

Galileo and the Copernican Theory.

It is often said, even by those who should be better informed, that the greatest obstacle in the way of the general acceptance of the Copernican theory was the Church, and that the cause of all of Galileo's woes was the ignorant officials of the Inquisition. The fact is, however, that it was not churchmen, as such, who were opposed to the views which Galileo so ardently and so successfully championed. It was rather the old peripatetic system of philosophy, which, after dominating the world of thought for two thousand years, saw itself finally face to face with what, it was felt on all sides, was destined to prove the most formidable adversary it had yet encountered. For the Ptolemaic system was so closely bound up with the philosophy of Aristotle, and this in turn was so intimately connected with theology, especially since the time of St. Thomas Aquinas, that any attack on the geocentric system was at once regarded as an onslaught on both philosophy and theology. So great, indeed, was the authority of the "Master," as Aristotle was called, and so long had his *dicta* been accepted without question, that in the minds of many it was almost as impious to assail his opinions as it was to attack the dogmas of faith.

One of the fundamental teachings of the Stagirite was, for instance, that concerning the incorruptibility and immutability of the heavens. Galileo's telescopic discoveries showed that this opinion was

not based on fact. He proved that "the heavens can change and lay aside their former aspects, and assume others entirely new;" and in doing this, he gave a death blow to one of the leading tenets on which peripatetics generally had so long set such store. Learned professors at Pisa, Padua and Bologna, tried to silence the illustrious Florentine by the profuse use of syllogisms and to disprove the truth of his observations by *a priori* reasonings. He was declared by others to be the victim of strange optical illusions, and, accordingly, it was asserted that the spots on the sun, and the satellites of Jupiter and the variable stars had no existence outside of the observer's diseased imagination. Aristotelians indignantly denied the existence of sun-spots, because, said they: "It is impossible that the eye of the universe could suffer from ophthalmia." For an equally trivial reason they rejected Kepler's great discovery of the accelerated and retarded motions of the planets in different parts of their orbits. "It is undignified," they declared, "for heavenly bodies to hurry and slacken their pace in accordance with the law of the German astronomer." Aristotelianism, it was almost universally agreed, was to be safeguarded at all hazards, and Galileo, Kepler and other innovators, who thus ruthlessly trampled under foot the philosophy of the master—"Si calpesta tutta la filosofia d'Aristotele"—were to be vanquished at whatever cost, for if they were allowed to continue their sacrilegious work, they would eventually undermine, not only philosophy and theology, but also sacred Scripture as well.

A quotation from one Sizzi, a learned astronomical authority of the time, will serve to exhibit the puerile character of some of the reasons adduced in favor of the old system and against the new. Galileo having, by the aid of his telescope, discovered the satellites of Jupiter, Sizzi argued against the existence of such bodies as follows: "There are seven windows given to animals in the domicile of the head, through which the air is admitted to the tabernacle of the body, viz., two nostrils, two eyes, two ears and one mouth. So, in the heavens, as in a macrocosm, or great world, there are two favorable stars, Jupiter and Venus; two unpropitious, Mars and Saturn; two luminaries, the sun and moon, and Mercury alone undecided and indifferent. From these and many other phenomena of nature, which it were tedious to enumerate, we gather that the number of planets is necessarily seven. Moreover, the satellites are invisible to the naked eye, and therefore, can exercise no influence over the earth, and would, of course, be useless; and therefore do not exist."

Such things appear to us childish and absurd in the extreme; but after all they are but a fair sample of the reasons which were offered by many of the astronomers and philosophers of the time, against the innovations and scientific heresies of Copernicus and Galileo. When one calls to mind what extravagant errors have been defended in the name of Aristotelian philosophy, and what untold mischief *a priori* reasoning has effected in the domain of experimental science; when we understand the temper of mind of

those who taught and speculated three centuries ago, we need not be surprised at the many strange things they said and did. We see in their opinions and conduct but a reflex of what is always observed in the progress of knowledge and in the dissipation of ignorance. The much-talked-of warfare between science and religion is something that does not exist. The warfare is between truth and error, between science and theory. In Galileo's case, as we have seen, it was Copernicanism *versus* Aristotelianism; *a priori* reasoning against observation and experiment; the syllogism against the telescope.

Conservatism in Science.

And more than this. The same objections that were brought against Galileo and heliocentrism, were urged against Laplace and the nebular hypothesis; against Joule, Mayer, Faraday, Liebig, Carpenter and Helmholtz, on account of their demonstrations of the grand doctrine of the conservation and correlation of the various physical forces. The truth is, men are loath to give up a pet theory, especially when they are once committed to it, and when the shadow of a great name gives to it an air of certainty, if not of infallibility. As a result of this tenaciousness of opinion, and of a conservatism which was far more marked formerly than it is at present, truth advances slowly and science is obliged to contest every step forward. For this reason the enemy of science has not been religion, as is so often declared, but science itself, or what for the time was accepted

as science. In like manner those who impeded the advance of science were not the representatives of the Church, as such, but the advocates of some theory or the adherents of some school or system of thought. For generally, if not always, those who are accused of opposing the advancement of science, and who may actually be in error in matters scientific, are as zealously laboring, so far as their lights go, in the interests of science, as those who have the truth on their side. The enemies of Galileo, for instance, imagined that they were doing the greatest possible service to science in battling as they did for Peripateticism and Ptolemaism. But if they had had before them the same evidences of the truth which we at present possess, they would have made no hesitation in acknowledging their mistakes, or rather, they would never have fallen into the errors for which they are now condemned.

Conflict of Opinions Beneficial.

In the long run, however, the conflict of opinions in questions of science, far from having a pernicious, has a beneficial influence on the advancement of knowledge. It stimulates investigation and discovery, and serves to place the truth in such a light as no longer to admit of contradiction.

The long-fought battle on the subject of spontaneous generation is a case in point. Pasteur and Van Beneden have proven by their epoch-making researches, that so far as experiment can give any information on the subject, abiogenesis is a chimera.

But while we cheerfully accord to these great savants all the encomiums to which they are entitled, we should not withhold from their great antagonists, Pouchet and Bastian, the meed of praise which their researches have earned for them. The latter were mistaken in their views, it is true; they were vanquished in the controversy which they carried on so ably; but, by the very force and originality of their objections, they contributed materially, though indeed indirectly, towards putting the truth in a bolder relief than it would otherwise have received. Had not Pasteur met with the contradictions he did, had he not been obliged to confute objections of all kinds, objections presented in the name of chemistry, objections urged in the name of biology, objections advanced in the name of metaphysics, he would undoubtedly have discontinued his investigations much sooner than he did, and would have rested satisfied with his earlier and simpler proofs of the untenableness of spontaneous generation.

All glory, therefore, to Galileo and Pasteur for their brilliant achievements! But while sounding the praises of the victors, let us not forget the honors due to those who battled long and gallantly only to suffer defeat in the end. By the very persistence and stubbornness of their contest, they enhanced not only the splendor of the results obtained by their conquerors, but they also labored effectually, albeit indirectly, for the attainment of the same object which was had in view by their antagonists—the truth, the advancement of science, and the placing of it on a surer and firmer foundation.

Evolution and Creationism.

Will it not be the same in the still greater and longer contest between creationism, in the sense of special creationism, and evolutionism? From what precedes it appears almost certain that our reply must be in the affirmative. And when the smoke of battle shall have cleared away; when all animosity shall have been extinguished, and men shall have a concern only for the truth, and not for certain individual opinions; when they shall be more disposed to conserve the interests of genuine science than those of mere hypothesis; then will it be evident to the world that both victors and vanquished were making for the same objective point, all according to their lights, and that the very earnestness and perseverance with which those in the wrong led a forlorn hope, but contributed in the end towards making the truth more conspicuous and towards rendering the stronghold of science more impregnable. Then, too, it will be manifest, that although truth was on the side championed by Aristotle, Sts. Athanasius, Gregory of Nyssa, Augustine and Thomas Aquinas, by Buffon, Geoffroy Saint-Hilaire, Lamarck, Spencer, Darwin, Huxley, Mivart and their compeers, nevertheless the opponents of the evolutionary idea, the Fathers and Schoolmen who favored the doctrine of special creation, the Linnæuses, the Cuviers and the Agassizs, who resolutely and consistently combated Evolution to the last, were all along but helping on and corroborating what they were intent on weakening and destroying. In this case, as in so many

others, history but repeats itself and demonstrates again, that opposition may be a source of strength, and contradiction the most effective means of securing certitude and light. For we must bear in mind that it is not mistaken theory that retards the progress of science, but rather erroneous observations. All working scientists are aware, often to their cost, that it is inaccurate or mistaken observations which lead men astray, while erroneous theories have often a most stimulating effect. They suggest and provoke new and more exact observations, and thus lead up to true theories and ultimately to a true knowledge of nature.

Errors in the Infancy of Science.

It is indeed a difficult matter for those who live in the closing years of the nineteenth century, duly to appreciate the mental attitude of those who lived and taught a thousand or two thousand years ago. It is difficult even for us to account for the extravagant views held by distinguished scientists of comparatively recent times, by such men, for example, as Kepler, Stahl, Kircher, Buckland and others of their contemporaries. We smile at the fantastic notions which they entertained respecting some of the most ordinary phenomena of astronomy, chemistry, biology and geology. But we forget that we are living in the full effulgence of inductive science, and that we have the benefit of the labors of thousands and tens of thousands of investigators in every department of thought. We forget that Kepler and

Kircher and their collaborators lived in the infancy of science; that they had to blaze the way for their successors, and that, notwithstanding their best efforts to arrive at the truth, error was inevitable. Ignorant of countless facts now known to every schoolboy, and unacquainted with the theories and laws which are now the common possession of all who read and think, it was but natural that they should have had recourse to explanations and hypotheses which we should at present regard as fanciful and absurd.

Thus, Kepler taught that the heavenly bodies were guided in their orbits by angels. Water, it was universally believed, would not rise in a pump above a certain height because nature abhors a vacuum. Fossils, it was thought, were but outlines of future creations which the great Artificer had cast aside, or objects placed in the tilted and contorted strata of the earth "to bring to naught human curiosity."

The statements regarding animals found in the "Physiologus" and in the "Bestiaries," allegorical works much esteemed during the Middle Ages, were accepted as veritable facts, and believed as firmly as were the ludicrous stories of Pliny, the naturalist. For a thousand years and more, even those who professed to teach natural history saw in the fables regarding the dragon and the unicorn, the phoenix and the basilisk, the hippogriff and the centaur, nothing to stagger their faith and nothing that was inconsistent with the science of the times. They believed without question that the phoenix rose from its ashes, that the pelican nourished its young with its blood,

that the salamander could quench fire, that the basilisk killed serpents by its breath and men by its glance, and many similar things equally preposterous.¹

The frame of mind, even of the most intelligent men, was such, that the extraordinary tales of Marco Polo and Sir John Mandeville were credited as readily as the most ordinary facts of history or biography. It was indeed difficult to exaggerate the powers or marvels of animated nature to such an extent that they would be pronounced unworthy of credence. But the world has moved since the times of Polo and Mandeville. Science has made wondrous strides forward since the days of Kepler and Kircher. Men are now more familiar with the laws and processes of the organic world, and have learned to recognize the value and necessity of careful observation on the part of the votaries of science.

And in proportion as our knowledge has widened, and become more precise, so likewise have our conceptions of nature and of the Deity's methods of work been modified and exalted. We no longer look upon God as an architect, a carpenter, an artificer; one who must plan and labor in a human fashion, as He was contemplated in the infancy of

¹In the "Physiologus" we read the following about the ant-lion, or myrmekoleon: "His father hath the shape of a lion, his mother that of an ant; the father liveth upon flesh and the mother upon herbs. And these bring forth the ant-lion, a compound of both and in part like to either, for his forepart is that of a lion and his hind part like that of an ant. Being thus composed he is neither able to eat flesh like his father, nor herbs like his mother, therefore he perishes from inanition." See "Encyclopædia Britannica," art., Physiologus.

our race, when the knowledge of the universe was much more circumscribed than it is at present. We now regard Him as a Creator in the highest and truest sense of the term; as one who "protects and governs by His Providence all things which He hath made," and who "reacheth from end to end mightily and ordereth all things sweetly."¹

Science Not Omnipotent.

But although science has made marvelous advances during recent times, especially during the present century, and although Evolution has contributed in a wonderful manner towards unifying what was before a heterogeneous mass of almost unintelligible facts, science is not omnipotent, nor is Evolution competent to furnish a key to all the mysteries of nature. To judge from the declarations of some of the best known representatives of modern thought, science was to replace religion and the Church, and to do far more for the welfare and elevation of humanity than the Gospel and its ministers are capable of effecting. Renan declares, that it is "science which will ever furnish man with the sole means of bettering his condition." Again he assures us, that "*to organize humanity scientifically* is the last word of modern science, its daring but legitimate aim."²

¹"Wisdom," viii, 1, and "Council of the Vatican," chap. 1.

²"La science restera toujours la satisfaction du plus haut désir de notre nature, la curiosité; elle fournira toujours à l'homme le seul moyen qu'il ait pour améliorer son sort."

"Organiser scientifiquement l'humanité, tel est donc le dernier mot de la science moderne, telle est son audacieuse, mais légitime prétension." "L'Avenir de la Science," p. 37.

Science, we were told but a few decades ago, would suppress the supernatural, remove mysteries and explain miracles. It would tell us all about the origin of things; the world, life, sensation, rational thought. It would inform us about the origin of society, language, morality, religion. It would throw light not only on the origin of man's body and soul, but also on his ultimate destiny. It would, in a word, frame for us a complete cosmology, a complete code of ethics, and introduce a new religion, which would be as superior to Christianity as science is superior to superstition. It promised that we should one day be able to "express consciousness in foot-pounds;" that we should be able to trace the connection between "the sentiment of love and the play of molecules;" that we should be in a position to discern "human genius and moral aspiration in a ring of cosmical vapor." Thanks to science and to its grand generalization, Evolution, old systems of thought were to be wiped out of existence, and we were to be ushered into an era of general enlightenment and universal progress.

But has science, as represented by Renan, Hæckel and others of their way of thinking, made good its promises? Has it been able to dispense with a personal God, and to relegate the supernatural to the limbo "where entities and quiddities, the ghosts of unknown bodies lie"? Has it, in the words of Virchow, succeeded in referring the origin of life to "a special system of mechanics," or in proving Renan's view that "the harmony of nature is but a resultant," and that "the existence of things is but an affair of

equilibrium"?¹ Has the religion which makes a God of humanity regarded in the abstract, or which evolves a Deity from the universe considered as a whole, rendered men better or happier? These are questions which press for an answer, but which, fortunately, can be answered as readily as they are asked.

The response to all these questions, collectively and severally, is a peremptory negative. It is the response which true philosophers and true men of science the world over have given all along. For it would be a mistake to imagine that the utterances of Renan, Hæckel, and their followers, have the indorsement of the worthier representatives of science, or that true science has ever made the pretensions claimed for it by some of its self-constituted exponents and protagonists. There are soi-disant scientists and true scientists, as well as there is a sham science and a science deserving the name.

Bankruptcy of Science.

It was in speaking of such soi-disant scientists and their unfulfilled promises, of such sham science and its boastful pretensions, that a brilliant member of the French Academy, M. Brunetière, did not hesitate to declare recently that "science had become bankrupt." Science has promised to tell us whence we come, what we are, whither we are going; but it

¹ "Ceux qui s'obstinent à reconnaître les traces d'une intelligence créatrice dans le développement de l'univers, sont encore dans les liens des vieilles illusions, car l'harmonie de la nature n'est qu'une résultant, et l'existence des choses une affaire d'équilibre." Renan, "L'Avenir de la Science."

has signally and totally failed to give an answer to any of these questions.

Hellenists had engaged themselves to exhibit the whole of Christianity in the philosophy of Greece and Rome, and to pick out for us in the "Thoughts" of Marcus Aurelius, and the "Manual" of Epictetus, all the "scattered members" of the Sermon on the Mount. But they did not succeed in this, and still less did they succeed in explaining why the Sermon on the Mount has conquered the world, and why the "Manual," and the "Thoughts" of Epictetus and Marcus Aurelius have always remained completely sterile.

Hebraists undertook to dissipate the "irrational" and "the marvelous," in the Bible; to exhibit it as a book like the "Iliad" or the "Mahabahrata," but the sum total of their researches has issued in the very opposite of what they anticipated, and their labors have had the effect of reintegrating what they had hoped to destroy.

Orientalists, in their turn, promised to deduce Christianity from Buddhism, and to prove that the teachings of Christ were drawn wholly, or in great part, from the doctrines of Buddha. Like the Hellenists and Hebraists, however, these orientalists failed completely to establish their thesis, and, far from throwing light on the subjects which they set out to clear up, they but plunged them into greater obscurity and introduced new hypotheses instead of reaching positive and incontestable conclusions.

All along the line, the science of which we are speaking—the physiscal, natural, historical, and

philological sciences—has shown itself incapable of giving an answer to the very questions which most interest us. And still more has it forfeited the claim, which it has made during the past hundred years, to frame laws for the government of mankind in lieu of those given by Christ and His Church. The consequence is that all thoughtful men are beginning to realize the fact, if they did not realize it before, that questions of free-will and moral responsibility are not to be settled by physiology, nor are rules of conduct to be sought for in Evolution. Hence, if we are to live anything more than an animal life, we must have something higher than science is able to afford; we must be guided by the teachings of the Founder of Christianity, by the saving influence of that Church which, for well-nigh two thousand years, has shown herself the sole power capable of lifting man from a lower to a higher moral and spiritual plane.

The net result, therefore, of a hundred years of aggressive warfare against the Church and religion, the outcome of all the flattering but misleading promises of science in the matters which we have been considering, have been the very opposite of those intended. M. Brunetière resumes the result in two words—and no well-informed person will, I think, be disposed to contradict his conclusions—these are: “Science has lost its prestige, and religion has recovered a portion of hers.”¹

¹“La Science a perdu son prestige; et la Religion a reconquis une partie du sien.” See his interesting article, “Après une Visite au Vatican,” in the *Revue des Deux Mondes*, for Jan. 1, 1895.

M. Brunetière's study is pretty much in the same strain as Lord Salisbury's much-discussed address at Oxford, before the British Association for the Advancement of Science. And has not Huxley, one of the most applauded representatives of science, and one of the staunchest defenders of Evolution, been forced to admit, in his celebrated Romanes Lecture, that science and Evolution have limitations which he would have been loath to acknowledge but a few years before he made the confession that so startled many of his scientific friends? The conclusion of this studied effort of the noted evolutionist is, briefly stated, that the cosmic process, or Evolution, is utterly incompatible with ethical progress, or rather, the two are ever and essentially antagonistic.¹

And Herbert Spencer, too, the great philosopher of Evolution, who sees the working of Evolution in everything; in the development of society, language, government, of worlds and systems of worlds, was obliged not long since to admit, not without reluctance we may be sure, that Evolution is not operating so rapidly as he expected it would, and is not fulfilling all the fond hopes he entertained regarding it as a factor of human progress. “My faith in free institutions,” says he, “originally strong, though always formed with the belief that the maintenance and success of them is a question of popular charac-

¹“Social progress,” he tells us, “means a checking of the cosmic process at every step and the substitution for it of another, which may be called the ethical process; the end of which is not the survival of who may happen to be the *fittest*, in respect of the whole of the conditions which obtain, but of those who are ethically the *best*.”