Dennert, Professor of the Evangelical Pedagogium in Godesberg-on-Rhine (Published by Pastor em. Fr. Zillesen, Berlin).

These two pamphlets had a somewhat modest forerunner in one entitled *Darwin's Fundamental Principles of the Doctrine of Evolution*, by Joseph Diepolder, Professor of Sciences at the Catholic Grammar School of St. Gall.

While the latter pamphlet, since its publication a year ago, has not evoked one hearty commendation from the press, and really contributed very little to the edification of its readers, the two first-named are still more lacking in convincing strength of argumentation in favor of the Evangelical Union. Diepolder was sincere enough to acknowledge before-hand that he had no new arguments to produce in his disquisition. Consequently the reader knew at once that the same old worn-out and futile objections were simply repeated, and the book earned little favor in the daily press.

Dr. Beck's pamphlet, *Anti-Dodel*, I cannot help confessing, is the weakest of all attempts at refutation that have made their appearance thus far, the loud and fervent praises of the Swiss orthodox notwithstanding. Diepolder proved at least a diligent compiler; but Dr. Beck displays, so far as general bearing and dignity is

concerned, so much clownishness—he uses such words as muzzle, humbug, blockhead, swindle, hireling, wolf, sham argumentation—that a person of taste cannot engage in a long discussion with him, if he were even accustomed to duelling with pitch-forks. I shall exhibit to the kind reader only a few of the fallacies of Mr. Beck's *mixtum compositum*.

Dr. Beck throws himself into position as the Knight St. George in defence of the Mosaic record, and brandishes his weapons against the doctrine of Evolution as in a fury, making such use as best he can of sophistry and insolence. This seems to have been the task assigned him by the Orthodox. He wants to justify Moses. Now hark, and wonder! He attempts, in the manner of a prestidigitator, to *stamp Moses into a prophet of Evolution*. (See upon this subject Huxley's *Critiques and Addresses*, and *The Genesis of Species*, by St. George Mivart—*Tr.*)

Moses a Darwinian in the wider meaning of the word! Pray, Doctor, are you not, as well as your authorities, greatly mistaken? It is extremely comical, approaching to silliness; but so you may read in Dr. Beck's pamphlet, where he says:

"I hesitate not for a moment to confess that the doctrine of Evolution is also my own conviction, and that I express my unlimited admiration for Darwin's labors. But this admiration is still more due to the venerable record of Moses, which was written at a time when all sciences were yet in the bud, and which already possessed the general outlines of the theory of Evolution."

Ah! this is your escape, is it? Knowing that you cannot gainsay the new doctrine and yet bound to cling to Moses, you attempt to foist Darwinism into the Bible! Or is this "Mosaic Darwinism" intended only for the educated Orthodox, while the

poor and uneducated believers are taught faith in Moses to the letter, and are to have their children stupefied with the multitude of miracles and impossibilities. It is only in this view of it that Dr. Beck's pamphlet is intelligible. But then it is a fraud perpetrated against the believing masses. There is no other escape. The basis of Dr. Beck's policy is either a nonsensical opposition, or a sham manœuvre. One of the two. How will the "lump of dirt" Adam agree with evolution? Neither sophistry nor pettifoggery, nor other word-rattling will be of avail here. Either you are a true believer in evolution and consequently cannot believe the Mosaic conception of creation, or you are a naive, honest believer of Moses, and consequently ought to keep hands off from dabbling in science. You cannot with any sense attempt to be on both sides.

Dr. Beck charges me with contempt for the Bible. The reverse is true. Assuredly,

I do not believe any longer every thing narrated in that book; but it is still dear to me, a precious book to which I resort with pleasure, although I should hesitate to put it into the hands of children, or those poor of intellect. In fact the Bible is so full of contradictions that everybody, no matter what he believes, may quote verses from it to his heart's content; not only the real philanthropist but the slaveholder, also; the poor and wretched, as well as the rich and mighty; the spiritualist and the materialist.

“But man dieth and wasteth away: yea, man giveth up the ghost, and where is he? As the waters fail from the sea, and the flood decayeth and drieth up, so man lieth down and riseth not. Till the heavens be no more, they shall not awake, nor be raised out of their sleep. If a man die shall he live again?” (Job xiv, 10-14). Just the immense variety of speculative philosophies that manifest them-

selves in its different component parts will forever create an interest in this book, and render its study even useful. That we cannot believe everything contained in Holy Writ is conceded by the most orthodox; the above quotations from the book of Job are surely not accepted by them.

Dr. Beck and his sophisticated friends feel puzzled that I am of the opinion that the essence of religion is not dependent upon belief or creed. I am very sorry to say that I found just those persons to possess the least religiosity who think so highly of their creed, and yet manifest such glaring hypocrisy. In fact, I believe Professor F. Vischer, my revered friend and teacher, was right when he said:

“Multitudes of souls, who never entertained a thought of the infinite, never were agitated by even a shadow of the elevating tragedy of life, pass among themselves and in the face of the world

for *religious* because they *believe*. This dangerous confounding of ideas has become a fixed general prejudice, which, invested with power, has tortured, burned, crucified, impaled, flayed alive, wound the intestines of living men upon reels, mutilated, blinded, buried alive, stabbed, pierced with lances, poisoned—in short, there is no brutish, no fiendish cruelty that has not been practiced to perfection by the fury of persecuting believers, in the name of religion. No, no. Creed and religion are two things; the former has ever done more harm than good. What? Shall we give new life to *Belief*? Never; do away with *Belief*, that *Religion* may live!"

Exactly so, Doctor. Away with stubborn belief, that religion may live. Strive for more knowledge and a better understanding, and for less belief. It is obvious that we shall reach this goal in the end, although Moses will undoubtedly

hold his own for a while yet in the public schools.

After these few remarks the kind reader will perceive that there is no need of entering into details in answer to Dr. Beck's "scientific" refutation of Darwinism. And the same holds good concerning Dr. Dennert, who at the conclusion of his lamentations frantically exclaims: "Darwinism in its consequences leads to Revolution, and Socialism, and Nihilism." Did Darwinism swell the vote of the German Socialists in February, 1890, to one million and a half?

To the *Teachers of the Public Schools* I wish to say again that it is a poor business to palm off for holy truth what science has shown to be error. An old Zurich burgher of eminent learning, and a champion of right and truth, related to me the following incident the other day. At an evening gathering the conversation turned upon historic inquiry and

the heroic legend of William Tell. Some simple-minded burghers were unwilling to believe that the story of Tell was but a myth. The train of discussion went smoothly on until finally the views supported by critical research prevailed. On a sudden an honest old burgher rose and turning to my friend broke out, "Hear what I have to say on this subject. If it really be so, as the critics have demonstrated, that the story of Tell is but an unfounded myth, a beautiful legend without any real foundation, I say that my teacher was either an unmitigated impostor and liar, or he was—a blockhead." I suggest that you apply this train of reasoning to the problem at issue. What will thousands and hundreds of thousands of pupils say after a few years, when they learn that in the public schools they were made to believe in fictions, although the teachers were conscious of the imposition and fraud? Will not just those pu-

pils whom the teacher loved best, on account of their pure souls and their tender intellects, pass grievous judgment upon him and upon his deserts? Woe to the liar! Those who sin against veracity in the pupils' youth will be treated with corresponding contempt by the same pupils when they become of age. Fraud brings poor returns!

And now in conclusion let us warm ourselves at a friendly scene.

In consequence of these lectures, which were received with sympathy and approbation, there was instituted a most comical "Dodel-baiting" in which the hypocrites of Berne by far surpassed the fanatic Ultramontanes of the venerable Abbey of St. Gall, in point of hot-headedness. Meanwhile the interest of the progressive Protestant clergy was also aroused, and a public lecture took place on a March Sunday evening, the lecture to be conducted under the auspices of

the "Verein für Freies Christenthum," and to treat of the *Religion of Darwinism and Socialism*. The hall was filled entirely, and many could not get admission for lack of room. In a beautiful oration the lecturer, Rev. Dr. K. Furrer, Pastor of St. Peter's in Zurich, showed in what position the "Verein für Freies Christenthum," which has among its members a considerable number of the Protestant clergy, places itself in regard to Darwinism and Socialism. All of us who had the pleasure of listening can testify to the bravery and honesty displayed by Rev. Dr. Furrer. This learned Palestine-traveler and oriental scholar showed that the Mosaic record of the creation is to be accepted as the product of an oriental imagination, intimately allied with poetic fertility, the intention of which could never have been to lay the foundation of an inviolable dogma, which was ever to obstruct scientific research; that this fic-

tion was originally not designed to pass for any other thing than a fiction, and that in the face of Darwinism the Mosaic account could not claim scientific credence. Subsequently the orator passed over to the statement of the Kant-Laplace theory of the evolution of the heavenly bodies; showed that the assumption of neither one nor of several floods was tenable, and that through Darwin the doctrine of Evolution finally obtained. With matchless sincerity and courage he dwelt with enthusiasm upon the *sublimely ennobling conception of progressive evolution*. He spoke of the restless dissatisfaction with the results of the now antiquated philosophies, he fearlessly praised the zeal for progress, and administered consolation in view of the progressive evolution in social life and in nature. The same sympathy was by the orator manifested toward Socialism, the impelling power of which was charity, and the longing for justice and equity.

Dr. Furrer is of opinion that Christianity has no cause for hostile opposition against either of the two great movements of our age.

Thus spoke a Christian theologian. In my opinion the Christian world would present a vastly friendlier aspect than it actually does, did all of the "Servants of the Word" think so fairly and stand so bravely by their convictions. Here in Zurich we are blessed with a group of enlightened clergymen who grappled with and mastered the doctrine of salvation by Evolution, and summoned up the courage to promulgate their convictions whenever opportunity was offered.

It remains for me only to say that I hope these theologians will logically and justly unite with those who urge the supplanting of the Mosaic cosmogony by something that is in accordance with Science. It will not do to declare that that myth is but a beautiful fiction, and

simultaneously to permit that it be taught over and again in the public schools as a revealed truth. To teach mythology our public schools lack time and occasion.

Let us teach more of the real, instead of the fictitious; of the actual, instead of visionary things.

Understanding matures virtue.

This work set out by attacking an old error. I propose to close it with the refutation of a modern and novel error.

Repeatedly, clerically minded opponents, as well as friends of Darwinism, have pointed out that this new teaching was unsuited to afford any consolation to the poor, the miserable, the crippled—in short, the most unfortunate of us; that consequently the doctrine of Christ was more comforting; that therefore the poor people should not be *robbed* of their "Faith," inasmuch as we could not supply anything better. One of the pamphleteers quoted the Bible in two instances against us.

Psalm lxxii, 4: "He shall judge the poor of the people, he shall save the children of the needy, and shall break in pieces the oppressor." St. Matt. ix, 28: "Come unto me, all ye that labor and are heavy laden, and I will give you rest."

Not one of all these promises of a highly elaborated religion, which pretends to glorify charity, has ever been fulfilled in these two thousand years.

Now mankind becomes aware that the "poor people" must fight for their rights *themselves*, and that the "oppressor" of this earth has just begun to be conscious that the poor have a *right to assistance*.

This is part of the universal consciousness that grew and evolved from the struggles of the modern age. Christianity has degenerated into fossilized creeds, and is being displaced by a new "secular" religion. With the overwhelming power of an uncontrollable force the conception of a *realizable and desirable happiness of ALL*

mankind, during our LIFE-TIME, not beyond the grave, has taken root, spread and become an intrinsic part of the moral ideal of this age.

And in the midst of this rolling sea of life we discover land already, land that will fulfill what it promised. Humanity will prevail over savagery. All mankind *will* some day unite in the almighty desire for redemption and freedom; and where there is a will, there is a way. Can a sensible person entertain fears of the consequences of Darwinism?

We believe what we are expressing over and again in the following lines to be true:

The doctrine of Natural Selection in its practical application to the public life will act beneficially; inasmuch as many noble gifts of Nature, heretofore suppressed, will be brought to development and activity to such an extent that the entire social organism will become ever more abun-

dantly equipped and provided against every emergency. Science and art, technology and modes of labor, will become so perfect that no man will need to worry himself to death or sickness in order to earn his living. Every person will gladly perform his portion of work; and the wretched and weakly will live, unencumbered with care or sorrow, to their natural death, thanks to the sentiment of charity. Those suffering either in body or in mind will naturally decrease; because it will be made a punishable offence to quicken a human germ in either a state of drunkenness, of insanity, or of infectious or hereditary disease.

To be sure, Darwinism can influence mankind only to elevate, physically and morally. Whoever would understand it otherwise is mistaken.

THE END.

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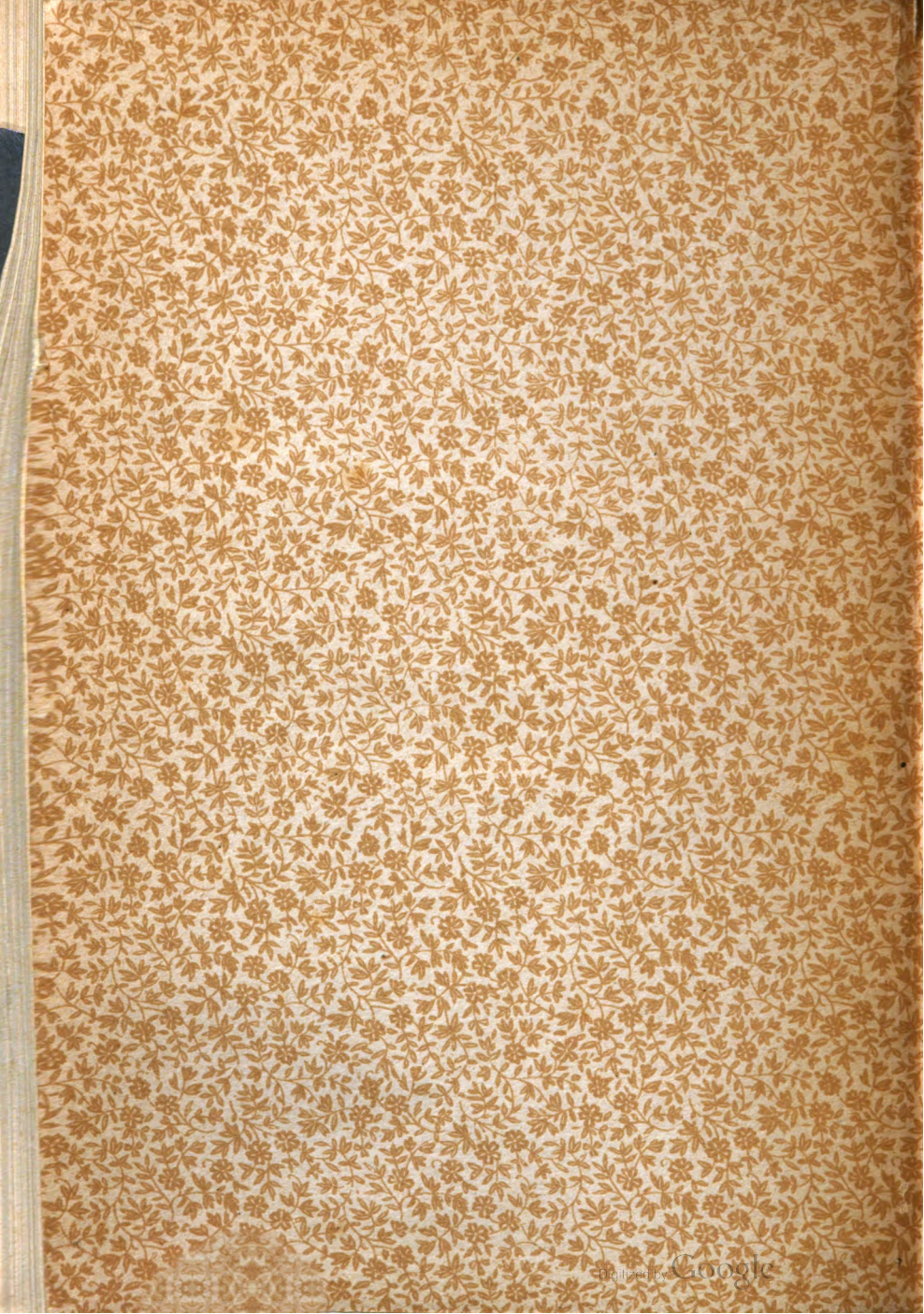
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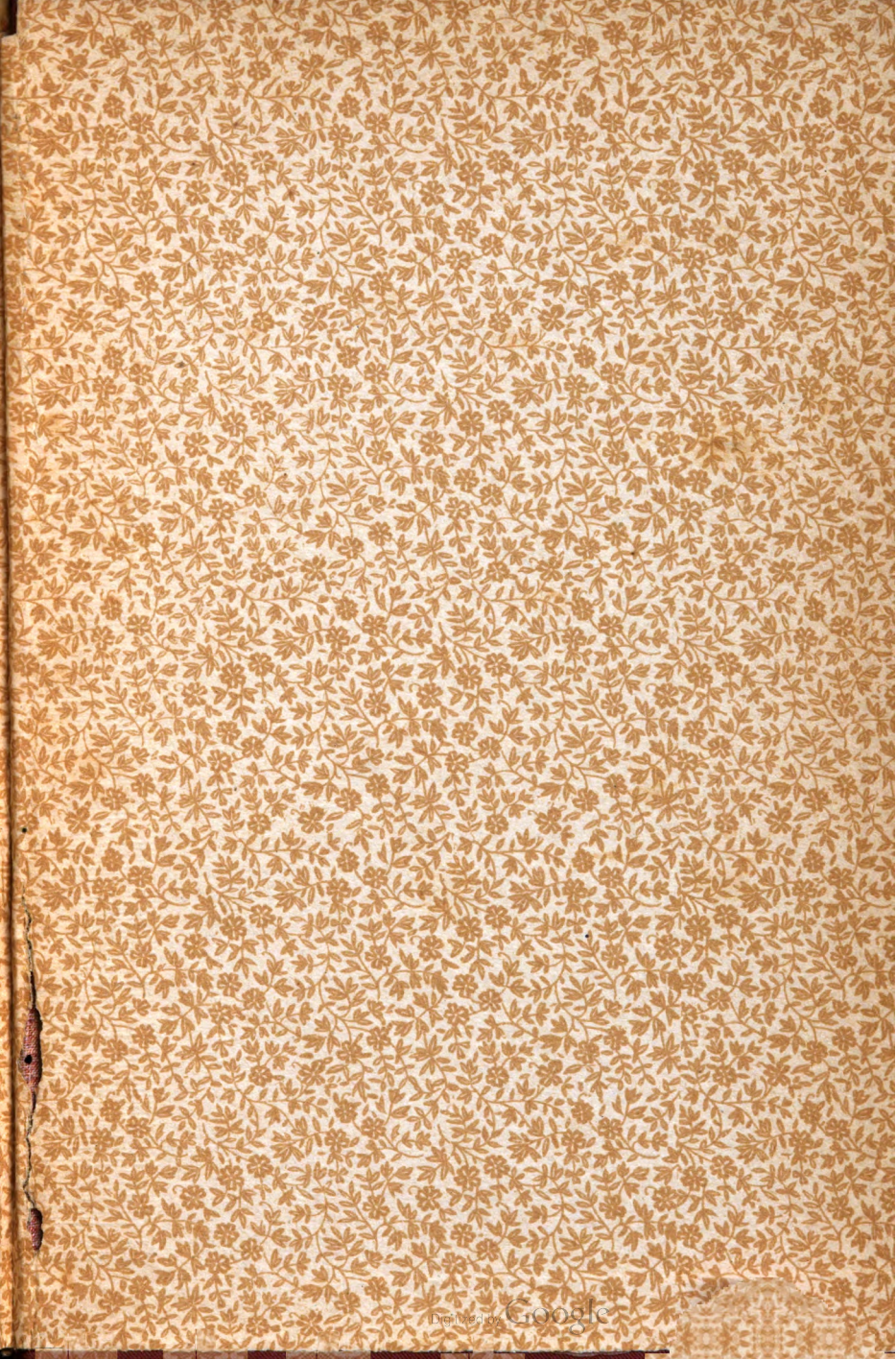
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