A HISTORY OF
THE WARFARE OF SCIENCE WITH THEOLOGY
IN CHRISTENDOM

by Andrew Dickson White (1832-1918)

Edited by Jon E. Noring

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To the Memory of

EZRA CORNELL

I Dedicate This Book

Thoughts that great hearts once broke for, we
Breathe cheaply in the common air. -- LOWELL

Dicipulus est prioris posterior dies. -- PUBLIUS SYRUS

Truth is the daughter of Time. -- BACON

The Truth shall make you free. -- JOHN 8:32

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About the Author and This Document

Andrew Dickson White was born on November 7, 1832 in Homer, New York. Following graduation from Yale in 1853, he went to Europe, serving as attaché (1854-55) at the U.S. legation in St. Petersburg, Russia. While there, he continued his studies, obtaining a Ph.D. from Jena. He returned to the United States and became professor of history and English literature at the University of Michigan in Ann Arbor. In 1865, he was appointed Cornell University's first president, fulfilling a dream of a state university in New York founded on liberal principles regarding religion, coeducation, race and the teaching of science -- ***and*** -- totally unhampered by theological dogma and/or control, a view considered quite revolutionary at that time. White devoted his energies and wealth to assure Cornell's success and growth.

White served on many Government commissions. He was U.S. minister to Germany (1879-81) and Russia (1892-94) and ambassador to Germany (1897-1902). In 1899 he was president of the U.S. delegation at the Hague Peace Conference. Andrew Dickson White died on November 4, 1918 in Ithaca, New York.

In addition to this outstanding work, ***A History of the Warfare of Science With Theology in Christendom***, White's other highly regarded work is ***Seven Great Statesmen in the Warfare of Humanity with Unreason***, first published in 1910.

This work is quite eloquently summarized in the following review, written by someone unknown, and very curiously pasted onto the inside cover of a recent reissue (published 1955 by George Braziller, New York, no copyright claimed):

> "In this monumental study the entire history of Western man's search for meaning unfolds impressively before the reader. An important landmark in American thought, it was written at a time when the impact of the scientific movement threatened to shake the time-honored theological structure of man's universe and to quench the religious aspirations of the human spirit. Unique both in its *summa*-like scope and the precision of its argument, it remains today the

classic effort in America to sharpen the lines of conflict and at the same time to safeguard the religious spirit.

"By distinguishing religion from its theological interpretation, White hoped not only to justify the claims of science, but at the same time to find in science religion's strongest ally. That man might be at once religious and scientific -- this was his purpose.

"From geology and astronomy to physics and anthropology, from medicine and philology to the problems of biblical interpretation, White explores every aspect of the historical conflict and presents us with a brilliant and stimulating panorama of the entire history of Western thought."

Several comments must also be made regarding this hypertext document. The primary source material came from a public domain ASCII file of ***A History of the Warfare of Science With Theology in Christendom***, freely available from several Internet sites as well as numerous BBS. This ASCII text file was electronically scanned, so it says, from an 1898 edition published by D. Appleton and Company, New York, New York.

Numerous scanning errors were found in the ASCII text, which have been corrected here. Also, many of the special characters, which were necessarily converted to their ordinary text equivalents during the scanning of the original document, were reinserted by reference to the original document.

The ASCII text is also missing the nearly 700 bibliographic footnotes; excerpts from 62 of these footnotes, which contain comments other than strictly bibliographical information, have been reinserted into this work. It was decided not to reproduce all the original footnotes since all the references are now at least a century old (some of them are centuries old!) and thus difficult to locate. Fortunately this work, in the original book form, is found in many libraries so that the interested scholar will have available the bibliographic references if needed. The focus of this hypertext conversion is towards the general reader who will not have the need to know, in gory detail, the original sources cited by White.

Another feature missing here is a complete index. The original book

contains a massive index of limited use to most people -- it mainly lists people and places, and would only be useful if one already has a given name that they want to search for in the text. When this electronic book is updated for Windows 4.0 usage (which will have, if the rumors are correct, a complete text/string search engine), then the lack of an index will no longer be an issue. Those who own this version will be given, upon request, an updated version at OmniMedia's cost (to cover handling, postage, cost of diskettes, etc.), should the update have a complete search/text engine.

Finally, it was felt necessary to update some of the archaic "19th century English" spelling and other attributes so as to make the text easier to read for today's audience. Though the purist may object, it must be emphasized that, unlike fictional and artistic literature, the primary focus of this treatise is on ***what*** is said, not on ***how*** it is said, and such archaisms would needlessly divert the readers' focus on the ***what***, that is, the factual message Andrew Dickson White is attempting to convey to the reader.

We hope you will enjoy ***A History of the Warfare of Science With Theology in Christendom.***

(Note: In this demo version, only the first three chapters are included. The full commercial version has a total of twenty chapters.)

Jon E. Noring
OmniMedia
April 18, 1994

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Introduction by the Author

My book is ready for the printer, and as I begin this preface my eye lights upon the crowd of Russian peasants at work on the Neva under my windows. With pick and shovel they are letting the rays of the April sun into the great ice barrier which binds together the modern quays and the old granite fortress where lie the bones of the Romanoff Czars.

This barrier is already weakened; it is widely decayed, in many places thin, and everywhere treacherous; but it is, as a whole, so broad, so crystallized about old boulders, so imbedded in shallows, so wedged into crannies on either shore, that it is a great danger. The waters from thousands of swollen streamlets above are pressing behind it; wreckage and refuse are piling up against it; every one knows that it must yield. But there is danger that it may resist the pressure too long and break suddenly, wrenching even the granite quays from their foundations, bringing desolation to a vast population, and leaving, after the subsidence of the flood, a widespread residue of slime, a fertile breeding-bed for the germs of disease.

But the patient *mujiks* are doing the right thing. The barrier, exposed more and more to the warmth of spring by the scores of channels they are making, will break away gradually, and the river will flow on beneficent and beautiful.

My work in this book is like that of the Russian *mujik* on the Neva. I simply try to aid in letting the light of historical truth into that decaying mass of outworn thought which attaches the modern world to medieval conceptions of Christianity, and which still lingers among us -- a most serious barrier to religion and morals, and a menace to the whole normal evolution of society.

For behind this barrier also the flood is rapidly rising -- the flood of increased knowledge and new thought; and this barrier also, though honeycombed and in many places thin, creates a danger -- danger of a sudden breaking away, distressing and calamitous, sweeping before it not only out worn creeds and noxious dogmas, but cherished principles and ideals, and even wrenching out most precious religious and moral foundations of the whole social and political fabric.

My hope is to aid -- even if it be but a little -- in the gradual and healthful dissolving away of this mass of unreason, that the stream of "religion pure and undefiled" may flow on broad and clear, a blessing to humanity.

And now a few words regarding the evolution of this book.

It is something over a quarter of a century since I labored with Ezra Cornell in founding the university which bears his honored name.

Our purpose was to establish in the State of New York an institution for advanced instruction and research, in which science, pure and applied, should have an equal place with literature; in which the study of literature, ancient and modern, should be emancipated as much as possible from pedantry; and which should be free from various useless trammels and vicious methods which at that period hampered many, if not most, of the American universities and colleges.

We had especially determined that the institution should be under the control of no political party and of no single religious sect, and with Mr. Cornell's approval I embodied stringent provisions to this effect in the charter.

It had certainly never entered into the mind of either of us that in all this we were doing anything irreligious or unchristian. Mr. Cornell was reared a member of the Society of Friends; he had from his fortune liberally aided every form of Christian effort which he found going on about him, and among the permanent trustees of the public library which he had already founded, he had named all the clergymen of the town -- Catholic and Protestant. As for myself, I had been bred a churchman, had recently been elected a trustee of one church college, and a professor in another; those nearest and dearest to me were devoutly religious; and, if I may be allowed to speak of a matter so personal to my self, my most cherished friendships were among deeply religious men and women, and my greatest sources of enjoyment were ecclesiastical architecture, religious music, and the more devout forms of poetry. So, far from wishing to injure Christianity, we both hoped to promote it; but we did not confound religion with sectarianism, and we saw in the sectarian character of American colleges and universities as a whole, a reason for the poverty of the advanced instruction then given in so many of them.

It required no great acuteness to see that a system of control which, in selecting a Professor of Mathematics or Language or Rhetoric or Physics or Chemistry, asked first and above all to what sect or even to what wing or branch of a sect he belonged, could hardly do much to advance the moral, religious, or intellectual development of mankind.

The reasons for the new foundation seemed to us, then, so cogent that we expected the cooperation of all good citizens, and anticipated no opposition from any source.

As I look back across the intervening years, I know not whether to be more astonished or amused at our simplicity.

Opposition began at once. In the State Legislature it confronted us at every turn, and it was soon in full blaze throughout the State -- from the good Protestant bishop who proclaimed that all professors should be in holy orders, since to the Church alone was given the command, "Go, teach all nations," to the zealous priest who published a charge that Goldwin Smith -- a profoundly Christian scholar -- had come to Cornell in order to inculcate the "infidelity of the ***Westminster Review***"; and from the eminent divine who went from city to city, denouncing the "atheistic and pantheistic tendencies" of the proposed education, to the perfervid minister who informed a denominational synod that Agassiz, the last great opponent of Darwin, and a devout theist, was "preaching Darwinism and atheism" in the new institution.

As the struggle deepened, as hostile resolutions were introduced into various ecclesiastical bodies, as honored clergymen solemnly warned their flocks first against the "atheism," then against the "infidelity," and finally against the "indifferentism" of the university, as devoted pastors endeavored to dissuade young men from matriculation, I took the defensive, and, in answer to various attacks from pulpits and religious newspapers, attempted to allay the fears of the public. "Sweet reasonableness" was fully tried. There was established and endowed in the university perhaps the most effective Christian pulpit, and one of the most vigorous branches of the Christian Association, then in the United States; but all this did nothing to ward off the attack. The clause in the charter of the university forbidding it to give predominance to the doctrines of any sect, and above all the fact that much prominence was given to instruction in various branches of science, seemed to prevent all compromise, and it

soon became clear that to stand on the defensive only made matters worse. Then it was that there was borne in upon me a sense of the real difficulty -- the antagonism between the theological and scientific view of the universe and of education in relation to it; therefore it was that, having been invited to deliver a lecture in the great hall of the Cooper Institute at New York, I took as my subject ***The Battlefields of Science***, maintaining this thesis which follows:

"In all modern history, interference with science in the supposed interest of religion, no matter how conscientious such interference may have been, has resulted in the direst evils both to religion and science, and invariably; and, on the other hand, all untrammeled scientific investigation, no matter how dangerous to religion some of its stages may have seemed for the time to be, has invariably resulted in the highest good both of religion and science."

The lecture was next day published in the ***New York Tribune*** at the request of Horace Greeley, its editor, who was also one of the Cornell University trustees. As a result of this widespread publication and of sundry attacks which it elicited, I was asked to maintain my thesis before various university associations and literary clubs; and I shall always remember with gratitude that among those who stood by me and presented me on the lecture platform with words of approval and cheer was my revered instructor, the Rev. Dr. Theodore Dwight Woolsey, at that time President of Yale College.

My lecture grew -- first into a couple of magazine articles, and then into a little book called ***The Warfare of Science***, for which, when republished in England, Prof. John Tyndall wrote a preface.

Sundry translations of this little book were published, but the most curious thing in its history is the fact that a very friendly introduction to the Swedish translation was written by a Lutheran bishop.

Meanwhile Prof. John W. Draper published his book on ***The Conflict between Science and Religion***, a work of great ability, which, as I then thought, ended the matter, so far as my giving it further attention was concerned.

But two things led me to keep on developing my own work in this field:

First, I had become deeply interested in it, and could not refrain from directing my observation and study to it; secondly, much as I admired Draper's treatment of the questions involved, his point of view and mode of looking at history were different from mine.

He regarded the struggle as one between Science and Religion. I believed then, and am convinced now, that it was a struggle between Science and Dogmatic Theology.

More and more I saw that it was the conflict between two epochs in the evolution of human thought -- the theological and the scientific.

So I kept on, and from time to time published ***New Chapters in the Warfare of Science*** as magazine articles in ***The Popular Science Monthly***. This was done under many difficulties. For twenty years, as President of Cornell University and Professor of History in that institution, I was immersed in the work of its early development. Besides this, I could not hold myself entirely aloof from public affairs, and was three times sent by the Government of the United States to do public duty abroad: first as a commissioner to Santo Domingo, in 1870; afterward as minister to Germany, in 1879; finally, as minister to Russia, in 1892; and was also called upon by the State of New York to do considerable labor in connection with international exhibitions at Philadelphia and at Paris. I was also obliged from time to time to throw off by travel the effects of overwork.

The variety of residence and occupation arising from these causes may perhaps explain some peculiarities in this book which might otherwise puzzle my reader.

While these journeyings have enabled me to collect materials over a very wide range -- in the New World, from Quebec to Santo Domingo and from Boston to Mexico, San Francisco, and Seattle, and in the Old World from Trondheim to Cairo and from St. Petersburg to Palermo -- they have often obliged me to write under circumstances not very favorable: sometimes on an Atlantic steamer, sometimes on a Nile boat, and not only in my own library at Cornell, but in those of Berlin, Helsingfors, Munich, Florence, and the British Museum. This fact will explain to the benevolent reader not only the citation of different editions of the same authority in different chapters, but some iterations which in the steady quiet of my own library

would not have been made.

It has been my constant endeavor to write for the general reader, avoiding scholastic and technical terms as much as possible and stating the truth simply as it presents itself to me.

That errors of omission and commission will be found here and there is probable -- nay, certain; but the substance of the book will, I believe, be found fully true. I am encouraged in this belief by the fact that, of the three bitter attacks which this work in its earlier form has already encountered, one was purely declamatory, objurgatory, and hortatory, and the others based upon ignorance of facts easily pointed out.

And here I must express my thanks to those who have aided me. First and above all to my former student and dear friend, Prof. George Lincoln Burr, of Cornell University, to whose contributions, suggestions, criticisms, and cautions I am most deeply indebted; also to my friends U. G. Weatherly, formerly Traveling Fellow of Cornell, and now Assistant Professor in the University of Indiana, -- Prof. and Mrs. Earl Barnes and Prof. William H. Hudson, of Stanford University, -- and Prof. E. P. Evans, formerly of the University of Michigan, but now of Munich, for extensive aid in researches upon the lines I have indicated to them, but which I could never have prosecuted without their cooperation. In libraries at home and abroad they have all worked for me most effectively, and I am deeply grateful to them.

This book is presented as a sort of *Festschrift* -- a tribute to Cornell University as it enters the second quarter-century of its existence, and probably my last tribute.

The ideas for which so bitter a struggle was made at its foundation have triumphed. Its faculty, numbering over one hundred and fifty; its students, numbering but little short of two thousand; its noble buildings and equipment; the munificent gifts, now amounting to millions of dollars, which it has received from public-spirited men and women; the evidences of public confidence on all sides; and, above all, the adoption of its cardinal principles and main features by various institutions of learning in other States, show this abundantly. But there has been a triumph far greater and wider. Everywhere among the leading modern nations the same general tendency is seen. During the quarter-century just past the

control of public instruction, not only in America but in the leading nations of Europe, has passed more and more from the clergy to the laity. Not only are the presidents of the larger universities in the United States, with but one or two exceptions, laymen, but the same thing is seen in the old European strongholds of metaphysical theology. At my first visit to Oxford and Cambridge, forty years ago, they were entirely under ecclesiastical control. Now, all this is changed. An eminent member of the present British Government has recently said, "A candidate for high university position is handicapped by holy orders." I refer to this with not the slightest feeling of hostility toward the clergy, for I have none; among them are many of my dearest friends; no one honors their proper work more than I; but the above fact is simply noted as proving the continuance of that evolution which I have endeavored to describe in this series of monographs -- an evolution, indeed, in which the warfare of Theology against Science has been one of the most active and powerful agents. My belief is that in the field left to them -- their proper field -- the clergy will more and more, as they cease to struggle against scientific methods and conclusions, do work even nobler and more beautiful than anything they have heretofore done. And this is saying much. My conviction is that Science, though it has evidently conquered Dogmatic Theology based on biblical texts and ancient modes of thought, will go hand in hand with Religion; and that, although theological control will continue to diminish, Religion, as seen in the recognition of "a Power in the universe, not ourselves, which makes for righteousness," and in the love of God and of our neighbor, will steadily grow stronger and stronger, not only in the American institutions of learning but in the world at large. Thus may the declaration of Micah as to the requirements of Jehovah, the definition by St. James of "pure religion and undefiled," and, above all, the precepts and ideals of the blessed Founder of Christianity himself, be brought to bear more and more effectively on mankind.

I close this preface some days after its first lines were written. The sun of spring has done its work on the Neva; the great river flows tranquilly on, a blessing and a joy; the *mujiks* are forgotten.

A. D. W.
Legation of the United States, St. Petersburg, April 14, 1894

P.S. -- Owing to a wish to give more thorough revision to some parts of

my work, it has been withheld from the press until the present date.

A. D. W.
Cornell University, Ithaca, New York, August 15, 1895

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Chapter and Section Index

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CHAPTER 1 FROM CREATION TO EVOLUTION

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1.1 The Visible Universe

[Click Here for Section Outline]

Among those masses of cathedral sculpture which preserve so much of medieval theology, one frequently recurring group is noteworthy for its presentment of a time-honored doctrine regarding the origin of the universe.

The Almighty, in human form, sits benignly, making the sun, moon, and stars, and hanging them from the solid firmament which supports the "heaven above" and overarches the "earth beneath."

The furrows of thought on the Creator's brow show that in this work he is obliged to contrive; the knotted muscles upon his arms show that he is obliged to toil; naturally, then, the sculptors and painters of the medieval and early modern period frequently represented him as the writers whose conceptions they embodied had done -- as, on the seventh day, weary after thought and toil, enjoying well-earned repose and the plaudits of the hosts of heaven.

In these thought-fossils of the cathedrals, and in other revelations of the same idea through sculpture, painting, glass-staining, mosaic work, and engraving, during the Middle Ages and the two centuries following, culminated a belief which had been developed through thousands of years, and which has determined the world's thought until our own time.

Its beginnings lie far back in human history; we find them among the early records of nearly all the great civilizations, and they hold a most prominent place in the various sacred books of the world. In nearly all of them is revealed the conception of a Creator of whom man is an imperfect image, and who literally and directly created the visible universe with his hands and fingers.

Among these theories, of special interest to us are those which controlled theological thought in Chaldea. The Assyrian inscriptions which have been recently recovered and given to the English-speaking peoples by Layard, George Smith, Sayce, and others, show that in the ancient religions of Chaldea and Babylonia there was elaborated a narrative of the

creation which, in its most important features, must have been the source of that in our own sacred books. It has now become perfectly clear that from the same sources which inspired the accounts of the creation of the universe among the Chaldeo-Babylonian, the Assyrian, the Phœnician, and other ancient civilizations came the ideas which hold so prominent a place in the sacred books of the Hebrews. In the two accounts imperfectly fused together in Genesis, and also in the account of which we have indications in the book of Job and in the Proverbs, there, is presented, often with the greatest sublimity, the same early conception of the Creator and of the creation -- the conception, so natural in the childhood of civilization, of a Creator who is an enlarged human being working literally with his own hands, and of a creation which is "the work of his fingers." To supplement this view there was developed the belief in this Creator as one who, having... "from his ample palm launched forth the rolling planets into space..." sits on high, enthroned "upon the circle of the heavens," perpetually controlling and directing them.

From this idea of creation was evolved in time a somewhat nobler view. Ancient thinkers, and especially, as is now found, in Egypt, suggested that the main agency in creation was not the hands and fingers of the Creator, but his *voice*. Hence was mingled with the earlier, cruder belief regarding the origin of the earth and heavenly bodies by the Almighty the more impressive idea that "he spake and they were made" -- that they were brought into existence by his *word*.[footnote]

Among the early fathers of the Church this general view of creation became fundamental; they impressed upon Christendom more and more strongly the belief that the universe was created in a perfectly literal sense by the hands or voice of God. Here and there sundry theologians of larger mind attempted to give a more spiritual view regarding some parts of the creative work, and of these were St. Gregory of Nyssa and St. Augustine. Ready as they were to accept the literal text of Scripture, they revolted against the conception of an actual creation of the universe by the hands and fingers of a Supreme Being, and in this they were followed by Bede and a few others; but the more material conceptions prevailed, and we find these taking shape not only in the sculptures and mosaics and stained glass of cathedrals, and in the illuminations of missals and Psalters, but later, at the close of the Middle Ages, in the pictured Bibles and in general literature.

Into the Anglo-Saxon mind this ancient material conception of the creation

was riveted by two poets whose works appealed especially to the deeper religious feelings. In the seventh century Cædmon paraphrased the account given in Genesis, bringing out this material conception in the most literal form; and a thousand years later Milton developed out of the various statements in the Old Testament, mingled with a theology regarding "the creative Word" which had been drawn from the New, his description of the creation by the second person in the Trinity, than which nothing could be more literal and material:

"He took the golden compasses, prepared in God's eternal store, to circumscribe this universe and all created things. One foot he centered, and the other turned round through the vast profundity obscure, and said, 'Thus far extend, thus far they bounds: This be they just circumference, O world!'"

So much for the orthodox view of the *manner* of creation.

The next point developed in this theological evolution had reference to the *matter* of which the universe was made, and it was decided by an overwhelming majority that no material substance existed before the creation of the material universe -- that "God created everything out of nothing." Some venturesome thinkers, basing their reasoning upon the first verses of Genesis, hinted at a different view -- namely, that the mass, "without form and void," existed before the universe; but this doctrine was soon swept out of sight. The vast majority of the fathers were explicit on this point. Tertullian especially was very severe against those who took any other view than that generally accepted as orthodox: he declared that, if there had been any pre-existing matter out of which the world was formed, Scripture would have mentioned it; that by not mentioning it God has given us a clear proof that there was no such thing; and, after a manner not unknown in other theological controversies, he threatens Hermogenes, who takes the opposite view, with the woe which impends on all who add to or take away from the written word."

St. Augustine, who showed signs of a belief in a pre-existence of matter, made his peace with the prevailing belief by the simple reasoning that, "although the world has been made of some material, that very same material must have been made out of nothing."

In the wake of these great men the universal Church steadily followed.

The Fourth Lateran Council declared that God created everything out of nothing; and at the present hour the vast majority of the faithful -- whether Catholic or Protestant -- are taught the same doctrine; on this point the syllabus of Pius IX and the Westminster Catechism fully agree.

Having thus disposed of the manner and matter of creation, the next subject taken up by theologians was the *time* required for the great work.

Here came a difficulty. The first of the two accounts given in Genesis extended the creative operation through six days, each of an evening and a morning, with much explicit detail regarding the progress made in each. But the second account spoke of "*the day*" in which "the Lord God made the earth and the heavens." The explicitness of the first account and its naturalness to the minds of the great mass of early theologians gave it at first a decided advantage; but Jewish thinkers, like Philo, and Christian thinkers, like Origen, forming higher conceptions of the Creator and his work, were not content with this, and by them was launched upon the troubled sea of Christian theology the idea that the creation was instantaneous, this idea being strengthened not only by the second of the Genesis legends, but by the great text, "He spake, and it was done; he commanded, and it stood fast" -- or, as it appears in the Vulgate and in most translations, "He spake, and they were made; he commanded, and they were created."

As a result, it began to be held that the safe and proper course was to believe literally *both* statements; that in some mysterious manner God created the universe in six days, and yet brought it all into existence in a moment. In spite of the outcries of sundry great theologians, like Ephrem Syrus, that the universe was created in exactly six days of twenty-four hours each, this compromise was promoted by St. Athanasius and St. Basil in the East, and by St. Augustine and St. Hilary in the West.

Serious difficulties were found in reconciling these two views, which to the natural mind seem absolutely contradictory; but by ingenious manipulation of texts, by dexterous play upon phrases, and by the abundant use of metaphysics to dissolve away facts, a reconciliation was effected, and men came at least to believe that they believed in a creation of the universe instantaneous and at the same time extended through six days.

Some of the efforts to reconcile these two accounts were so fruitful as to

deserve special record. The fathers, Eastern and Western, developed out of the double account in Genesis, and the indications in the Psalms, the Proverbs, and the book of Job, a vast mass of sacred science bearing upon this point. As regards the whole work of creation, stress was laid upon certain occult powers in numerals. Philo Judæus, while believing in an instantaneous creation, had also declared that the world was created in six days because "of all numbers six is the most productive"; he had explained the creation of the heavenly bodies on the fourth day by "the harmony of the number four"; of the animals on the fifth day by the five senses; of man on the sixth day by the same virtues in the number six which had caused it to be set as a limit to the creative work; and, greatest of all, the rest on the seventh day by the vast mass of mysterious virtues in the number seven.

St. Jerome held that the reason why God did not pronounce the work of the second day "good" is to be found in the fact that there is something essentially evil in the number two, and this was echoed centuries afterward, afar off in Britain, by Bede.

St. Augustine brought this view to bear upon the Church in the following statement: "There are three classes of numbers -- the more than perfect, the perfect, and the less than perfect, according as the sum of them is greater than, equal to, or less than the original number. Six is the first perfect number: wherefore we must not say that six is a perfect number because God finished all his works in six days, but that God finished all his works in six days because six is a perfect number."

Reasoning of this sort echoed along through the medieval Church until a year after the discovery of America, when the ***Nuremberg Chronicle*** re-echoed it as follows: "The creation of things is explained by the number six, the parts of which, one, two, and three, assume the form of a triangle."

This view of the creation of the universe as instantaneous and also as in six days, each made up of an evening and a morning, became virtually universal. Peter Lombard and Hugo of St. Victor, authorities of vast weight, gave it their sanction in the twelfth century, and impressed it for ages upon the mind of the Church.

Both these lines of speculation -- as to the creation of everything out of nothing, and the reconciling of the instantaneous creation of the universe

with its creation in six days -- were still further developed by other great thinkers of the Middle Ages.

St. Hilary of Poitiers reconciled the two conceptions as follows: "For, although according to Moses there is an appearance of regular order in the fixing of the firmament, the laying bare of the dry land, the gathering together of the waters, the formation of the heavenly bodies, and the arising of living things from land and water, yet the creation of the heavens, earth, and other elements is seen to be the work of a single moment."

St. Thomas Aquinas drew from St. Augustine a subtle distinction which for ages eased the difficulties in the case: he taught in effect that God created the substance of things in a moment, but gave to the work of separating, shaping, and adorning this creation, six days.

The early reformers accepted and developed the same view, and Luther especially showed himself equal to the occasion. With his usual boldness he declared, first, that Moses "spoke properly and plainly, and neither allegorically nor figuratively," and that therefore "the world with all creatures was created in six days." And he then goes on to show how, by a great miracle, the whole creation was also instantaneous.

Melanchthon also insisted that the universe was created out of nothing and in a mysterious way, both in an instant and in six days, citing the text: "He spake, and they were made."

Calvin opposed the idea of an instantaneous creation, and laid special stress on the creation in six days: having called attention to the fact that the biblical chronology shows the world to be not quite six thousand years old and that it is now near its end, he says that "creation was extended through six days that it might not be tedious for us to occupy the whole of life in the consideration of it."

Peter Martyr clinched the matter by declaring: "So important is it to comprehend the work of creation that we see the creed of the Church take this as its starting point. Were this article taken away there would be no original sin, the promise of Christ would become void, and all the vital force of our religion would be destroyed." The Westminster divines in drawing up their Confession of Faith specially laid it down as necessary to believe that all things visible and invisible were created not only out of nothing but

in exactly six days.

Nor were the Roman divines less strenuous than the Protestant reformers regarding the necessity of holding closely to the so-called Mosaic account of creation. As late as the middle of the eighteenth century, when Buffon attempted to state simple geological truths, the theological faculty of the Sorbonne forced him to make and to publish a most ignominious recantation which ended with these words: "I abandon everything in my book respecting the formation of the earth, and generally all which may be Contrary to the narrative of Moses."

Theologians, having thus settled the manner of the creation, the matter used in it, and the time required for it, now exerted themselves to fix its *date*.

The long series of efforts by the greatest minds in the Church, from Eusebius to Archbishop Usher, to settle this point are presented in another chapter. Suffice it here that the general conclusion arrived at by an overwhelming majority of the most competent students of the biblical accounts was that the date of creation was, in round numbers, four thousand years before our era; and in the seventeenth century, in his great work, Dr. John Lightfoot, Vice-Chancellor of the University of Cambridge, and one of the most eminent Hebrew scholars of his time, declared, as the result of his most profound and exhaustive study of the Scriptures, that "heaven and earth, center and circumference, were created all together, in the same instant, and clouds full of water," and that "this work took place and man was created by the Trinity on October 23, 4004 B.C., at nine o'clock in the morning."

Here was, indeed, a triumph of Lactantius' method, the result of hundreds of years of biblical study and theological thought since Bede in the eighth century, and Vincent of Beauvais in the thirteenth, had declared that creation must have taken place in the spring. Yet, alas! within two centuries after Lightfoot's great biblical demonstration as to the exact hour of creation, it was discovered that at that hour an exceedingly cultivated people, enjoying all the fruits of a highly developed civilization, had long been swarming in the great cities of Egypt, and that other nations hardly less advanced had at that time reached a high development in Asia.

But, strange as it may seem, even after theologians had thus settled the

manner of creation, the matter employed in it, the time required for it, and the exact date of it, there remained virtually unsettled the first and greatest question of all; and this was nothing less than the question, WHO actually created the universe?

Various theories more or less nebulous, but all centered in texts of Scripture, had swept through the mind of the Church. By some theologians it was held virtually that the actual creative agent was the third person of the Trinity, who, in the opening words of our sublime creation poem, "moved upon the face of the waters." By others it was held that the actual Creator was the second person of the Trinity, in behalf of whose agency many texts were cited from the New Testament. Others held that the actual Creator was the first person, and this view was embodied in the two great formulas known as the Apostles' and Nicene Creeds, which explicitly assigned the work to "God the Father Almighty, Maker of Heaven and Earth." Others, finding a deep meaning in the words "Let *us* make," ascribed in Genesis to the Creator, held that the entire Trinity directly created all things; and still others, by curious metaphysical processes, seemed to arrive at the idea that peculiar combinations of two persons of the Trinity achieved the creation.

In all this there would seem to be considerable courage in view of the fearful condemnations launched in the Athanasian Creed against all who should "confound the persons" or "divide the substance of the Trinity."

These various stages in the evolution of scholastic theology were also embodied in sacred art, and especially in cathedral sculpture, in glass-staining, in mosaic working, and in missal painting.

The creative Being is thus represented sometimes as the third person of the Trinity, in the form of a dove brooding over chaos; sometimes as the second person, and therefore a youth; sometimes as the first person, and therefore fatherly and venerable; sometimes as the first and second persons, one being venerable and the other youthful; and sometimes as three persons, one venerable and one youthful, both wearing papal crowns, and each holding in his lips a tip of the wing of the dove, which thus seems to proceed from both and to be suspended between them.

Nor was this the most complete development of the medieval idea. The Creator was sometimes represented with a single body, but with three

faces, thus showing that Christian belief had in some pious minds gone through substantially the same cycle which an earlier form of belief had made ages before in India, when the Supreme Being was represented with one body but with the three faces of Brahma, Vishnu, and Siva.

But at the beginning of the modern period the older view in its primitive Jewish form was impressed upon Christians by the most mighty genius in art the world has known; for in 1512, after four years of Titanic labor, Michaelangelo uncovered his frescoes within the vault of the Sistine Chapel.

They had been executed by the command and under the sanction of the ruling Pope, Julius II, to represent the conception of Christian theology then dominant, and they remain today in all their majesty to show the highest point ever attained by the older thought upon the origin of the visible universe.

In the midst of the expanse of heaven the Almighty Father -- the first person of the Trinity -- in human form, august and venerable, attended by angels and upborne by mighty winds, sweeps over the abyss, and, moving through successive compartments of the great vault, accomplishes the work of the creative days. With a simple gesture he divides the light from the darkness, rears on high the solid firmament, gathers together beneath it the seas, or summons into existence the sun, moon, and planets, and sets them circling about the earth.

In this sublime work culminated the thought of thousands of years; the strongest minds accepted it or pretended to accept it, and nearly two centuries later this conception, in accordance with the first of the two accounts given in Genesis, was especially enforced by Bossuet, and received a new lease of life in the Church, both Catholic and Protestant. **[footnote]**

But to these discussions was added yet another, which, beginning in the early days of the Church, was handed down the ages until it had died out among the theologians of our own time.

In the first of the biblical accounts light is created and the distinction between day and night thereby made on the first day, while the sun and moon are not created until the fourth day. Masses of profound theological

and pseudo-scientific reasoning have been developed to account for this -- masses so great that for ages they have obscured the simple fact that the original text is a precious revelation to us of one of the most ancient of recorded beliefs -- the belief that light and darkness are entities independent of the heavenly bodies, and that the sun, moon, and stars exist not merely to increase light but to "divide the day from the night, to be for signs and for seasons, and for days and for years," and "to rule the day and the night."

Of this belief we find survivals among the early fathers, and especially in St. Ambrose. In his work on creation he tells us: "We must remember that the light of day is one thing and the light of the sun, moon, and stars another -- the sun by his rays appearing to add luster to the daylight. For before sunrise the day dawns, but is not in full refulgence, for the sun adds still further to its splendor." This idea became one of the "treasures of sacred knowledge committed to the Church," and was faithfully received by the Middle Ages. The medieval mysteries and miracle plays give curious evidences of this: In a performance of the creation, when God separates light from darkness, the stage direction is, "Now a painted cloth is to be exhibited, one half black and the other half white." It was also given more permanent form. In the mosaics of San Marco at Venice, in the frescoes of the Baptistery at Florence and of the Church of St. Francis at Assisi, and in the altar carving at Salerno, we find a striking realization of it -- the Creator placing in the heavens two disks or living figures of equal size, each suitably colored or inscribed to show that one represents light and the other darkness. This conception was without doubt that of the person or persons who compiled from the Chaldean and other earlier statements the accounts of the creation in the first of our sacred books.

Thus, down to a period almost within living memory, it was held, virtually "always, everywhere, and by all," that the universe, as we now see it, was created literally and directly by the voice or hands of the Almighty, or by both -- out of nothing -- in an instant or in six days, or in both -- about four thousand years before the Christian era -- and for the convenience of the dwellers upon the earth, which was at the base and foundation of the whole structure.

But there had been implanted along through the ages germs of another growth in human thinking, some of them even as early as the Babylonian period. In the Assyrian inscriptions we find recorded the Chaldeo-

Babylonian idea of *an evolution* of the universe out of the primeval flood or "great deep," and of the animal creation out of the earth and sea. This idea, recast, partially at least, into monotheistic form, passed naturally into the sacred books of the neighbors and pupils of the Chaldeans -- the Hebrews; but its growth in Christendom afterward was checked, as we shall hereafter find, by the more powerful influence of other inherited statements which appealed more intelligibly to the mind of the Church.

Striking, also, was the effect of this idea as rewrought by the early Ionian philosophers, to whom it was probably transmitted from the Chaldeans through the Phœnicians. In the minds of Ionians like Anaximander and Anaximenes it was most clearly developed: the first of these conceiving of the visible universe as the result of processes of evolution, and the latter pressing further the same mode of reasoning, and dwelling on agencies in cosmic development recognized in modern science.

This general idea of evolution in Nature thus took strong hold upon Greek thought and was developed in many ways, some ingenious, some perverse. Plato, indeed, withstood it; but Aristotle sometimes developed it in a manner which reminds us of modern views.

Among the Romans Lucretius caught much from it, extending the evolutionary process virtually to all things.

In the early Church, as we have seen, the idea of a creation direct, material, and by means like those used by man, was all-powerful for the exclusion of conceptions based on evolution. From the more simple and crude views of creation given in the Babylonian legends, and thence incorporated into Genesis, rose the stream of orthodox thought on the subject, which grew into a flood and swept on through the Middle Ages and into modern times. Yet here and there in the midst of this flood were high grounds of thought held by strong men. Scotus Erigena and Duns Scotus, among the schoolmen, bewildered though they were, had caught some rays of this ancient light, and passed on to their successors, in modified form, doctrines of an evolutionary process in the universe.

In the latter half of the sixteenth century these evolutionary theories seemed to take more definite form in the mind of Giordano Bruno, who evidently divined the fundamental idea of what is now known as the "nebular hypothesis"; but with his murder by the Inquisition at Rome this

idea seemed utterly to disappear -- dissipated by the flames which in 1600 consumed his body on the Campo dei Fiori.

Yet within the two centuries divided by Bruno's death the world was led into a new realm of thought in which an evolution theory of the visible universe was sure to be rapidly developed. For there came, one after the other, five of the greatest men our race has produced -- Copernicus, Kepler, Galileo, Descartes, and Newton -- and when their work was done the old theological conception of the universe was gone. "The spacious firmament on high" -- "the crystalline spheres" -- the Almighty enthroned upon "the circle of the heavens," and with his own lands, or with angels as his agents, keeping sun, moon, and planets in motion for the benefit of the earth, opening and closing the "windows of heaven," letting down upon the earth the "waters above the firmament," "setting his bow in the cloud," hanging out "signs and wonders," hurling comets, "casting forth lightnings" to scare the wicked, and "shaking the earth" in his wrath: all this had disappeared.

These five men had given a new divine revelation to the world; and through the last, Newton, had come a vast new conception, destined to be fatal to the old theory of creation, for he had shown throughout the universe, in place of almighty caprice, all-pervading law. The bitter opposition of theology to the first four of these men is well known; but the fact is not so widely known that Newton, in spite of his deeply religious spirit, was also strongly opposed. It was vigorously urged against him that by his statement of the law of gravitation he "took from God that direct action on his works so constantly ascribed to him in Scripture and transferred it to material mechanism," and that he "substituted gravitation for Providence." But, more than this, these men gave a new basis for the theory of evolution as distinguished from the theory of creation.

Especially worthy of note is it that the great work of Descartes, erroneous as many of its deductions were, and, in view of the lack of physical knowledge in his time, must be, had done much to weaken the old conception. His theory of a universe brought out of all-pervading matter, wrought into orderly arrangement by movements in accordance with physical laws -- though it was but a provisional hypothesis -- had done much to draw men's minds from the old theological view of creation; it was an example of intellectual honesty arriving at errors, but thereby aiding the advent of truths. Crippled though Descartes was by his almost morbid fear

of the Church, this part of his work was no small factor in bringing in that attitude of mind which led to a reception of the thoughts of more unfettered thinkers.

Thirty years later came, in England, an effort of a different sort, but with a similar result. In 1678 Ralph Cudworth published his ***Intellectual System of the Universe***. To this day he remains, in breadth of scholarship, in strength of thought, in tolerance, and in honesty, one of the greatest glories of the English Church, and his work was worthy of him. He purposed to build a fortress which should protect Christianity against all dangerous theories of the universe, ancient or modern. The foundations of the structure were laid with old thoughts thrown often into new and striking forms; but, as the superstructure arose more and more into view, while genius marked every part of it, features appeared which gave the rigidly orthodox serious misgivings. From the old theories of direct personal action on the universe by the Almighty he broke utterly. He dwelt on the action of law, rejected the continuous exercise of miraculous intervention, pointed out the fact that in the natural world there are "errors" and "bungles," and argued vigorously in favor of the origin and maintenance of the universe as a slow and gradual development of Nature in obedience to an inward principle. The Balaks of seventeenth-century orthodoxy might well condemn this honest Balaam.

Toward the end of the next century a still more profound genius, Immanuel Kant, presented the nebular theory, giving it, in the light of Newton's great utterances, a consistency which it never before had; and about the same time Laplace gave it yet greater strength by mathematical reasonings of wonderful power and extent, thus implanting firmly in modern thought the idea that our own solar system and others -- suns, planets, satellites, and their various movements, distances, and magnitudes -- necessarily result from the obedience of nebulous masses to natural laws.

Throughout the theological world there was an outcry at once against "atheism," and war raged fiercely. Herschel and others pointed out many nebulous patches apparently gaseous. They showed by physical and mathematical demonstrations that the hypothesis accounted for the great body of facts, and, despite clamor, were gaining ground, when the improved telescopes resolved some of the patches of nebulous matter into multitudes of stars. The opponents of the nebular hypothesis were overjoyed; they now sang pæans to astronomy, because, as they said, it

had proved the truth of Scripture. They had jumped to the conclusion that all nebula must be alike; that, if *some* are made up of systems of stars, *all* must be so made up; that none can be masses of attenuated gaseous matter, because some are not.

Science halted for a time. The accepted doctrine became this: that the only reason why all the nebula are not resolved into distinct stars is that our telescopes are not sufficiently powerful. But in time came the discovery of the spectroscope and spectrum analysis, and thence Fraunhofer's discovery that the spectrum of an ignited gaseous body is non-continuous, with interrupting lines; and Draper's discovery that the spectrum of an ignited solid is continuous, with no interrupting lines. And now the spectroscope was turned upon the nebula, and many of them were found to be gaseous. Here, then, was ground for the inference that in these nebulous masses at different stages of condensation -- some apparently mere pitches of mist, some with luminous centers -- we have the process of development actually going on, and observations like those of Lord Rosse and Arrest gave yet further confirmation to this view. Then came the great contribution of the nineteenth century to physics, aiding to explain important parts of the vast process by the mechanical theory of heat.

Again the nebular hypothesis came forth stronger than ever, and about 1850 the beautiful experiment of Plateau on the rotation of a fluid globe came in apparently to illustrate if not to confirm it. Even so determined a defender of orthodoxy as Mr. Gladstone at last acknowledged some form of a nebular hypothesis as probably true.

Here, too, was exhibited that form of surrendering theological views to science under the claim that science concurs with theology, which we have seen in so many other fields; and, as typical, an example may be given, which, however restricted in its scope, throws light on the process by which such surrenders are obtained. A few years since one of the most noted professors of chemistry in the city of New York, under the auspices of one of its most fashionable churches, gave a lecture which, as was claimed in the public prints and in placards posted in the streets, was to show that science supports the theory of creation given in the sacred books ascribed to Moses. A large audience assembled, and a brilliant series of elementary experiments with oxygen, hydrogen, and carbonic acid was concluded by the Plateau demonstration. It was beautifully made. As the colored globule of oil, representing the earth, was revolved in a transparent

medium of equal density, as it became flattened at the poles, as rings then broke forth from it and revolved about it, and, finally, as some of these rings broke into satellites, which for a moment continued to circle about the central mass, the audience, as well they might, rose and burst into rapturous applause.

Thereupon a well-to-do citizen arose and moved the thanks of the audience to the eminent professor for "this perfect demonstration of the exact and literal conformity of the statements given in Holy Scripture with the latest results of science." The motion was carried unanimously and with applause, and the audience dispersed, feeling that a great service had been rendered to orthodoxy. *Sancta simplicitas!*

What this incident exhibited on a small scale has been seen elsewhere with more distinguished actors and on a broader stage. Scores of theologians, chief among whom of late, in zeal if not in knowledge, has been Mr. Gladstone, have endeavored to "reconcile" the two accounts in Genesis with each other and with the truths regarding the origin of the universe gained by astronomy, geology, geography, physics, and chemistry. The result has been recently stated by an eminent theologian, the Hulsean Professor of Divinity at the University of Cambridge. He declares, "No attempt at reconciling Genesis with the exacting requirements of modern sciences has ever been known to succeed without entailing a degree of special pleading or forced interpretation to which, in such a question, we should be wise to have no recourse."

The revelations of another group of sciences, though sometimes bitterly opposed and sometimes "reconciled" by theologians, have finally set the whole question at rest. First, there have come the biblical critics -- earnest Christian scholars, working for the sake of truth -- and these have revealed beyond the shadow of a reasonable doubt the existence of at least two distinct accounts of creation in our book of Genesis, which can sometimes be forced to agree, but which are generally absolutely at variance with each other. These scholars have further shown the two accounts to be not the cunningly devised fables of priestcraft, but evidently fragments of earlier legends, myths, and theologies, accepted in good faith and brought together for the noblest of purposes by those who put in order the first of our sacred books.

Next have come the archaeologists and philologists, the devoted students

of ancient monuments and records; of these are such as Rawlinson, George Smith, Sayce, Oppert, Jensen, Schrader, Delitzsch, and a phalanx of similarly devoted scholars, who have deciphered a multitude of ancient texts, especially the inscriptions found in the great library of Assurbanipal at Nineveh, and have discovered therein an account of the origin of the world identical in its most important features with the later accounts in our own book of Genesis.

These men have had the courage to point out these facts and to connect them with the truth that these Chaldean and Babylonian myths, legends, and theories were far earlier than those of the Hebrews, which so strikingly resemble them, and which we have in our sacred books; and they have also shown us how natural it was that the Jewish accounts of the creation should have been obtained at that remote period when the earliest Hebrews were among the Chaldeans, and how the great Hebrew poetic accounts of creation were drawn either from the sacred traditions of these earlier peoples or from antecedent sources common to various ancient nations.

In a summary which for profound thought and fearless integrity does honor not only to himself but to the great position which he holds, the Rev. Dr. Driver, Professor of Hebrew and Canon of Christ Church at Oxford, has recently stated the case fully and fairly. Having pointed out the fact that the Hebrews were one people out of many who thought upon the origin of the universe, he says that they "framed theories to account for the beginnings of the earth and man"; that "they either did this for themselves or borrowed those of their neighbors"; that "of the theories current in Assyria and Phœnicia fragments have been preserved, and these exhibit points of resemblance with the biblical narrative sufficient to warrant the inference that both are derived from the same cycle of tradition."

After giving some extracts from the Chaldean creation tablets he says: "In the light of these facts it is difficult to resist the conclusion that the biblical narrative is drawn from the same source as these other records. The biblical historians, it is plain, derived their materials from the best human sources available.... The materials which with other nations were combined into the crudest physical theories or associated with a grotesque polytheism were vivified and transformed by the inspired genius of the Hebrew historians, and adapted to become the vehicle of profound religious truth."

Not less honorable to the sister university and to himself is the statement recently made by the Rev. Dr. Ryle, Hulsean Professor of Divinity at Cambridge. He says that to suppose that a Christian "must either renounce his confidence in the achievements of scientific research or abandon his faith in Scripture is a monstrous perversion of Christian freedom." He declares: "The old position is no longer tenable; a new position has to be taken up at once, prayerfully chosen, and hopefully held." He then goes on to compare the Hebrew story of creation with the earlier stories developed among kindred peoples, and especially with the pre-existing Assyro-Babylonian cosmogony, and shows that they are from the same source. He points out that any attempt to explain particular features of the story into harmony with the modern scientific ideas necessitates "a non-natural" interpretation; but he says that, if we adopt a natural interpretation, "we shall consider that the Hebrew description of the visible universe is unscientific as judged by modern standards, and that it shares the limitations of the imperfect knowledge of the age at which it was committed to writing." Regarding the account in Genesis of man's physical origin, he says that it "is expressed in the simple terms of prehistoric legend, of unscientific pictorial description."

In these statements and in a multitude of others made by eminent Christian investigators in other countries is indicated what the victory is which has now been fully won over the older theology.

Thus, from the Assyrian researches as well as from other sources, it has come to be acknowledged by the most eminent scholars at the leading seats of Christian learning that the accounts of creation with which for nearly two thousand years all scientific discoveries have had to be "reconciled" -- the accounts which blocked the way of Copernicus, and Galileo, and Newton, and Laplace -- were simply transcribed or evolved from a mass of myths and legends largely derived by the Hebrews from their ancient relations with Chaldea, rewrought in a monotheistic sense, imperfectly welded together, and then thrown into poetic forms in the sacred books which we have inherited.

On one hand, then, we have the various groups of men devoted to the physical sciences all converging toward the proofs that the universe, as we at present know it, is the result of an evolutionary process -- that is, of the gradual working of physical laws upon an early condition of matter; on the

other hand, we have other great groups of men devoted to historical, philological, and archaeological science whose researches all converge toward the conclusion that our sacred accounts of creation were the result of an evolution from an early chaos of rude opinion.

The great body of theologians who have so long resisted the conclusions of the men of science have claimed to be fighting especially for "the truth of Scripture," and their final answer to the simple conclusions of science regarding the evolution of the material universe has been the cry, "The Bible is true." And they are right -- though in a sense nobler than they have dreamed. Science, while conquering them, has found in our Scriptures a far nobler truth than that literal historical exactness for which theologians have so long and so vainly contended. More and more as we consider the results of the long struggle in this field we are brought to the conclusion that the inestimable value of the great sacred books of the world is found in their revelation of the steady striving of our race after higher conceptions, beliefs, and aspirations, both in morals and religion. Unfolding and exhibiting this long-continued effort, each of the great sacred books of the world is precious, and all, in the highest sense, are true. Not one of them, indeed, conforms to the measure of what mankind has now reached in historical and scientific truth; to make a claim to such conformity is folly, for it simply exposes those who make it and the books for which it is made to loss of their just influence.

That to which the great sacred books of the world conform, and our own most of all, is the evolution of the highest conceptions, beliefs, and aspirations of our race from its childhood through the great turning-points in its history. Herein lies the truth of all bibles, and especially of our own. Of vast value they indeed often are as a record of historical outward fact; recent researches in the East are constantly increasing this value; but it is not for this that we prize them most: they are eminently precious, not as a record of outward fact, but as a mirror of the evolving heart, mind, and soul of man. They are true because they have been developed in accordance with the laws governing the evolution of truth in human history, and because in poem, chronicle, code, legend, myth, apologue, or parable they reflect this development of what is best in the onward march of humanity. To say that they are not true is as if one should say that a flower or a tree or a planet is not true; to scoff at them is to scoff at the law of the universe. In welding together into noble form, whether in the book of Genesis, or in the Psalms, or in the book of Job, or elsewhere, the great conceptions of

men acting under earlier inspiration, whether in Egypt, or Chaldea, or India, or Persia, the compilers of our sacred books have given to humanity a possession ever becoming more and more precious; and modern science, in substituting a new heaven and a new earth for the old -- the reign of law for the reign of caprice, and the idea of evolution for that of creation -- has added and is steadily adding a new revelation divinely inspired.

In the light of these two evolutions, then -- one of the visible universe, the other of a sacred creation-legend -- science and theology, if the master minds in both are wise, may at last be reconciled. A great step in this reconciliation was recently seen at the main center of theological thought among English-speaking people, when, in the collection of essays entitled ***Lux Mundi***, emanating from the college established in these latter days as a fortress of orthodoxy at Oxford, the legendary character of the creation accounts in our sacred books was acknowledged, and when the Archbishop of Canterbury asked, "May not the Holy Spirit at times have made use of myth and legend?"

Continue

Ancient and medieval views regarding:

- **The manner of creation**
- **The matter of creation**
- **The time of creation**
- **The date of creation**
- **The Creator**
- **Light and darkness**

Rise of the conception of an evolution among:

- **The Chaldeans**
- **The Hebrews**
- **The Greeks**
- **The Romans**

Its survival through the Middle Ages, despite the disfavor of the Church

Its development in modern times -- The nebular hypothesis and its struggle with theology

The idea of evolution at last victorious

Our sacred books themselves an illustration of its truth

The true reconciliation of Science and Theology

Among the many medieval representations of the creation of the universe, I especially recall from personal observation those sculptured above the portals of the cathedrals of Freiburg and Upsala, the paintings on the walls of the Campo Santo at Pisa, and, most striking of all, the mosaics of the Cathedral of Monreale and those in the Cappella Palatina at Palermo. Among peculiarities showing the simplicity of the earlier conception the representation of the repose of the Almighty on the seventh day is very striking. He is shown as seated in almost the exact attitude of the "Weary Mercury" of classic sculpture -- bent, and with a very marked expression of fatigue upon his countenance and in the whole disposition of his body.

The most naïve of all survivals of the medieval idea of creation which the present writer has ever seen was exhibited in 1894 on the banner of one of the guilds at the celebration of the four-hundredth anniversary of the founding of the Munich Cathedral. Jesus of Nazareth, as a beautiful boy and with a nimbus encircling his head, was shown turning and shaping the globe on a lathe, which he keeps in motion with his foot. The emblems of the Passion are about him, God the Father looking approvingly upon him from a cloud, and the dove hovering between the two. The date upon the banner was 1727.

1.2 Theological Teachings Regarding the Animals and Man

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In one of the windows of the cathedral at Ulm a medieval glass-stainer has represented the Almighty as busily engaged in creating the animals, and there has just left the divine hands an elephant fully accoutered, with armor, harness, and housings, ready-for war. Similar representations appear in illuminated manuscripts and even in early printed books, and, as the culmination of the whole, the Almighty is shown as fashioning the first man from a hillock of clay and extracting from his side, with evident effort, the first woman.

This view of the general process of creation had come from far, appearing under varying forms in various ancient cosmogonies. In the Egyptian temples at Philæ and Denderah may still be seen representations of the Nile gods modeling lumps of clay into men, and a similar work is ascribed in the Assyrian tablets to the gods of Babylonia. Passing into our own sacred books, these ideas became the starting point of a vast new development of theology.

The fathers of the Church generally received each of the two conflicting creation legends in Genesis literally, and then, having done their best to reconcile them with each other and to mold them together, made them the final test of thought upon the universe and all things therein. At the beginning of the fourth century Lactantius struck the key-note of this mode of subordinating all other things in the study of creation to the literal text of Scripture, and he enforces his view of the creation of man by a bit of philology, saying the final being created "is called man because he is made from the ground -- *homo ex humo*."

In the second half of the same century this view as to the literal acceptance of the sacred text was reasserted by St. Ambrose, who, in his work on the creation, declared that "Moses opened his mouth and poured forth what God had said to him." But a greater than either of them fastened this idea into the Christian theologies. St. Augustine, preparing his ***Commentary on the Book of Genesis***, laid down in one famous sentence the law which has lasted in the Church until our own time: "Nothing is to be accepted save on the authority of Scripture, since greater is that authority than all the

powers of the human mind." The vigor of the sentence in its original Latin carried it ringing down the centuries: "*Major est Scripturæ auctoritas quam omnis humani ingenii capacitas*."

Through the medieval period, in spite of a revolt led by no other than St. Augustine himself, and followed by a series of influential churchmen, contending, as we shall hereafter see, for a modification of the accepted view of creation, this phrase held the minds of men firmly. The great Dominican encyclopedist, Vincent of Beauvais, in his ***Mirror of Nature***, while mixing ideas brought from Aristotle with a theory drawn from the Bible, stood firmly by the first of the accounts given in Genesis, and assigned the special virtue of the number six as a reason why all things were created in six days; and in the later Middle Ages that eminent authority, Cardinal d'Ailly, accepted everything regarding creation in the sacred books literally. Only a faint dissent is seen in Gregory Reisch, another authority of this later period, who, while giving, in his book on the beginning of things, a full length woodcut showing the Almighty in the act of extracting Eve from Adam's side, with all the rest of new-formed Nature in the background, leans in his writings, like St. Augustine, toward a belief in the pre-existence of matter.

At the Reformation the vast authority of Luther was thrown in favor of the literal acceptance of Scripture as the main source of natural science. The allegorical and mystical interpretations of earlier theologians he utterly rejected. "Why," he asks, "should Moses use allegory when he is not speaking of allegorical creatures or of an allegorical world, but of real creatures and of a visible world, which can be seen, felt, and grasped? Moses calls things by their right names, as we ought to do.... I hold that the animals took their being at once upon the word of God, as did also the fishes in the sea."

Not less explicit in his adherence to the literal account of creation given in Genesis was Calvin. He warns those who, by taking another view than his own, "basely insult the Creator, to expect a judge who will annihilate them." He insists that all species of animals were created in six days, each made up of an evening and a morning, and that no new species has ever appeared since. He dwells on the production of birds from the water as resting upon certain warrant of Scripture, but adds, "If the question is to be argued on physical grounds, we know that water is more akin to air than the earth is." As to difficulties in the scriptural account of creation, he tells

us that God "wished by these to give proofs of his power which should fill us with astonishment."

The controlling minds in the Roman Church steadfastly held this view. In the seventeenth century Bossuet threw his vast authority in its favor, and in his ***Discourse on Universal History***, which has remained the foundation not only of theological but of general historical teaching in France down to the present republic, we find him calling attention to what he regards as the culminating act of creation, and asserting that, literally, for the creation of man earth was used, and "the finger of God applied to corruptible matter."

The Protestant world held this idea no less persistently. In the seventeenth century Dr. John Lightfoot, Vice-Chancellor of the University of Cambridge, the great rabbinical scholar of his time, attempted to reconcile the two main legends in Genesis by saying that of the "clean sort of beasts there were seven of every kind created, three couples for breeding and the odd one for Adam's sacrifice on his fall, which God foresaw"; and that of unclean beasts only one couple was created.

So literal was this whole conception of the work of creation that in these days it can scarcely be imagined. The Almighty was represented in theological literature, in the pictured Bibles, and in works of art generally, as a sort of enlarged and venerable Nuremberg toymaker. At times the accounts in Genesis were illustrated with even more literal exactness; thus, in connection with a well-known passage in the sacred text, the Creator was shown as a tailor, seated, needle in hand, diligently sewing together skins of beasts into coats for Adam and Eve. Such representations presented no difficulties to the docile minds of the Middle Ages and the Reformation period; and in the same spirit, when the discovery of fossils began to provoke thought, these were declared to be "models of his works approved or rejected by the great Artificer," "outlines of future creations," "sports of Nature," or "objects placed in the strata to bring to naught human curiosity"; and this kind of explanation lingered on until in our own time an eminent naturalist, in his anxiety to save the literal account in Genesis, has urged that Jehovah tilted and twisted the strata, scattered the fossils through them, scratched the glacial furrows upon them, spread over them the marks of erosion by water, and set Niagara pouring -- all in an instant -- thus mystifying the world "for some inscrutable purpose, but for his own glory."

The next important development of theological reasoning had regard to the *divisions* of the animal kingdom.

Naturally, one of the first divisions which struck the inquiring mind was that between useful and noxious creatures, and the question therefore occurred, How could a good God create tigers and serpents, thorns and thistles? The answer was found in theological considerations upon *sin*. To man's first disobedience all woes were due. Great men for eighteen hundred years developed the theory that before Adam's disobedience there was no death, and therefore neither ferocity nor venom.

Some typical utterances in the evolution of this doctrine are worthy of a passing glance. St. Augustine expressly confirmed and emphasized the view that the vegetable as well as the animal kingdom was cursed on account of man's sin. Two hundred years later this utterance had been echoed on from father to father of the Church until it was caught by Bede; he declared that before man's fall animals were harmless, but were made poisonous or hurtful by Adam's sin, and he said, "Thus fierce and poisonous animals were created for terrifying man (because God foresaw that he would sin), in order that he might be made aware of the final punishment of hell."

In the twelfth century this view was incorporated by Peter Lombard into his great theological work, the ***Sentences***, which became a textbook of theology through the middle ages. He affirmed that "no created things would have been hurtful to man had he not sinned; they became hurtful for the sake of terrifying and punishing vice or of proving and perfecting virtue; they were created harmless, and on account of sin became hurtful."

This theological theory regarding animals was brought out in the eighteenth century with great force by John Wesley. He declared that before Adam's sin "none of these attempted to devour or in any wise hurt one another"; "the spider was as harmless as the fly, and did not lie in wait for blood." Not only Wesley, but the eminent Dr. Adam Clarke and Dr. Richard Watson, whose ideas had the very greatest weight among the English Dissenters, and even among leading thinkers in the Established Church, held firmly to this theory; so that not until, in our own time, geology revealed the remains of vast multitudes of carnivorous creatures, many of them with half-digested remains of other animals in their stomachs, all extinct long

ages before the appearance of man upon earth, was a victory won by science over theology in this field.

A curious development of this doctrine was seen in the belief drawn by sundry old commentators from the condemnation of the serpent in Genesis -- a belief, indeed, perfectly natural, since it was evidently that of the original writers of the account preserved in the first of our sacred books. This belief was that, until the tempting serpent was cursed by the Almighty, all serpents stood erect, walked, and talked.

This belief was handed down the ages as part of "the sacred deposit of the faith" until Watson, the most prolific writer of the evangelical reform in the eighteenth century and the standard theologian of the evangelical party, declared: "We have no reason at all to believe that the animal had a serpentine form in any mode or degree until its transformation; that he was then degraded to a reptile to go upon his belly imports, on the contrary, an entire loss and alteration of the original form." Here, again, was a ripe result of the theological method diligently pursued by the strongest thinkers in the Church during nearly two thousand years; but this "sacred deposit" also faded away when the geologists found abundant remains of fossil serpents dating from periods long before the appearance of man.

Troublesome questions also arose among theologians regarding animals classed as "superfluous." St. Augustine was especially exercised thereby. He says: "I confess I am ignorant why mice and frogs were created, or flies and worms.... All creatures are either useful, hurtful, or superfluous to us.... As for the hurtful creatures, we are either punished, or disciplined, or terrified by them, so that we may not cherish and love this life." As to the "superfluous animals," he says, "Although they are not necessary for our service, yet the whole design of the universe is thereby completed and finished." Luther, who followed St. Augustine in so many other matters, declined to follow him fully in this. To him a fly was not merely superfluous, it was noxious -- sent by the devil to vex him when reading.

Another subject which gave rise to much searching of Scripture and long trains of theological reasoning was the difference between the creation of man and that of other living beings.

Great stress was laid by theologians, from St. Basil and St. Augustine to St. Thomas Aquinas and Bossuet, and from Luther to Wesley, on the radical

distinction indicated in Genesis, God having created man "in his own image." What this statement meant was seen in the light of the later biblical statement that "Adam begat Seth in his own likeness, after his image."

In view of this and of well-known texts incorporated from older creation legends into the Hebrew sacred books it came to be widely held that, while man was directly molded and fashioned separately by the Creator's hand, the animals generally were evoked in numbers from the earth and sea by the Creator's voice.

A question now arose naturally as to the *distinctions of species* among animals. The vast majority of theologians agreed in representing all animals as created "in the beginning," and named by Adam, preserved in the Ark, and continued ever afterward under exactly the same species. This belief ripened into a dogma. Like so many other dogmas in the Church, Catholic and Protestant, its real origins are to be found rather in pagan philosophy than in the Christian Scriptures; it came far more from Plato and Aristotle than from Moses and St. Paul. But this was not considered: more and more it became necessary to believe that each and every difference of species was impressed by the Creator "in the beginning," and that no change had taken place or could have taken place since.

Some difficulties arose here and there as zoology progressed and revealed ever-increasing numbers of species; but through the Middle Ages, and indeed long after the Reformation, these difficulties were easily surmounted by making the Ark of Noah larger and larger, and especially by holding that there had been a human error in regard to its measurement.

But naturally there was developed among both ecclesiastics and laymen a human desire to go beyond these special points in the history of animated beings -- a desire to know what the creation really *is*.

Current legends, stories, and travelers' observations, poor as they were, tended powerfully to stimulate curiosity in this field.

Three centuries before the Christian era Aristotle had made the first really great attempt to satisfy this curiosity, and had begun a development of studies in natural history which remains one of the leading achievements in

the story of our race.

But the feeling which we have already seen so strong in the early Church -- that all study of Nature was futile in view of the approaching end of the world -- indicated so clearly in the New Testament and voiced so powerfully by Lactantius and St. Augustine -- held back this current of thought for many centuries. Still, the better tendency in humanity continued to assert itself. There was, indeed, an influence coming from the Hebrew Scriptures themselves which wrought powerfully to this end; for, in spite of all that Lactantius or St. Augustine might say as to the futility of any study of Nature, the grand utterances in the Psalms regarding the beauties and wonders of creation, in all the glow of the truest poetry, ennobled the study even among those whom logic drew away from it.

But, as a matter of course, in the early Church and throughout the Middle Ages all such studies were cast in a theological mold. Without some purpose of biblical illustration or spiritual edification they were considered futile too much prying into the secrets of Nature was very generally held to be dangerous both to body and soul; only for showing forth God's glory and his purposes in the creation were such studies praiseworthy. The great work of Aristotle was under eclipse. The early Christian thinkers gave little attention to it, and that little was devoted to transforming it into something absolutely opposed to his whole spirit and method; in place of it they developed the ***Physiologus*** and the ***Bestiaries***, mingling scriptural statements, legends of the saints, and fanciful inventions with pious intent and childlike simplicity. In place of research came authority -- the authority of the Scriptures as interpreted by the ***Physio Cogus*** and the ***Bestiaries*** -- and these remained the principal source of thought on animated Nature for over a thousand years.

Occasionally, indeed, fear was shown among the rulers in the Church, even at such poor prying into the creation as this, and in the fifth century a synod under Pope Gelasius administered a rebuke to the ***Physiologus***; but the interest in Nature was too strong: the great work on ***Creation*** by St. Basil had drawn from the ***Physiologus*** precious illustrations of Holy Writ, and the strongest of the early popes, Gregory the Great, virtually sanctioned it.

Thus was developed a sacred science of creation and of the divine purpose in Nature, which went on developing from the fourth century to the nineteenth -- from St. Basil to St. Isidore of Seville, from Isidore to Vincent

of Beauvais, and from Vincent to Archdeacon Paley and the Bridgewater Treatises.

Like all else in the Middle Ages, this sacred science was developed purely by theological methods. Neglecting the wonders which the dissection of the commonest animals would have afforded them, these naturalists attempted to throw light into Nature by ingenious use of scriptural texts, by research among the lives of the saints, and by the plentiful application of metaphysics. Hence even such strong men as St. Isidore of Seville treasured up accounts of the unicorn and dragons mentioned in the Scriptures and of the phœnix and basilisk in profane writings. Hence such contributions to knowledge as that the basilisk kills serpents by his breath and men by his glance, that the lion when pursued effaces his tracks with the end of his tail, that the pelican nourishes her young with her own blood, that serpents lay aside their venom before drinking, that the salamander quenches fire, that the hyena can talk with shepherds, that certain birds are born of the fruit of a certain tree when it happens to fall into the water, with other masses of science equally valuable.

As to the method of bringing science to bear on Scripture, the ***Physiologus*** gives an example, illustrating the passage in the book of Job which speaks of the old lion perishing for lack of prey. Out of the attempt to explain an unusual Hebrew word in the text there came a curious development of error, until we find fully evolved an account of the "ant-lion," which, it gives us to understand, was the lion mentioned by Job, and it says: "As to the ant-lion, his father hath the shape of a lion, his mother that of an ant; the father liveth upon flesh and the mother upon herbs; these bring forth the ant-lion, a compound of both and in part like to either; for his fore part is like 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, and so he perisheth."

In the middle of the thirteenth century we have a triumph of this theological method in the great work of the English Franciscan Bartholomew on ***The Properties of Things***. The theological method as applied to science consists largely in accepting tradition and in spinning arguments to fit it. In this field Bartholomew was a master. Having begun with the intent mainly to explain the allusions in Scripture to natural objects, he soon rises logically into a survey of all Nature. Discussing the "cockatrice" of Scripture, he tells us: "He drieth and burneth leaves with his touch, and he

is of so great venom and perilous that he slayeth and wasteth him that nigheth him without tarrying; and yet the weasel overcometh him, for the biting of the weasel is death to the cockatrice. Nevertheless the biting of the cockatrice is death to the weasel if the weasel eat not rue before. And though the cockatrice be venomous without remedy while he is alive, yet he looseth all the malice when he is burnt to ashes. His ashes be accounted profitable in working of alchemy, and namely in turning and changing of metals."

Bartholomew also enlightens us on the animals of Egypt, and says, "If the crocodile findeth a man by the water's brim he slayeth him, and then he weepeth over him and swalloweth him."

Naturally this good Franciscan naturalist devotes much thought to the "dragons" mentioned in Scripture. He says: "The dragon is most greatest of all serpents, and oft he is drawn out of his den and riseth up into the air, and the air is moved by him, and also the sea swelleth against his venom, and he hath a crest, and reareth his tongue, and hath teeth like a saw, and hath strength, and not only in teeth but in tail, and grieveth with biting and with stinging. Whom he findeth he slayeth. Oft four or five of them fasten their tails together and rear up their heads, and sail over the sea to get good meat. Between elephants and dragons is everlasting fighting; for the dragon with his tail spanneth the elephant, and the elephant with his nose throweth down the dragon.... The cause why the dragon desireth his blood is the coldness thereof, by the which the dragon desireth to cool himself. Jerome saith that the dragon is a full thirsty beast, insomuch that he openeth his mouth against the wind to quench the burning of his thirst in that wise. Therefore, when he seeth ships in great wind he flieth against the sail to take the cold wind, and overthroweth the ship."

These ideas of Friar Bartholomew spread far and struck deep into the popular mind. His book was translated into the principal languages of Europe, and was one of those most generally read during the Ages of Faith. It maintained its position nearly three hundred years; even after the invention of printing it held its own, and in the fifteenth century there were issued no less than ten editions of it in Latin, four in French, and various versions of it in Dutch, Spanish, and English. Preachers found it especially useful in illustrating the ways of God to man. It was only when the great voyages of discovery substituted ascertained fact for theological reasoning in this province that its authority was broken.

The same sort of science flourished in the ***Bestiaries***, which were used everywhere, and especially in the pulpits, for the edification of the faithful. In all of these, as in that compiled early in the thirteenth century by an ecclesiastic, William of Normandy, we have this lesson, borrowed from the ***Physiologus***: "The lioness giveth birth to cubs which remain three days without life. Then cometh the lion, breatheth upon them, and bringeth them to life.... Thus it is that Jesus Christ during three days was deprived of life, but God the Father raised him gloriously."

Pious use was constantly made of this science, especially by monkish preachers. The phœnix rising from his ashes proves the doctrine of the resurrection; the structure and mischief of monkeys proves the existence of demons; the fact that certain monkeys have no tails proves that Satan has been shorn of his glory; the weasel, which "constantly changes its place, is a type of the man estranged from the word of God, who findeth no rest."

The moral treatises of the time often took the form of works on natural history, in order the more fully to exploit these religious teachings of Nature. Thus from the book ***On Bees***, the Dominican Thomas of Cantimpré, we learn that "wasps persecute bees and make war on them out of natural hatred"; and these, he tells us, typify the demons who dwell in the air and with lightning and tempest assail and vex mankind -- whereupon he fills a long chapter with anecdotes of such demonic warfare on mortals. In like manner his fellow-Dominican, the inquisitor Nider, in his book ***The Ant Hill***, teaches us that the ants in Ethiopia, which are said to have horns and to grow so large as to look like dogs, are emblems of atrocious heretics, like Wyclif and the Hussites, who bark and bite against the truth; while the ants of India, which dig up gold out of the sand with their feet and hoard it, though they make no use of it, symbolize the fruitless toil with which the heretics dig out the gold of Holy Scripture and hoard it in their books to no purpose.

This pious spirit not only pervaded science; it bloomed out in art, and especially in the cathedrals. In the gargoyles overhanging the walls, in the grotesques clambering about the towers or perched upon pinnacles, in the dragons prowling under archways or lurking in bosses of foliage, in the apocalyptic beasts carved upon the stalls of the choir, stained into the windows, wrought into the tapestries, illuminated in the letters and borders

of psalters and missals, these marvels of creation suggested everywhere morals from the ***Physiologus***, the ***Bestiaries***, and the ***Exempla***.

Here and there among men who were free from church control we have work of a better sort. In the twelfth and thirteenth centuries Abd Allatif made observations upon the natural history of Egypt which showed a truly scientific spirit, and the Emperor Frederick II attempted to promote a more fruitful study of Nature; but one of these men was abhorred as a Mussulman and the other as an infidel. Far more in accordance with the spirit of the time was the ecclesiastic Giraldus Cambrensis, whose book on the topography of Ireland bestows much attention upon the animals of the island, and rarely fails to make each contribute an appropriate moral. For example, he says that in Ireland "eagles live for so many ages that they seem to contend with eternity itself; so also the saints, having put off the old man and put on the new, obtain the blessed fruit of everlasting life." Again, he tells us: "Eagles often fly so high that their wings are scorched by the sun; so those who in the Holy Scriptures strive to unravel the deep and hidden secrets of the heavenly mysteries, beyond what is allowed, fall below, as if the wings of the presumptuous imaginations on which they are borne were scorched."

In one of the great men of the following century appeared a gleam of healthful criticism: Albert the Great, in his work on the animals, dissents from the widespread belief that certain birds spring from trees and are nourished by the sap, and also from the theory that some are generated in the sea from decaying wood.

But it required many generations for such skepticism to produce much effect, and we find among the illustrations in an edition of Mandeville published just before the Reformation not only careful accounts but pictured representations both of birds and of beasts produced in the fruit of trees.

This general employment of natural science for pious purposes went on after the Reformation. Luther frequently made this use of it, and his example controlled his followers. In 1612, Wolfgang Franz, Professor of Theology at Luther's university, gave to the world his sacred history of animals, which went through many editions. It contained a very ingenious classification, describing "natural dragons," which have three rows of teeth to each jaw, and he piously adds, "the principal dragon is the Devil."

Near the end of the same century, Father Kircher, the great Jesuit professor at Rome, holds back the skeptical current, insists upon the orthodox view, and represents among the animals entering the Ark sirens and griffins.

Yet even among theologians we note here and there a skeptical spirit in natural science. Early in the same seventeenth century Eugène Roger published his ***Travels in Palestine.*** As regards the utterances of Scripture he is soundly orthodox: he prefaces his work with a map showing, among other important points referred to in biblical history, the place where Samson slew a thousand Philistines with the jawbone of an ass, the cavern which Adam and Eve inhabited after their expulsion from paradise, the spot where Balaam's ass spoke, the place where Jacob wrestled with the angel, the steep place down which the swine possessed of devils plunged into the sea, the position of the salt statue which was once Lot's wife, the place at sea where Jonah was swallowed by the whale, and "the exact spot where St. Peter caught one hundred and fifty-three fishes."

As to natural history, he describes and discusses with great theological acuteness the basilisk. He tells us that the animal is about a foot and a half long, is shaped like a crocodile, and kills people with a single glance. The one which he saw was dead, fortunately for him, since in the time of Pope Leo IV -- as he tells us -- one appeared in Rome and killed many people by merely looking at them; but the Pope destroyed it with his prayers and the sign of the cross. He informs us that Providence has wisely and mercifully protected man by requiring the monster to cry aloud two or three times whenever it leaves its den, and that the divine wisdom in creation is also shown by the fact that the monster is obliged to look its victim in the eye, and at a certain fixed distance, before its glance can penetrate the victim's brain and so pass to his heart. He also gives a reason for supposing that the same divine mercy has provided that the crowing of a cock will kill the basilisk.

Yet even in this good and credulous missionary we see the influence of Bacon and the dawn of experimental science; for, having been told many stories regarding the salamander, he secured one, placed it alive upon the burning coals, and reports to us that the legends concerning its power to live in the fire are untrue. He also tried experiments with the chameleon, and found that the stories told of it were to be received with much

allowance: while, then, he locks up his judgment whenever he discusses the letter of Scripture, he uses his mind in other things much after the modern method.

In the second half of the same century Hottinger, in his ***Theological Examination of the History of Creation***, breaks from the belief in the phœnix; but his skepticism is carefully kept within the limits imposed by Scripture. He avows his doubts, first, "because God created the animals in couples, while the phœnix is represented as a single, unmated creature"; secondly, "because Noah, when he entered the Ark, brought the animals in by sevens, while there were never so many individuals of the phœnix species" thirdly, because "no man is known who dares assert that he has ever seen this bird"; fourthly, because "those who assert there is a phœnix differ among themselves."

In view of these attacks on the salamander and the phœnix, we are not surprised to find, before the end of the century, skepticism regarding the basilisk: the eminent Prof. Kirchmaier, at the University of Wittenberg, treats phœnix and basilisk alike as old wives' fables. As to the phœnix, he denies its existence, not only because Noah took no such bird into the Ark, but also because, as he pithily remarks, "birds come from eggs, not from ashes." But the unicorn he cannot resign, nor will he even concede that the unicorn is a rhinoceros; he appeals to Job and to Marco Polo to prove that this animal, as usually conceived, really exists, and says, "Who would not fear to deny the existence of the unicorn, since Holy Scripture names him with distinct praises?" As to the other great animals mentioned in Scripture, he is so rationalistic as to admit that behemoth was an elephant and leviathan a whale.

But these germs of a fruitful skepticism grew, and we soon find Dannhauer going a step further and declaring his disbelief even in the unicorn, insisting that it was a rhinoceros -- only that and nothing more. Still, the main current continued strongly theological. In 1712 Samuel Bochart published his great work upon the animals of Holy Scripture. As showing its spirit we may take the titles of the chapters on the horse:

"Chapter VI. Of the Hebrew Name of the Horse."

"Chapter VII. Of the Colors of the Six Horses in Zechariah."

"Chapter VIII. Of the Horses in Job."

"Chapter IX. Of Solomon's Horses, and of the Texts wherein the Writers praise the Excellence of Horses."

"Chapter X. Of the Consecrated Horses of the Sun."

Among the other titles of chapters are such as: Of Balaam's Ass; Of the Thousand Philistines slain by Samson with the Jawbone of an Ass; Of the Golden Calves of Aaron and Jeroboam; Of the Bleating, Milk, Wool, External and Internal Parts of Sheep mentioned in Scripture; Of Notable Things told regarding Lions in Scripture; Of Noah's Dove and of the Dove which appeared at Christ's Baptism. Mixed up in the book, with the principal mass drawn from Scripture, were many facts and reasonings taken from investigations by naturalists; but all were permeated by the theological spirit.

The inquiry into Nature having thus been pursued nearly two thousand years theologically, we find by the middle of the sixteenth century some promising beginnings of a different method -- the method of inquiry into Nature scientifically -- the method which seeks not plausibilities but facts. At that time Edward Wotton led the way in England and Conrad Gesner on the Continent, by observations widely extended, carefully noted, and thoughtfully classified.

This better method of interrogating Nature soon led to the formation of societies for the same purpose. In 1560 was founded an Academy for the Study of Nature at Naples, but theologians, becoming alarmed, suppressed it, and for nearly one hundred years there was no new combined effort of that sort, until in 1645 began the meetings in London of what was afterward the Royal Society. Then came the Academy of Sciences in France, and the Accademia del Cimento in Italy; others followed in all parts of the world, and a great new movement was begun.

Theologians soon saw a danger in this movement. In Italy, Prince Leopold de Medici, a protector of the Florentine Academy, was bribed with a cardinal's hat to neglect it, and from the days of Urban VIII to Pius IX a similar spirit was there shown. In France, there were frequent ecclesiastical interferences, of which Buffon's humiliation for stating a simple scientific truth was a noted example. In England, Protestantism

was at first hardly more favorable toward the Royal Society, and the great Dr. South denounced it in his sermons as irreligious.

Fortunately, one thing prevented an open breach between theology and science: while new investigators had mainly given up the medieval method so dear to the Church, they had very generally retained the conception of direct creation and of design throughout creation -- a design having as its main purpose the profit, instruction, enjoyment, and amusement of man.

On this the naturally opposing tendencies of theology and science were compromised. Science, while somewhat freed from its old limitations, became the handmaid of theology in illustrating the doctrine of creative design, and always with apparent deference to the Chaldean and other ancient myths and legends embodied in the Hebrew sacred books.

About the middle of the seventeenth century came a great victory of the scientific over the theological method. At that time Francesco Redi published the results of his inquiries into the doctrine of spontaneous generation. For ages a widely accepted doctrine had been that water, filth, and carrion had received power from the Creator to generate worms, insects, and a multitude of the smaller animals; and this doctrine had been especially welcomed by St. Augustine and many of the fathers, since it relieved the Almighty of making, Adam of naming, and Noah of living in the Ark with these innumerable despised species. But to this fallacy Redi put an end. By researches which could not be gainsaid, he showed that every one of these animals came from an egg; each, therefore, must be the lineal descendant of an animal created, named, and preserved from "the beginning."

Similar work went on in England, but under more distinctly theological limitations. In the same seventeenth century a very famous and popular English book was published by the naturalist John Ray, a fellow of the Royal Society, who produced a number of works on plants, fishes, and birds; but the most widely read of all was entitled ***The Wisdom of God Manifested in the Works of Creation***. Between the years 1691 and 1827 it passed through nearly twenty editions.

Ray argued the goodness and wisdom of God from the adaptation of the animals not only to man's uses but to their own lives and surroundings.

In the first years of the eighteenth century Dr. Nehemiah Grew, of the Royal Society, published his ***Cosmologia Sacra*** to refute anti-scriptural opinions by producing evidences of creative design. Discussing "the ends of Providence," he says, "A crane, which is scurvy meat, lays but two eggs in the year, but a pheasant and partridge, both excellent meat, lay and hatch fifteen or twenty." He points to the fact that "those of value which lay few at a time sit the oftener, as the woodcock and the dove." He breaks decidedly from the doctrine that noxious things in Nature are caused by sin, and shows that they, too, are useful; that, "if nettles sting, it is to secure an excellent medicine for children and cattle"; that, "if the bramble hurts man, it makes all the better hedge"; and that, "if it chances to prick the owner, it tears the thief." "Weasels, kites, and other hurtful animals induce us to watchfulness; thistles and moles, to good husbandry; lice oblige us to cleanliness in our bodies, spiders in our houses, and the moth in our clothes." This very optimistic view, triumphing over the theological theory of noxious animals and plants as effects of sin, which prevailed with so much force from St. Augustine to Wesley, was developed into nobler form during the century by various thinkers, and especially by Archdeacon Paley, whose ***Natural Theology*** exercised a powerful influence down to recent times. The same tendency appeared in other countries, though various philosophers showed weak points in the argument, and Goethe made sport of it in a noted verse, praising the forethought of the Creator in foreordaining the cork tree to furnish stoppers for wine-bottles.

Shortly before the middle of the nineteenth century the main movement culminated in the ***Bridgewater Treatises***. Pursuant to the will of the eighth Earl of Bridgewater, the President of the Royal Society selected eight persons, each to receive a thousand pounds sterling for writing and publishing a treatise on the "power, wisdom, and goodness of God, as manifested in the creation." Of these, the leading essays in regard to animated Nature were those of Thomas Chalmers, on ***The Adaptation of External Nature to the Moral and Intellectual Condition of Man***; of Sir Charles Bell, on ***The Hand as Evincing Design***; of Roget, on ***Animal and Vegetable Physiology With Reference to Natural Theology***; and of Kirby, on ***The Habits and Instincts of Animals with Reference to Natural Theology***.

Besides these there were treatises by Whewell, Buckland, Kidd, and Prout. The work was well done. It was a marked advance on all that had

appeared before, in matter, method, and spirit. Looking back upon it now we can see that it was provisional, but that it was none the less fruitful in truth, and we may well remember Darwin's remark on the stimulating effect of mistaken *theories*, as compared with the sterilizing effect of mistaken *observations*: mistaken observations lead men astray, mistaken theories suggest true theories.

An effort made in so noble a spirit certainly does not deserve the ridicule that, in our own day, has sometimes been lavished upon it. Curiously, indeed, one of the most contemptuous of these criticisms has been recently made by one of the most strenuous defenders of orthodoxy. No less eminent a standard-bearer of the faith than the Rev. Prof. Zöckler says of this movement to demonstrate creative purpose and design, and of the men who took part in it, "The earth appeared in their representation of it like a great clothing shop and soup kitchen, and God as a glorified rationalistic professor." Such a statement as this is far from just to the conceptions of such men as Butler, Paley, and Chalmers, no matter how fully the thinking world has now outlived them.

But, noble as the work of these men was, the foundation of fact on which they reared it became evidently more and more insecure.

For as far back as the seventeenth century acute theologians had begun to discern difficulties more serious than any that had before confronted them. More and more it was seen that the number of different species was far greater than the world had hitherto imagined. Greater and greater had become the old difficulty in conceiving that, of these innumerable species, each had been specially created by the Almighty hand; that each had been brought before Adam by the Almighty to be named; and that each, in couples or in sevens, had been gathered by Noah into the Ark. But the difficulties thus suggested were as nothing compared to those raised by the *distribution* of animals.

Even in the first days of the Church this had aroused serious thought, and above all in the great mind of St. Augustine. In his ***City of God*** he had stated the difficulty as follows: "But there is a question about all these kinds of beasts, which are neither tamed by man, nor spring from the earth like frogs, such as wolves and others of that sort,... as to how they could find their way to the islands after that flood which destroyed every living thing not preserved in the Ark.... Some, indeed, might be thought to reach

islands by swimming, in case these were very near; but some islands are so remote from continental lands that it does not seem possible that any creature could reach them by swimming. It is not an incredible thing, either, that some animals may have been captured by men and taken with them to those lands which they intended to inhabit, in order that they might have the pleasure of hunting; and it cannot be denied that the transfer may have been accomplished through the agency of angels, commanded or allowed to perform this labor by God."

But this difficulty had now assumed a magnitude of which St. Augustine never dreamed. Most powerful of all agencies to increase it were the voyages of Columbus, Vasco da Gama, Magellan, Amerigo Vespucci, and other navigators of the period of discovery. Still more serious did it become as the great islands of the southern seas were explored. Every navigator brought home tidings of new species of animals and of races of men living in parts of the world where the theologians, relying on the statement of St. Paul that the gospel had gone into all lands, had for ages declared there could be none; until finally it overtaxed even the theological imagination to conceive of angels, in obedience to the divine command, distributing the various animals over the earth, dropping the megatherium in South America, the archaeopteryx in Europe, the ornithorhynchus in Australia, and the opossum in North America.

The first striking evidence of this new difficulty was shown by the eminent Jesuit missionary, Joseph Acosta. In his ***Natural and Moral History of the Indies***, published in 1590, he proved himself honest and lucid. Though entangled in most of the older scriptural views, he broke away from many; but the distribution of animals gave him great trouble. Having shown the futility of St. Augustine's other explanations, he quaintly asks: "Who can imagine that in so long a voyage men woulde take the paines to carrie Foxes to Peru, especially that kinde they call 'Acias,' which is the filthiest I have seene? Who woulde likewise say that they have carried Tygers and Lyons? Truly it were a thing worthy the laughing at to thinke so. It was sufficient, yea, very much, for men driven against their willes by tempest, in so long and unknowne a voyage, to escape with their owne lives, without busying themselves to carrie Woolves and Foxes, and to nourish them at sea."

It was under the impression made by this new array of facts that in 1667 Abraham Milius published at Geneva his book on ***The Origin of Animals***

and the Migration of Peoples. This book shows, like that of Acosta, the shock and strain to which the discovery of America subjected the received theological scheme of things. It was issued with the special approbation of the Bishop of Salzburg, and it indicates the possibility that a solution of the whole trouble may be found in the text, "Let the earth bring forth the living creature after his kind." Milius goes on to show that the ancient philosophers agree with Moses, and that "the earth and the waters, and especially the heat of the sun and of the genial sky, together with that slimy and putrid quality which seems to be inherent in the soil, may furnish the origin for fishes, terrestrial animals, and birds." On the other hand, he is very severe against those who imagine that man can have had the same origin with animals. But the subject with which Milius especially grapples is the *distribution* of animals. He is greatly exercised by the many species found in America and in remote islands of the ocean -- species entirely unknown in the other continents -- and of course he is especially troubled by the fact that these species existing in those exceedingly remote parts of the earth do not exist in the neighborhood of Mount Ararat. He confesses that to explain the distribution of animals is the most difficult part of the problem. If it be urged that birds could reach America by flying and fishes by swimming, he asks, "What of the beasts which neither fly nor swim?" Yet even as to the birds he asks, "Is there not an infinite variety of winged creatures who fly so slowly and heavily, and have such a horror of the water, that they would not even dare trust themselves to fly over a wide river?" As to fishes, he says, "They are very averse to wandering from their native waters," and he shows that there are now reported many species of American and East Indian fishes entirely unknown on the other continents, whose presence, therefore, cannot be explained by any theory of natural dispersion.

Of those who suggest that land animals may have been dispersed over the earth by the direct agency of man for his use or pleasure he asks: "Who would like to get different sorts of lions, bears, tigers, and other ferocious and noxious creatures on board ship? Who would trust himself with them? And who would wish to plant colonies of such creatures in new, desirable lands?"

His conclusion is that plants and animals take their origin in the lands wherein they are found; an opinion which he supports by quoting from the two narrations in Genesis passages which imply generative force in earth and water.

But in the eighteenth century matters had become even worse for the theological view. To meet the difficulty the eminent Benedictine, Dom Calmet, in his ***Commentary***, expressed the belief that all the species of a genus had originally been formed as one species, and he dwelt on this view as one which enabled him to explain the possibility of gathering all animals into the Ark. This idea, dangerous as it was to the fabric of orthodoxy, and involving a profound separation from the general doctrine of the Church, seems to have been abroad among thinking men, for we find in the latter half of the same century even Linnæus inclining to consider it. It was time, indeed, that some new theological theory be evolved; the great Linnæus himself, in spite of his famous declaration favoring the fixity of species, had dealt a death-blow to the old theory. In his ***Systema Naturæ***, published in the middle of the eighteenth century, he had enumerated four thousand species of animals, and the difficulties involved in the naming of each of them by Adam and in bringing them together in the Ark appeared to all thinking men more and more insurmountable.

What was more embarrassing, the number of distinct species went on increasing rapidly, indeed enormously, until, as an eminent zoological authority of our own time has declared, "for every one of the species enumerated by Linnæus, more than fifty kinds are known to the naturalist of today, and the number of species still unknown doubtless far exceeds the list of those recorded."

Already there were premonitions of the strain made upon Scripture by requiring a hundred and sixty distinct miraculous interventions of the Creator to produce the hundred and sixty species of land shells found in the little island of Madeira alone, and fourteen hundred distinct interventions to produce the actual number of distinct species of a single well-known shell.

Ever more and more difficult, too, became the question of the geographical distribution of animals. As new explorations were made in various parts of the world, this danger to the theological view went on increasing. The sloths in South America suggested painful questions: How could animals so sluggish have got away from the neighborhood of Mount Ararat so completely and have traveled so far?

The explorations in Australia and neighboring islands made matters still

worse, for there was found in those regions a whole realm of animals differing widely from those of other parts of the earth.

The problem before the strict theologians became, for example, how to explain the fact that the kangaroo can have been in the Ark and be now only found in Australia: his saltatory powers are indeed great, but how could he by any series of leaps have sprung across the intervening mountains, plains, and oceans to that remote continent? And, if the theory were adopted that at some period a causeway extended across the vast chasm separating Australia from the nearest mainland, why did not lions, tigers, camels, and camelopards force or find their way across it?

The theological theory, therefore, had by the end of the eighteenth century gone to pieces. The wiser theologians waited; the unwise indulged in exhortations to "root out the wicked heart of unbelief," in denunciation of "science falsely so called," and in frantic declarations that "the Bible is true" -- by which they meant that the limited understanding of it which they had happened to inherit is true.

By the middle of the nineteenth century the whole theological theory of creation -- though still preached everywhere as a matter of form -- was clearly seen by all thinking men to be hopelessly lost: such strong men as Cardinal Wiseman in the Roman Church, Dean Buckland in the Anglican, and Hugh Miller in the Scottish Church, made heroic efforts to save something from it, but all to no purpose. That sturdy Teutonic and Anglo-Saxon honesty, which is the best legacy of the Middle Ages to Christendom, asserted itself in the old strongholds of theological thought, the universities. Neither the powerful logic of Bishop Butler nor the nimble reasoning of Archdeacon Paley availed. Just as the line of astronomical thinkers from Copernicus to Newton had destroyed the old astronomy, in which the earth was the center, and the Almighty sitting above the firmament the agent in moving the heavenly bodies about it with his own hands, so now a race of biological thinkers had destroyed the old idea of a Creator minutely contriving and fashioning all animals to suit the needs and purposes of man. They had developed a system of a very different sort, and this we shall next consider.

Continue

Ancient and medieval representations of the creation of man

Literal acceptance of the book of Genesis by:

- **The Christian fathers**
- **The Reformers**
- **Modern theologians, Catholic and Protestant**

Theological reasoning as to the divisions of the Animal Kingdom

The Physiologus, the Bestiaries, the Exempila

Beginnings of skeptical observation

Development of a scientific method in the study of Nature

Breaking down of the theological theory of creation

1.3 Theological and Scientific Theories, of an Evolution of Animated Nature

[Click Here for Section Outline]

We have seen, thus far, how there came into the thinking of mankind upon the visible universe and its inhabitants the idea of a creation virtually instantaneous and complete, and of a Creator in human form with human attributes, who spoke matter into existence literally by the exercise of his throat and lips, or shaped and placed it with his hands and fingers.

We have seen that this view came from far; that it existed in the Chaldaeo-Babylonian and Egyptian civilizations, and probably in others of the earliest date known to us; that its main features passed thence into the sacred books of the Hebrews and then into the early Christian Church, by whose theologians it was developed through the Middle Ages and maintained during the modern period.

But, while this idea was thus developed by a succession of noble and thoughtful men through thousands of years, another conception, to all appearance equally ancient, was developed, sometimes in antagonism to it, sometimes mingled with it -- the conception of all living beings as wholly or in part the result of a growth process -- of an evolution.

This idea, in various forms, became a powerful factor in nearly all the greater ancient theologies and philosophies. For very widespread among the early peoples who attained to much thinking power was a conception that, in obedience to the divine fiat, a watery chaos produced the earth, and that the sea and land gave birth to their inhabitants.

This is clearly seen in those records of Chaldaeo-Babylonian thought deciphered in these latter years, to which reference has already been made. In these we have a watery chaos which, under divine action, brings forth the earth and its inhabitants; first the sea animals and then the land animals -- the latter being separated into three kinds, substantially as recorded afterward in the Hebrew accounts. At the various stages in the work the Chaldean Creator pronounces it "beautiful," just as the Hebrew Creator in our own later account pronounces it "good."

In both accounts there is placed over the whole creation a solid, concave firmament; in both, light is created first, and the heavenly bodies are afterward placed "for signs and for seasons"; in both, the number seven is especially sacred, giving rise to a sacred division of time and to much else. It may be added that, with many other features in the Hebrew legends evidently drawn from the Chaldean, the account of the creation in each is followed by a legend regarding "the fall of man" and a deluge, many details of which clearly passed in slightly modified form from the Chaldean into the Hebrew accounts.

It would have been a miracle indeed if these primitive conceptions, wrought out with so much poetic vigor in that earlier civilization on the Tigris and Euphrates, had failed to influence the Hebrews, who during the most plastic periods of their development were under the tutelage of their Chaldean neighbors. Since the researches of Layard, George Smith, Oppert, Schrader, Jensen, Sayce, and their compeers, there is no longer a reasonable doubt that this ancient view of the world, elaborated if not originated in that earlier civilization, came thence as a legacy to the Hebrews, who wrought it in a somewhat disjointed but mainly monotheistic form into the poetic whole which forms one of the most precious treasures of ancient thought preserved in the book of Genesis.

Thus it was that, while the idea of a simple material creation literally by the hands and fingers or voice of the Creator became, as we have seen, the starting-point of a powerful stream of theological thought, and while this stream was swollen from age to age by contributions from the fathers, doctors, and learned divines of the Church, Catholic and Protestant, there was poured into it this lesser current, always discernible and at times clearly separated from it -- a current of belief in a process of evolution.

The Rev. Prof. Sayce, of Oxford, than whom no English-speaking scholar carries more weight in a matter of this kind, has recently declared his belief that the Chaldaeo-Babylonian theory was the undoubted source of the similar theory propounded by the Ionic philosopher Anaximander -- the Greek thinkers deriving this view from the Babylonians through the Phœnicians; he also allows that from the same source its main features were adopted into both the accounts given in the first of our sacred books, and in this general view the most eminent Christian Assyriologists concur.

It is true that these sacred accounts of ours contradict each other. In that

part of the first or Elohistic account given in the first chapter of Genesis the *waters* bring forth fishes, marine animals, and birds (Genesis 1:20); but in that part of the second or Jehovistic account given in the second chapter of Genesis both the land animals and birds are declared to have been created not out of the water, but "*out of the ground*" (Genesis 2:19).

The dialectic skill of the fathers was easily equal to explaining away this contradiction; but the old current of thought, strengthened by both these legends, arrested their attention, and, passing through the minds of a succession of the greatest men of the Church, influenced theological opinion deeply, if not widely, for ages, in favor of an evolution theory.

But there was still another ancient source of evolution ideas. Thoughtful men of the early civilizations which were developed along the great rivers in the warmer regions of the earth noted how the sun-god as he rose in his fullest might caused the water and the rich soil to teem with the lesser forms of life. In Egypt, especially, men saw how under this divine power the Nile slime brought forth "creeping things innumerable." Hence mainly this ancient belief that the animals and man were produced by lifeless matter at the divine command, "in the beginning," was supplemented by the idea that some of the lesser animals, especially the insects, were produced by a later evolution, being evoked after the original creation from various sources, but chiefly from matter in a state of decay.

This crude, early view aided doubtless in giving germs of a better evolution theory to the early Greeks. Anaximander, Empedocles, Anaxagoras, and, greatest of all, Aristotle, as we have seen, developed them, making their way at times by guesses toward truths since established by observation. Aristotle especially, both by speculation and observation, arrived at some results which, had Greek freedom of thought continued, might have brought the world long since to its present plane of biological knowledge; for he reached something like the modern idea of a succession of higher organizations from lower, and made the fruitful suggestion of "a perfecting principle" in Nature.

With the coming in of Christian theology this tendency toward a yet truer theory of evolution was mainly stopped, but the old crude view remained, and as a typical example of it we may note the opinion of St. Basil the Great in the fourth century. Discussing the work of creation, he declares that, at the command of God, "the waters were gifted with productive

power"; "from slime and muddy places frogs, flies, and gnats came into being"; and he finally declares that the same voice which gave this energy and quality of productiveness to earth and water shall be similarly efficacious until the end of the world. St. Gregory of Nyssa held a similar view.

This idea of these great fathers of the Eastern Church took even stronger hold on the great father of the Western Church. For St. Augustine, so fettered usually by the letter of the sacred text, broke from his own famous doctrine as to the acceptance of Scripture and spurned the generally received belief of a creative process like that by which a toymaker brings into existence a box of playthings. In his great treatise on ***Genesis*** he says: "To suppose that God formed man from the dust with bodily hands is very childish.... God neither formed man with bodily hands nor did he breathe upon him with throat and lips."

St. Augustine then suggests the adoption of the old emanation or evolution theory, saying that "certain very small animals may not have been created on the fifth and sixth days, but may have originated later from putrefying matter." He argues that, even if this be so, God is still their creator, dwells upon such a potential creation as involved in the actual creation, and speaks of animals "whose numbers the after-time unfolded."

In his great treatise on the ***Trinity*** -- the work to which he devoted the best thirty years of his life -- we find the full growth of this opinion. He develops at length the view that in the creation of living beings there was something like a growth -- that God is the ultimate author, but works through secondary causes; and finally argues that certain substances are endowed by God with the power of producing certain classes of plants and animals.

This idea of a development by secondary causes apart from the original creation was helped in its growth by a theological exigency. More and more, as the organic world was observed, the vast multitude of petty animals, winged creatures, and "creeping things" was felt to be a strain upon the sacred narrative. More and more it became difficult to reconcile the dignity of the Almighty with his work in bringing each of these creatures before Adam to be named; or to reconcile the human limitations of Adam with his work in naming "every living creature"; or to reconcile the dimensions of Noah's Ark with the space required for preserving all of them,

and the food of all sorts necessary for their sustenance, whether they were admitted by twos, as stated in one scriptural account, or by sevens, as stated in the other.

The inadequate size of the Ark gave especial trouble. Origen had dealt with it by suggesting that the cubit was six times greater than had been supposed. Bede explained Noah's ability to complete so large a vessel by supposing that he worked upon it during a hundred years; and, as to the provision of food taken into it, he declared that there was no need of a supply for more than one day, since God could throw the animals into a deep sleep or otherwise miraculously make one day's supply sufficient; he also lessened the strain on faith still more by diminishing the number of animals taken into the Ark -- supporting his view upon Augustine's theory of the later development of insects out of carrion.

Doubtless this theological necessity was among the main reasons which led St. Isidore of Seville, in the seventh century, to incorporate this theory, supported by St. Basil and St. Augustine, into his great encyclopedic work which gave materials for thought on God and Nature to so many generations. He familiarized the theological world still further with the doctrine of secondary creation, giving such examples of it as that "bees are generated from decomposed veal, beetles from horseflesh, grasshoppers from mules, scorpions from crabs," and, in order to give still stronger force to the idea of such transformations, he dwells on the biblical account of Nebuchadnezzar, which appears to have taken strong hold upon medieval thought in science, and he declares that other human beings had been changed into animals, especially into swine, wolves, and owls.

This doctrine of after-creations went on gathering strength until, in the twelfth century, Peter Lombard, in his theological summary, ***The Sentences***, so powerful in molding the thought of the Church, emphasized the distinction between animals which spring from carrion and those which are created from earth and water; the former he holds to have been created "potentially" the latter "actually."

In the century following, this idea was taken up by St. Thomas Aquinas and virtually received from him its final form. In the ***Summa***, which remains the greatest work of medieval thought, he accepts the idea that certain animals spring from the decaying bodies of plants and animals, and declares that they are produced by the creative word of God either actually

or virtually. He develops this view by saying, "Nothing was made by God, after the six days of creation, absolutely new, but it was in some sense included in the work of the six days"; and that "even new species, if any appear, have existed before in certain native properties, just as animals are produced from putrefaction."

The distinction thus developed between creation "causally" or "potentially," and "materially" or "formally," was made much of by commentators afterward. Cornelius à Lapide spread it by saying that certain animals were created not "absolutely," but only "derivatively," and this thought was still further developed three centuries later by Augustinus Eugubinus, who tells us that, after the first creative energy had called forth land and water, light was made by the Almighty, the instrument of all future creation, and that the light called everything into existence.

All this "science falsely so called," so sedulously developed by the master minds of the Church, and yet so futile that we might almost suppose that the great apostle, in a glow of prophetic vision, had foreseen it in his famous condemnation, seems at this distance very harmless indeed; yet, to many guardians of the "sacred deposit of doctrine" in the Church, even so slight a departure from the main current of thought seemed dangerous. It appeared to them like pressing the doctrine of secondary causes to a perilous extent; and about the beginning of the seventeenth century we have the eminent Spanish Jesuit and theologian Suarez denouncing it, and declaring St. Augustine a heretic for his share in it.

But there was little danger to the older idea just then; the main theological tendency was so strong that the world kept on as of old. Biblical theology continued to spin its own webs out of its own bowels, and all the lesser theological flies continued to be entangled in them; yet here and there stronger thinkers broke loose from this entanglement and helped somewhat to disentangle others.

At the close of the Middle Ages, in spite of the devotion of the Reformed Church to the letter of Scripture, the revival of learning and the great voyages gave an atmosphere in which better thinking on the problems of Nature began to gain strength. On all sides, in every field, men were making discoveries which caused the general theological view to appear more and more inadequate.

First of those who should be mentioned with reverence as beginning to develop again that current of Greek thought which the system drawn from our sacred books by the fathers and doctors of the Church had interrupted for more than a thousand years, was Giordano Bruno. His utterances were indeed vague and enigmatical, but this fault may well be forgiven him, for he saw but too clearly what must be his reward for any more open statements. His reward indeed came -- even for his faulty utterances -- when, toward the end of the nineteenth century, thoughtful men from all parts of the world united in erecting his statue on the spot where he had been burned by the Roman Inquisition nearly three hundred years before.

After Bruno's death, during the first half of the seventeenth century, Descartes seemed about to take the leadership of human thought: his theories, however superseded now, gave a great impulse to investigation then. His genius in promoting an evolution doctrine as regards the mechanical formation of the solar system was great, and his mode of thought strengthened the current of evolutionary doctrine generally; but his constant dread of persecution, both from Catholics and Protestants, led him steadily to veil his thoughts and even to suppress them. The execution of Bruno had occurred in his childhood, and in the midst of his Career he had watched the Galileo struggle in all its stages. He had seen his own works condemned by university after university under the direction of theologians, and placed upon the Roman ***Index***. Although he gave new and striking arguments to prove the existence of God, and humbled himself before the Jesuits, he was condemned by Catholics and Protestants alike. Since Roger Bacon, perhaps, no great thinker had been so completely abased and thwarted by theological oppression.

Near the close of the same century another great thinker, Leibnitz, though not propounding any full doctrine on evolution, gave it an impulse by suggesting a view contrary to the sacrosanct belief in the immutability of species -- that is, to the pious doctrine that every species in the animal kingdom now exists as it left the hands of the Creator, the naming process by Adam, and the door of Noah's Ark.

His punishment at the hands of the Church came a few years later, when, in 1712, the Jesuits defeated his attempt to found an Academy of Science at Vienna. The imperial authorities covered him with honors, but the priests -- ruling in the confessionals and pulpits -- would not allow him the privilege of aiding his fellow-men to ascertain God's truths revealed in

Nature.

Spinoza, Hume, and Kant may also be mentioned as among those whose thinking, even when mistaken, might have done much to aid in the development of a truer theory had not the theological atmosphere of their times been so unpropitious; but a few years after Leibnitz's death came in France a thinker in natural science of much less influence than any of these, who made a decided step forward.

Early in the eighteenth century Benoist de Maillet, a man of the world, but a wide observer and close thinker upon Nature, began meditating especially upon the origin of animal forms, and was led into the idea of the transformation of species and so into a theory of evolution, which in some important respects anticipated modern ideas. He definitely, though at times absurdly, conceived the production of existing species by the modification of their predecessors, and he plainly accepted one of the fundamental maxims of modern geology -- that the structure of the globe must be studied in the light of the present course of Nature.

But he fell between two ranks of adversaries. On one side, the Church authorities denounced him as a freethinker; on the other, Voltaire ridiculed him as a devotee. Feeling that his greatest danger was from the orthodox theologians, de Maillet endeavored to protect himself by disguising his name in the title of his book, and by so wording its preface and dedication that, if persecuted, he could declare it a mere sport of fancy; he therefore announced it as the reverie of a Hindu sage imparted to a Christian missionary. But this strategy availed nothing: he had allowed his Hindu sage to suggest that the days of creation named in Genesis might be long periods of time; and this, with other ideas of equally fearful import, was fatal. Though the book was in type in 1735, it was not published till 1748 -- three years after his death.

On the other hand, the heterodox theology of Voltaire was also aroused; and, as de Maillet had seen in the presence of fossils on high mountains a proof that these mountains were once below the sea, Voltaire, recognizing in this an argument for the deluge of Noah, ridiculed the new thinker without mercy. Unfortunately, some of de Maillet's vagaries lent themselves admirably to Voltaire's sarcasm; better material for it could hardly be conceived than the theory, seriously proposed, that the first human being was born of a mermaid.

Hence it was that, between these two extremes of theology, de Maillet received no recognition until, very recently, the greatest men of science in England and France have united in giving him his due. But his work was not lost, even in his own day; Robinet and Bonnet pushed forward victoriously on helpful lines.

In the second half of the eighteenth century a great barrier was thrown across this current -- the authority of Linnæus. He was the most eminent naturalist of his time, a wide observer, a close thinker; but the atmosphere in which he lived and moved and had his being was saturated with biblical theology, and this permeated all his thinking.

He who visits the tomb of Linnæus today, entering the beautiful cathedral of Upsala by its southern porch, sees above it, wrought in stone, the Hebrew legend of creation. In a series of medallions, the Almighty -- in human form -- accomplishes the work of each creative day. In due order he puts in place the solid firmament with the waters above it, the sun, moon, and stars within it, the beasts, birds, and plants below it, and finishes his task by taking man out of a little hillock of "the earth beneath," and woman out of man's side. Doubtless Linnæus, as he went to his devotions, often smiled at this childlike portrayal. Yet he was never able to break away from the idea it embodied. At times, in face of the difficulties which beset the orthodox theory, he ventured to favor some slight concessions. Toward the end of his life he timidly advanced the hypothesis that all the species of one genus constituted at the creation one species; and from the last edition of his ***Systema Naturæ*** he quietly left out the strongly orthodox statement of the fixity of each species, which he had insisted upon in his earlier works. But he made no adequate declaration. What he might expect if he openly and decidedly sanctioned a newer view he learned to his cost; warnings came speedily both from the Catholic and Protestant sides.

At a time when eminent prelates of the older Church were eulogizing debauched princes like Louis XV, and using the unspeakably obscene casuistry of the Jesuit Sanchez in the education of the priesthood as to the relations of men to women, the modesty of the Church authorities was so shocked by Linnæus' proofs of a sexual system in plants that for many years his writings were prohibited in the Papal States and in various other parts of Europe where clerical authority was strong enough to resist the

new scientific current. Not until 1773 did one of the more broad-minded cardinals -- Zelanda -- succeed in gaining permission that Prof. Minasi should discuss the Linnæan system at Rome.

And Protestantism was quite as oppressive. In a letter to Eloius, Linnæus tells of the rebuke given to science by one of the great Lutheran prelates of Sweden, Bishop Svedberg. From various parts of Europe detailed statements had been sent to the Royal Academy of Science that water had been turned into blood, and well-meaning ecclesiastics had seen in this an indication of the wrath of God, certainly against the regions in which these miracles had occurred and possibly against the whole world. A miracle of this sort appearing in Sweden, Linnæus looked into it carefully and found that the reddening of the water was caused by dense masses of minute insects. News of this explanation having reached the bishop, he took the field against it; he denounced this scientific discovery as "a Satanic abyss" (*abyssum Satanæ*), and declared "The reddening of the water is *not* natural," and "when God allows such a miracle to take place Satan endeavors, and so do his ungodly, self-reliant, self-sufficient, and worldly tools, to make it signify nothing." In face of this onslaught Linnæus retreated; he tells his correspondent that "it is difficult to say anything in this matter," and shields himself under the statement "It is certainly a miracle that so many millions of creatures can be so suddenly propagated," and "it shows undoubtedly the all-wise power of the Infinite."

The great naturalist, grown old and worn with labors for science, could no longer resist the contemporary theology; he settled into obedience to it, and while the modification of his early orthodox view was, as we have seen, quietly imbedded in the final edition of his great work, he made no special effort to impress it upon the world. To all appearance he continued to adhere to the doctrine that all existing species had been created by the Almighty "in the beginning," and that since "the beginning" no new species had appeared.

Yet even his great authority could not arrest the swelling tide; more and more vast became the number of species, more and more incomprehensible under the old theory became the newly ascertained facts in geographical distribution, more and more it was felt that the universe and animated beings had come into existence by some process other than a special creation "in the beginning," and the question was constantly pressing, "By *what* process?"

Throughout the whole of the eighteenth century one man was at work on natural history who might have contributed much toward an answer to this question: this man was Buffon. His powers of research and thought were remarkable, and his gift in presenting results of research and thought showed genius. He had caught the idea of an evolution in Nature by the variation of species, and was likely to make a great advance with it; but he, too, was made to feel the power of theology.

As long as he gave pleasing descriptions of animals the Church petted him, but when he began to deduce truths of philosophical import the batteries of the Sorbonne were opened upon him; he was made to know that "the sacred deposit of truth committed to the Church" was, that "in the beginning God made the heavens and the earth" and that "all things were made at the beginning of the world." For his simple statement of truths in natural science which are today truisms, he was, as we have seen, dragged forth by the theological faculty, forced to recant publicly, and to print his recantation. In this he announced, "I abandon everything in my book respecting the formation of the earth, and generally all which may be contrary to the narrative of Moses."[footnote]

But all this triumph of the Chaldaeo-Babylonian creation legends which the Church had inherited availed but little.

For about the end of the eighteenth century fruitful suggestions and even clear presentations of this or that part of a large evolutionary doctrine came thick and fast, and from the most divergent quarters. Especially remarkable were those which came from Erasmus Darwin in England, from Maupertuis in France, from Oken in Switzerland, and from Herder, and, most brilliantly of all, from Goethe in Germany.

Two men among these thinkers must be especially mentioned -- Treviranus in Germany and Lamarck in France; each independently of the other drew the world more completely than ever before in this direction.

From Treviranus came, in 1802, his work on biology, and in this he gave forth the idea that from forms of life originally simple had arisen all higher organizations by gradual development; that every living feature has a capacity for receiving modifications of its structure from external influences; and that no species had become really extinct, but that each had passed

into some other species. From Lamarck came about the same time his ***Researches***, and a little later his ***Zoological Philosophy***, which introduced a new factor into the process of evolution -- the action of the animal itself in its efforts toward a development to suit new needs -- and he gave as his principal conclusions the following:

> Life tends to increase the volume of each living body and of all its parts up to a limit determined by its own necessities.
>
> New wants in animals give rise to new organs.
>
> The development of these organs is in proportion to their employment.
>
> New developments may be transmitted to offspring.

His well-known examples to illustrate these views, such as that of successive generations of giraffes lengthening their necks by stretching them to gather high-growing foliage, and of successive generations of kangaroos lengthening and strengthening their hind legs by the necessity of keeping themselves erect while jumping, provoked laughter, but the very comicality of these illustrations aided to fasten his main conclusion in men's memories.

In both these statements, imperfect as they were, great truths were embodied -- truths which were sure to grow.

Lamarck's declaration, especially, that the development of organs is in ratio to their employment, and his indications of the reproduction in progeny of what is gained or lost in parents by the influence of circumstances, entered as a most effective force into the development of the evolution theory.

The next great successor in the apostolate of this idea of the universe was Geoffroy Saint-Hilaire. As early as 1795 he had begun to form a theory that species are various modifications of the same type, and this theory he developed, testing it at various stages as Nature was more and more displayed to him. It fell to his lot to bear the brunt in a struggle against heavy odds which lasted many years.

For the man who now took up the warfare, avowedly for science but

unconsciously for theology, was the foremost naturalist then living -- Cuvier. His scientific eminence was deserved; the highest honors of his own and other countries were given him, and he bore them worthily. An Imperial Councillor under Napoleon; President of the Council of Public Instruction and Chancellor of the University under the restored Bourbons; Grand Officer of the Legion of Honor, a Peer of France, Minister of the Interior, and President of the Council of State under Louis Philippe; he was eminent in all these capacities, and yet the dignity given by such high administrative positions was as nothing compared to his leadership in natural science. Science throughout the world acknowledged in him its chief contemporary ornament, and to this hour his fame rightly continues. But there was in him, as in Linnæus, a survival of certain theological ways of looking at the universe and certain theological conceptions of a plan of creation; it must be said, too, that while his temperament made him distrust new hypotheses, of which he had seen so many born and die, his environment as a great functionary of state, honored, admired, almost adored by the greatest, not only in the state but in the Church, his solicitude lest science should receive some detriment by openly resisting the Church, which had recaptured Europe after the French Revolution, and had made of its enemies its footstool -- all these considerations led him to oppose the new theory. Amid the plaudits, then, of the foremost churchmen he threw across the path of the evolution doctrines the whole mass of his authority in favor of the old theory of catastrophic changes and special creations.

Geoffroy Saint-Hilaire stoutly withstood him, braving non-recognition, ill-treatment, and ridicule. Treviranus, afar off in his mathematical lecture-room at Bremen, seemed simply forgotten.

But the current of evolutionary thought could not thus be checked: dammed up for a time, it broke out in new channels and in ways and places least expected; turned away from France, it appeared especially in England, where great paleontologists and geologists arose whose work culminated in that of Lyell. Specialists throughout all the world now became more vigorous than ever, gathering facts and thinking upon them in a way which caused the special creation theory to shrink more and more. Broader and more full became these various rivulets, soon to unite in one great stream of thought.

In 1813 Dr. Wells developed a theory of evolution by natural selection to account for varieties in the human race. About 1820 Dean Herbert,

eminent as an authority in horticulture, avowed his conviction that species are but fixed varieties. In 1831 Patrick Matthews stumbled upon and stated the main doctrine of natural selection in evolution; and others here and there, in Europe and America, caught an inkling of it.

But no one outside of a circle apparently uninfluential cared for these things: the Church was serene: on the Continent it had obtained reactionary control of courts, cabinets, and universities; in England, Dean Cockburn was denouncing Mary Somerville and the geologists to the delight of churchmen; and the Rev. Mellor Brown was doing the same thing for the edification of dissenters.

In America the mild suggestions of Silliman and his compeers were met by the protestations of the Andover theologians headed by Moses Stuart. Neither of the great English universities, as a rule, took any notice of the innovators save by sneers.

To this current of thought there was joined a new element when, in 1844, Robert Chambers published his ***Vestiges of Creation***. The book was attractive and was widely read. In Chambers' view the several series of animated beings, from the simplest and oldest up to the highest and most recent, were the result of two distinct impulses, each given once and for all time by the Creator. The first of these was an impulse imparted to forms of life, lifting them gradually through higher grades; the second was an impulse tending to modify organic substances in accordance with external circumstances; in fact, the doctrine of the book was evolution tempered by miracle -- a stretching out of the creative act through all time -- a pious version of Lamarck.

Two results followed, one mirth-provoking, the other leading to serious thought. The amusing result was that the theologians were greatly alarmed by the book: it was loudly insisted that it promoted atheism. Looking back along the line of thought which has since been developed, one feels that the older theologians ought to have put up thanksgivings for Chambers' theory, and prayers that it might prove true. The more serious result was that it accustomed men's minds to a belief in evolution as in some form possible or even probable. In this way it was provisionally of service.

Eight years later Herbert Spencer published an essay contrasting the

theories of creation and evolution -- reasoning with great force in favor of the latter, showing that species had undoubtedly been modified by circumstances; but still only few and chosen men saw the significance of all these lines of reasoning which had been converging during so many years toward one conclusion.

On July 1, 1858, there were read before the Linnæan Society at London two papers -- one presented by Charles Darwin, the other by Alfred Russell Wallace -- and with the reading of these papers the doctrine of evolution by natural selection was born. Then and there a fatal breach was made in the great theological barrier of the continued fixity of species since the creation.

The story of these papers the scientific world knows by heart: how Charles Darwin, having been sent to the University of Cambridge to fit him for the Anglican priesthood, left it in 1831 to go upon the scientific expedition of the Beagle; how for five years he studied with wonderful vigor and acuteness the problems of life as revealed on land and at sea -- among volcanoes and coral reefs, in forests and on the sands, from the tropics to the arctic regions; how, in the Cape Verde and the Galapagos Islands, and in Brazil, Patagonia, and Australia he interrogated Nature with matchless persistency and skill; how he returned unheralded, quietly settled down to his work, and soon set the world thinking over its first published results, such as his book on ***Coral Reefs***, and the monograph on the ***Cirripædia***; and, finally, how he presented his paper, and followed it up with treatises which made him one of the great leaders in the history of human thought.

The scientific world realizes, too, more and more, the power of character shown by Darwin in all this great career; the faculty of silence, the reserve of strength seen in keeping his great thought -- his idea of evolution by natural selection -- under silent study and meditation for nearly twenty years, giving no hint of it to the world at large, but working in every field to secure proofs or disproofs, and accumulating masses of precious material for the solution of the questions involved.

To one man only did he reveal his thought -- to Dr. Joseph Hooker, to whom in 1844, under the seal of secrecy, he gave a summary of his conclusions. Not until fourteen years later occurred the event which showed him that the fullness of time had come -- the letter from Alfred Russell Wallace, to

whom, in brilliant researches during the decade from 1848 to 1858, in Brazil and in the Malay Archipelago, the same truth of evolution by natural selection had been revealed. Among the proofs that scientific study does no injury to the more delicate shades of sentiment is the well-known story of this letter. With it Wallace sent Darwin a memoir, asking him to present it to the Linnæan Society: on examining it, Darwin found that Wallace had independently arrived at conclusions similar to his own -- possibly had deprived him of fame; but Darwin was loyal to his friend, and his friend remained ever loyal to him. He publicly presented the paper from Wallace, with his own conclusions; and the date of this presentation -- July 1, 1858 -- separates two epochs in the history, not merely of natural science, but of human thought.

In the following year, 1859, came the first installment of his work in its fuller development -- his book on ***The Origin of Species***. In this book one at least of the main secrets at the heart of the evolutionary process, which had baffled the long line of investigators and philosophers from the days of Aristotle, was more broadly revealed. The effective mechanism of evolution was shown at work in three ascertained facts: in the struggle for existence among organized beings; in the survival of the fittest; and in heredity. These facts were presented with such minute research, wide observation, patient collation, transparent honesty, and judicial fairness, that they at once commanded the world's attention. It was the outcome of thirty years' work and thought by a worker and thinker of genius, but it was yet more than that -- it was the outcome, also, of the work and thought of another man of genius fifty years before. The book of Malthus on the ***Principle of Population***, mainly founded on the fact that animals increase in a geometrical ratio, and therefore, if unchecked, must encumber the earth, had been generally forgotten, and was only recalled with a sneer. But the genius of Darwin recognized in it a deeper meaning, and now the thought of Malthus was joined to the new current. Meditating upon it in connection with his own observations of the luxuriance of Nature, Darwin had arrived at his doctrine of natural selection and survival of the fittest.

As the great dogmatic barrier between the old and new views of the universe was broken down, the flood of new thought pouring over the world stimulated and nourished strong growths in every field of research and reasoning: edition after edition of the book was called for; it was translated even into Japanese and Hindustani; the stagnation of scientific thought, which Buckle, only a few years before, had so deeply lamented,

gave place to a widespread and fruitful activity; masses of accumulated observations, which had seemed stale and unprofitable, were made alive; facts formerly without meaning now found their interpretation. Under this new influence an army of young men took up every promising line of scientific investigation in every land. Epoch-making books appeared in all the great nations. Spencer, Wallace, Huxley, Galton, Tyndall, Tylor, Lubbock, Bagehot, Lewes, in England, and a phalanx of strong men in Germany, Italy, France, and America gave forth works which became authoritative in every department of biology. If some of the older men in France held back, overawed perhaps by the authority of Cuvier, the younger and more vigorous pressed on.

One source of opposition deserves to be especially mentioned -- Louis Agassiz.

A great investigator, an inspired and inspiring teacher, a noble man, he had received and elaborated a theory of animated creation which he could not readily change. In his heart and mind still prevailed the atmosphere of the little Swiss parsonage in which he was born, and his religious and moral nature, so beautiful to all who knew him, was especially repelled by sundry evolutionists, who, in their zeal as neophytes, made proclamations seeming to have a decidedly irreligious if not immoral bearing. In addition to this was the direction his thinking had received from Cuvier. Both these influences combined to prevent his acceptance of the new view.

He was the third great man who had thrown his influence as a barrier across the current of evolutionary thought. Linnæus in the second half of the eighteenth century, Cuvier in the first half, and Agassiz in the second half of the nineteenth -- all made the same effort. Each remains great; but not all of them together could arrest the current. Agassiz's strong efforts throughout the United States, and indeed throughout Europe, to check it, really promoted it. From the great museum he had founded at Cambridge, from his summer school at Penikese, from his lecture rooms at Harvard and Cornell, his disciples went forth full of love and admiration for him, full of enthusiasm which he had stirred and into fields which he had indicated; but their powers, which he had aroused and strengthened, were devoted to developing the truth he failed to recognize; Shaler, Verrill, Packard, Hart, Wilder, Jordan, with a multitude of others, and especially the son who bore his honored name, did justice to his memory by applying what they had received from him to research under inspiration of the new

revelation.

Still another man deserves especial gratitude and honor in this progress -- Edward Livingston Youmans. He was perhaps the first in America to recognize the vast bearings of the truths presented by Darwin, Wallace, and Spencer. He became the apostle of these truths, sacrificing the brilliant career on which he had entered as a public lecturer, subordinating himself to the three leaders, and giving himself to editorial drudgery in the stimulation of research and the announcement of results.

In support of the new doctrine came a world of new proofs; those which Darwin himself added in regard to the cross-fertilization of plants, and which he had adopted from embryology, led the way, and these were followed by the discoveries of Wallace, Bates, Huxley, Marsh, Cope, Leidy, Häckel, Müller, Gaudry, and a multitude of others in all lands.[footnote]

Continue

- **Ideas of evolution**
  - **Among the ancients**
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- **Development of these ideas from the sixteenth to the eighteenth centuries**
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- **Contributions to the theory of evolution at the close of the eighteenth century**
  - **Treviranus and Lamarck**
  - **Geoffroy Saint-Hilaire and Cuvier**
- **Development of the theory up to the middle of the nineteenth century**
  - **Darwin and Wallace**
  - **The opposition of Agassiz**

As to the creation medallions at the Cathedral of Upsala, it is a somewhat curious coincidence that the present writer came upon them while visiting that edifice during the preparation of this chapter.

A reminiscence of my own enables me to appreciate his deep ethical and religious feeling. I was passing the day with him at Nahant in 1868, consulting him regarding candidates for various scientific chairs at the newly established Cornell University, in which he took a deep interest. As we discussed one after another of the candidates he suddenly said: "Who is to be your Professor of Moral Philosophy? That is a far more important position than all the others."

1.4 The Final Effort of Theology

[Click Here for Section Outline]

Darwin's ***Origin of Species*** had come into the theological world like a plow into an ant-hill. Everywhere those thus rudely awakened from their old comfort and repose had swarmed forth angry and confused. Reviews, sermons, books light and heavy, came flying at the new thinker from all sides.

The keynote was struck at once in the ***Quarterly Review*** by Wilberforce, Bishop of Oxford. He declared that Darwin was guilty of "a tendency to limit God's glory in creation"; that "the principle of natural selection is absolutely incompatible with the Word of God"; that it "contradicts the revealed relations of creation to its Creator"; that it is "inconsistent with the fullness of his glory"; that it is "a dishonoring view of Nature"; and that there is "a simpler explanation of the presence of these strange forms among the works of God": that explanation being -- "the fall of Adam." Nor did the bishop's efforts end here; at the meeting of the British Association for the Advancement of Science he again disported himself in the tide of popular applause. Referring to the ideas of Darwin, who was absent on account of illness, he congratulated himself in a public speech that he was not descended from a monkey. The reply came from Huxley, who said in substance: "If I had to choose, I would prefer to be a descendant of a humble monkey rather than of a man who employs his knowledge and eloquence in misrepresenting those who are wearing out their lives in the search for truth."

This shot reverberated through England, and indeed through other countries.

The utterances of this the most brilliant prelate of the Anglican Church received a sort of antiphonal response from the leaders of the English Catholics. In an address before the "Academia," which had been organized to combat "science falsely so called," Cardinal Manning declared his abhorrence of the new view of Nature, and described it as "a brutal philosophy -- to wit, there is no God, and the ape is our Adam."

These attacks from such eminent sources set the clerical fashion for

several years. One distinguished clerical reviewer, in spite of Darwin's thirty years of quiet labor, and in spite of the powerful summing up of his book, prefaced a diatribe by saying that Darwin "might have been more modest had he given some slight reason for dissenting from the views generally entertained." Another distinguished clergyman, vice-president of a Protestant institute to combat "dangerous" science, declared Darwinism "an attempt to dethrone God." Another critic spoke of persons accepting the Darwinian views as "under the frenzied inspiration of the inhaler of mephitic gas," and of Darwin's argument as "a jungle of fanciful assumption." Another spoke of Darwin's views as suggesting that "God is dead," and declared that Darwin's work "does open violence to everything which the Creator himself has told us in the Scriptures of the methods and results of his work." Still another theological authority asserted: "If the Darwinian theory is true, Genesis is a lie, the whole framework of the book of life falls to pieces, and the revelation of God to man, as we Christians know it, is a delusion and a snare." Another, who had shown excellent qualities as an observing naturalist, declared the Darwinian view "a huge imposture from the beginning."

Echoes came from America. One review, the organ of the most widespread of American religious sects, declared that Darwin was "attempting to befog and to pettifog the whole question"; another denounced Darwin's views as "infidelity"; another, representing the American branch of the Anglican Church, poured contempt over Darwin as "sophistical and illogical," and then plunged into an exceedingly dangerous line of argument in the following words: "If this hypothesis be true, then is the Bible an unbearable fiction;... then have Christians for nearly two thousand years been duped by a monstrous lie.... Darwin requires us to disbelieve the authoritative word of the Creator." A leading journal representing the same church took pains to show the evolution theory to be as contrary to the explicit declarations of the New Testament as to those of the Old, and said: "If we have all, men and monkeys, oysters and eagles, developed from an original germ, then is St. Paul's grand deliverance -- 'All flesh is not the same flesh; there is one kind of flesh of men, another of beasts, another of fishes, and another of birds' -- untrue?"

Another echo came from Australia, where Dr. Perry, Lord Bishop of Melbourne, in a most bitter book on ***Science and the Bible***, declared that the obvious object of Chambers, Darwin, and Huxley is "to produce in their readers a disbelief of the Bible."

Nor was the older branch of the Church to be left behind in this chorus. Bayma, in the ***Catholic World***, declared, "Mr. Darwin is, we have reason to believe, the mouthpiece or chief trumpeter of that infidel clique whose well-known object is to do away with all idea of a God."

Worthy of special note as showing the determination of the theological side at that period was the foundation of sacro-scientific organizations to combat the new ideas. First to be noted is the "Academia," planned by Cardinal Wiseman. In a circular letter the cardinal, usually so moderate and just, sounded an alarm and summed up by saying, "Now it is for the Church, which alone possesses divine certainty and divine discernment, to place itself at once in the front of a movement which threatens even the fragmentary remains of Christian belief in England." The necessary permission was obtained from Rome, the Academia was founded, and the "divine discernment" of the Church was seen in the utterances which came from it, such as those of Cardinal Manning, which every thoughtful Catholic would now desire to recall, and in the diatribes of Dr. Laing, which only aroused laughter on all sides. A similar effort was seen in Protestant quarters; the "Victoria Institute" was created, and perhaps the most noted utterance which ever came from it was the declaration of its vice-president, the Rev. Walter Mitchell, that "Darwinism endeavors to dethrone God."

In France the attack was even more violent. Fabre d'Envieu brought out the heavy artillery of theology, and in a long series of elaborate propositions demonstrated that any other doctrine than that of the fixity and persistence of species is absolutely contrary to Scripture. The Abbé Désorges, a former Professor of Theology, stigmatized Darwin as a "pedant," and evolution as "gloomy". Monsignor Ségur, referring to Darwin and his followers, went into hysterics and shrieked: "These infamous doctrines have for their only support the most abject passions. Their father is pride, their mother impurity, their offspring revolutions. They come from hell and return thither, taking with them the gross creatures who blush not to proclaim and accept them."

In Germany the attack, if less declamatory, was no less severe. Catholic theologians vied with Protestants in bitterness. Prof. Michelis declared Darwin's theory "a caricature of creation." Dr. Hagermann asserted that it "turned the Creator out of doors." Dr. Schund insisted that "every idea of the Holy Scriptures, from the first to the last page, stands in diametrical

opposition to the Darwinian theory"; and, "if Darwin be right in his view of the development of man out of a brutal condition, then the Bible teaching in regard to man is utterly annihilated." Rougemont in Switzerland called for a crusade against the obnoxious doctrine. Luthardt, Professor of Theology at Leipzig, declared: "The idea of creation belongs to religion and not to natural science; the whole superstructure of personal religion is built upon the doctrine of creation"; and he showed the evolution theory to be in direct contradiction to Holy Writ.

But in 1863 came an event which brought serious confusion to the theological camp: Sir Charles Lyell, the most eminent of living geologists, a man of deeply Christian feeling and of exceedingly cautious temper, who had opposed the evolution theory of Lamarck and declared his adherence to the idea of successive creations, then published his work on the ***Antiquity of Man***, and in this and other utterances showed himself a complete though unwilling convert to the fundamental ideas of Darwin. The blow was serious in many ways, and especially so in two -- first, as withdrawing all foundation in fact from the scriptural chronology, and secondly, as discrediting the creation theory. The blow was not unexpected; in various review articles against the Darwinian theory there had been appeals to Lyell, at times almost piteous, "not to flinch from the truths he had formerly proclaimed." But Lyell, like the honest man he was, yielded unreservedly to the mass of new proofs arrayed on the side of evolution against that of creation.

At the same time came Huxley's ***Man's Place in Nature***, giving new and most cogent arguments in favor of evolution by natural selection.

In 1871 was published Darwin's ***Descent of Man***. Its doctrine had been anticipated by critics of his previous books, but it made, none the less, a great stir; again the opposing army trooped forth, though evidently with much less heart than before. A few were very violent. ***The Dublin University Magazine***, after the traditional Hibernian fashion, charged Mr. Darwin with seeking "to displace God by the unerring action of vagary," and with being "resolved to hunt God out of the world." But most notable from the side of the older Church was the elaborate answer to Darwin's book by the eminent French Catholic physician, Dr. Constantin James. In his work, ***On Darwinism, or the Man-Ape***, published at Paris in 1877, Dr. James not only refuted Darwin scientifically but poured contempt on his book, calling it "a fairy tale," and insisted that a work "so fantastic and so burlesque" was,

doubtless, only a huge joke, like Erasmus' ***Praise of Folly***, or Montesquieu's ***Persian Letters***. The princes of the Church were delighted. The Cardinal Archbishop of Paris assured the author that the book had become his "spiritual reading," and begged him to send a copy to the Pope himself. His Holiness, Pope Pius IX, acknowledged the gift in a remarkable letter. He thanked his dear son, the writer, for the book in which he "refutes so well the aberrations of Darwinism." "A system," His Holiness adds, "which is repugnant at once to history, to the tradition of all peoples, to exact science, to observed facts, and even to Reason herself, would seem to need no refutation, did not alienation from God and the leaning toward materialism, due to depravity, eagerly seek a support in all this tissue of fables.... And, in fact, pride, after rejecting the Creator of all things and proclaiming man independent, wishing him to be his own king, his own priest, and his own God -- pride goes so far as to degrade man himself to the level of the unreasoning brutes, perhaps even of lifeless matter, thus unconsciously confirming the Divine declaration, *When pride cometh, then cometh shame*. But the corruption of this age, the machinations of the perverse, the danger of the simple, demand that such fancies, altogether absurd though they are, should -- since they borrow the mask of science -- be refuted by true science." Wherefore the Pope thanked Dr. James for his book, "so opportune and so perfectly appropriate to the exigencies of our time," and bestowed on him the apostolic benediction. Nor was this brief all. With it there came a second, creating the author an officer of the Papal Order of St. Sylvester. The cardinal archbishop assured the delighted physician that such a double honor of brief and brevet was perhaps unprecedented, and suggested only that in a new edition of his book he should "insist a little more on the relation existing between the narratives of Genesis and the discoveries of modern science, in such fashion as to convince the most incredulous of their perfect agreement." The prelate urged also a more dignified title. The proofs of this new edition were accordingly all submitted to His Eminence, and in 1882 it appeared as ***Moses and Darwin: the Man of Genesis Compared with the Man-Ape, or Religious Education Opposed to Atheistic***. No wonder the cardinal embraced the author, thanking him in the name of science and religion. " We have at last," he declared, "a handbook which we can safely put into the hands of youth."

Scarcely less vigorous were the champions of English Protestant orthodoxy. In an address at Liverpool, Mr. Gladstone remarked: "Upon the grounds of what is termed evolution God is relieved of the labor of

creation; in the name of unchangeable laws he is discharged from governing the world"; and, when Herbert Spencer called his attention to the fact that Newton with the doctrine of gravitation and with the science of physical astronomy is open to the same charge, Mr. Gladstone retreated in the ***Contemporary Review*** under one of his characteristic clouds of words. The Rev. Dr. Coles, in the ***British and Foreign Evangelical Review***, declared that the God of evolution is not the Christian's God. Burgon, Dean of Chichester, in a sermon preached before the University of Oxford, pathetically warned the students that "those who refuse to accept the history of the creation of our first parents according to its obvious literal intention, and are for substituting the modern dream of evolution in its place, cause the entire scheme of man's salvation to collapse." Dr. Pusey also came into the fray with most earnest appeals against the new doctrine, and the Rev. Gavin Carlyle was perfervid on the same side. The Society for Promoting Christian Knowledge published a book by the Rev. Mr. Birks, in which the evolution doctrine was declared to be "flatly opposed to the fundamental doctrine of creation." Even the ***London Times*** admitted a review stigmatizing Darwin's ***Descent of Man*** as an "utterly unsupported hypothesis," full of "unsubstantiated premises, cursory investigations, and disintegrating speculations," and Darwin himself as "reckless and unscientific."

But it was noted that this second series of attacks, on the **Descent of Man**, differed in one remarkable respect -- so far as England was concerned -- from those which had been made over ten years before on the ***Origin of Species***. While everything was done to discredit Darwin, to pour contempt upon him, and even, of all things in the world, to make him -- the gentlest of mankind, only occupied with the scientific side of the problem -- "a persecutor of Christianity," while his followers were represented more and more as charlatans or dupes, there began to be in the most influential quarters careful avoidance of the old argument that evolution -- even by natural selection -- contradicts Scripture. It began to be felt that this was dangerous ground. The defection of Lyell had, perhaps, more than anything else, started the question among theologians who had preserved some equanimity, *"What if, after all, the Darwinian theory should prove to be true?"* Recollections of the position in which the Roman Church found itself after the establishment of the doctrines of Copernicus and Galileo naturally came into the minds of the more thoughtful. In Germany this consideration does not seem to have occurred at quite so early a day. One eminent Lutheran clergyman at Magdeburg called on his hearers to

choose between Darwin and religion; Delitszch, in his new commentary on Genesis, attempted to bring science back to recognize human sin as an important factor in creation; Prof. Heinrich Ewald, while carefully avoiding any sharp conflict between the scriptural doctrine and evolution, comforted himself by covering Darwin and his followers with contempt; Christlieb, in his address before the Evangelical Alliance at New York in 1873, simply took the view that the tendencies of the Darwinian theory were "toward infidelity," but declined to make any serious battle on biblical grounds; the Jesuit, Father Pesch, in Holland, drew up in Latin, after the old scholastic manner, a sort of general indictment of evolution, of which one may say that it was interesting -- as interesting as the display of a troop in chain armor and with cross-bows on a nineteenth-century battlefield.

From America there came new echoes. Among the myriad attacks on the Darwinian theory by Protestants and Catholics two should be especially mentioned. The first of these was by Dr. Noah Porter, President of Yale College, an excellent scholar, an interesting writer, a noble man, broadly tolerant, combining in his thinking a curious mixture of radicalism and conservatism. While giving great latitude to the evolutionary teaching in the university under his care, he felt it his duty upon one occasion to avow his disbelief in it; but he was too wise a man to suggest any necessary antagonism between it and the Scriptures. He confined himself mainly to pointing out the tendency of the evolution doctrine in this form toward agnosticism and pantheism. To those who knew and loved him, and had noted the genial way in which by wise neglect he had allowed scientific studies to flourish at Yale, there was an amusing side to all this. Within a stone's throw of his college rooms was the Museum of Paleontology, in which Prof. Marsh had laid side by side, among other evidences of the new truth, that wonderful series of specimens showing the evolution of the horse from the earliest form of the animal, "not larger than a fox, with five toes," through the whole series up to his present form and size -- that series which Huxley declared an absolute proof of the existence of natural selection as an agent in evolution. In spite of the veneration and love which all Yale men felt for President Porter, it was hardly to be expected that these particular arguments of his would have much permanent effect upon them when there was constantly before their eyes so convincing a refutation.

But a far more determined opponent was the Rev. Dr. Hodge, of Princeton; his anger toward the evolution doctrine was bitter: he denounced it as

thoroughly "atheistic"; he insisted that Christians "have a right to protest against the arraying of probabilities against the clear evidence of the Scriptures"; he even censured so orthodox a writer as the Duke of Argyll, and declared that the Darwinian theory of natural selection is "utterly inconsistent with the Scriptures," and that "an absent God, who does nothing, is to us no God"; that "to ignore design as manifested in God's creation is to dethrone God"; that "a denial of design in Nature is virtually a denial of God"; and that "no teleologist can be a Darwinian." Even more uncompromising was another of the leading authorities at the same university -- the Rev. Dr. Duffield. He declared war not only against Darwin but even against men like Asa Gray, Le Conte, and others, who had attempted to reconcile the new theory with the Bible: he insisted that "evolutionism and the scriptural account of the origin of man are irreconcilable" -- that the Darwinian theory is "in direct conflict with the teaching of the apostle, 'All scripture is given by inspiration of God'"; he pointed out, in his opposition to Darwin's ***Descent of Man*** and Lyell's ***Antiquity of Man***, that in the Bible "the genealogical links which connect the Israelites in Egypt with Adam and Eve in Eden are explicitly given." These utterances of Prof. Duffield culminated in a declaration which deserves to be cited as showing that a Presbyterian minister can "deal damnation round the land" *ex cathedra* in a fashion quite equal to that of popes and bishops. It is as follows: "If the development theory of the origin of man," wrote Dr. Duffield in the ***Princeton Review***, "shall in a little while take its place -- as doubtless it will -- with other exploded scientific speculations, then they who accept it with its proper logical consequences will in the life to come have their portion with those who in this life 'know not God and obey not the gospel of his Son.'"

Fortunately, at about the time when Darwin's ***Descent of Man*** was published, there had come into Princeton University *"deus ex machina"* in the person of Dr. James McCosh. Called to the presidency, he at once took his stand against teachings so dangerous to Christianity as those of Drs. Hodge, Duffield, and their associates. In one of his personal confidences he has let us into the secret of this matter. With that hard Scotch sense which Thackeray had applauded in his well-known verses, he saw that the most dangerous thing which could be done to Christianity at Princeton was to reiterate in the university pulpit, week after week, solemn declarations that if evolution by natural selection, or indeed evolution at all, be true, the Scriptures are false. He tells us that he saw that this was the certain way to make the students unbelievers; he therefore not only

checked this dangerous preaching but preached an opposite doctrine. With him began the inevitable compromise, and, in spite of mutterings against him as a Darwinian, he carried the day. Whatever may be thought of his general system of philosophy, no one can deny his great service in neutralizing the teachings of his predecessors and colleagues -- so dangerous to all that is essential in Christianity.

Other divines of strong sense in other parts of the country began to take similar ground -- namely, that men could be Christians and at the same time Darwinians. There appeared, indeed, here and there, curious discrepancies: thus in 1873 the ***Monthly Religious Magazine*** of Boston congratulated its readers that the Rev. Mr. Burr had "demolished the evolution theory, knocking the breath of life out of it and throwing it to the dogs." This amazing performance by the Rev. Mr. Burr was repeated in a very striking way by Bishop Keener before the Ecumenical Council of Methodism at Washington in 1891. In what the newspapers described as an "admirable speech," he refuted evolution doctrines by saying that evolutionists had "only to make a journey of twelve hours from the place where he was then standing to find together the bones of the muskrat, the opossum, the coprolite, and the ichthyosaurus." He asserted that Agassiz -- whom the good bishop, like so many others, seemed to think an evolutionist -- when he visited these beds near Charleston, declared: "These old beds have set me crazy; they have destroyed the work of a lifetime." And the Methodist prelate ended by saying: "Now, gentlemen, brethren, take these facts home with you; get down and look at them. This is the watch that was under the steam hammer -- the doctrine of evolution; and this steam hammer is the wonderful deposit of the Ashley beds." Exhibitions like these availed little. While the good bishop amid vociferous applause thus made comically evident his belief that Agassiz was a Darwinian and a coprolite an animal, scientific men were recording in all parts of the world facts confirming the dreaded theory of an evolution by natural selection. While the Rev. Mr. Burr was so loudly praised for "throwing Darwinism to the dogs," Marsh was completing his series leading from the five-toed ungulates to the horse. While Dr. Tayler Lewis at Union, and Drs. Hodge and Duffield at Princeton, were showing that if evolution be true the biblical accounts must be false, the indefatigable Yale professor was showing his Cretaceous birds, and among them *Hesperornis* and *Ichthyornis* with teeth. While in Germany Luthardt, Schund, and their compeers were demonstrating that Scripture requires a belief in special and separate creations, the Archaeopteryx, showing a most remarkable

connection between birds and reptiles, was discovered. While in France Monsignor Ségur and others were indulging in diatribes against "a certain Darwin," Gaudry and Filhol were discovering a striking series of "missing links" among the Carnivora.

In view of the proofs accumulating in favor of the new evolutionary hypothesis, the change in the tone of controlling theologians was now rapid. From all sides came evidences of desire to compromise with the theory. Strict adherents of the biblical text pointed significantly to the verses in Genesis in which the earth and sea were made to bring forth birds and fishes, and man was created out of the dust of the ground. Men of larger mind like Kingsley and Farrar, with English and American broad churchmen generally, took ground directly in Darwin's favor. Even Whewell took pains to show that there might be such a thing as a Darwinian argument for design in Nature; and the Rev. Samuel Houghton, of the Royal Society, gave interesting suggestions of a divine design in evolution.

Both the great English universities received the new teaching as a leaven: at Oxford, in the very front of the High Church party at Keble College, was elaborated a statement that the evolution doctrine is "an advance in our theological thinking." And Temple, Bishop of London, perhaps the most influential thinker then in the Anglican episcopate, accepted the new revelation in the following words: "It seems something more majestic, more befitting him to whom a thousand years are as one day, thus to impress his will once for all on his creation, and provide for all the countless varieties by this one original impress, than by special acts of creation to be perpetually modifying what he had previously made."

In Scotland the Duke of Argyll, head and front of the orthodox party, dissenting in many respects from Darwin's full conclusions, made concessions which badly shook the old position.

Curiously enough, from the Roman Catholic Church, bitter as some of its writers had been, now came argument to prove that the Catholic faith does not prevent any one from holding the Darwinian theory, and especially a declaration from an authority eminent among American Catholics -- a declaration which has a very curious sound, but which it would be ungracious to find fault with -- that "the doctrine of evolution is no more in opposition to the doctrine of the Catholic Church than is the Copernican

theory or that of Galileo."

Here and there, indeed, men of science like Dawson, Mivart, and Wigand, in view of theological considerations, sought to make conditions; but the current was too strong, and eminent theologians in every country accepted natural selection as at least a very important part in the mechanism of evolution.

At the death of Darwin it was felt that there was but one place in England where his body should be laid, and that this place was next the grave of Sir Isaac Newton in Westminster Abbey. The noble address of Canon Farrar at his funeral was echoed from many pulpits in Europe and America, and theological opposition as such was ended. Occasionally appeared, it is true, a survival of the old feeling: the Rev. Dr. Laing referred to the burial of Darwin in Westminster Abbey as "a proof that England is no longer a Christian country," and added that this burial was a desecration -- that this honor was given him because he had been "the chief promoter of the mock doctrine of evolution of the species and the ape descent of man."

Still another of these belated prophets was, of all men, Thomas Carlyle. Soured and embittered, in the same spirit which led him to find more heroism in a marauding Viking or in one of Frederick the Great's generals than in Washington, or Lincoln, or Grant, and which caused him to see in the American Civil War only the burning out of a foul chimney, he, with the petulance natural to a dyspeptic eunuch, railed at Darwin as an "apostle of dirt worship."

The last echoes of these utterances reverberated between Scotland and America. In the former country, in 1885, the Rev. Dr. Lee issued a volume declaring that, if the Darwinian view be true, "there is no place for God"; that "by no method of interpretation can the language of Holy Scripture be made wide enough to re-echo the orangutan theory of man's natural history"; that "Darwinism reverses the revelation of God" and "implies utter blasphemy against the divine and human character of our Incarnate Lord"; and he was pleased to call Darwin and his followers "gospellers of the gutter." In one of the intellectual centers of America the editor of a periodical called ***The Christian*** urged frantically that "the battle be set in array, and that men find out who is on the Lord's side and who is on the side of the Devil and the monkeys."

To the honor of the Church of England it should be recorded that a considerable number of her truest men opposed such utterances as these, and that one of them -- Farrar, Archdeacon of Westminster -- made a protest worthy to be held in perpetual remembrance. While confessing his own inability to accept fully the new scientific belief, he said: "We should consider it disgraceful and humiliating to try to shake it by an *ad captandum* argument, or by a clap-trap platform appeal to the unfathomable ignorance and unlimited arrogance of a prejudiced assembly. We should blush to meet it with an anathema or a sneer."

All opposition had availed nothing; Darwin's work and fame were secure. As men looked back over his beautiful life -- simple, honest, tolerant, kindly -- and thought upon his great labors in the search for truth, all the attacks faded into nothingness.

There were indeed some dark spots, which as time goes on appear darker. At Trinity College, Cambridge, Whewell, the "omniscient," author of the ***History of the Inductive Sciences***, refused to allow a copy of the ***Origin of Species*** to be placed in the library. At multitudes of institutions under theological control -- Protestant as well as Catholic -- attempts were made to stamp out or to stifle evolutionary teaching. Especially was this true for a time in America, and the case of the American College at Beirut, where nearly all the younger professors were dismissed for adhering to Darwin's views, is worthy of remembrance. The treatment of Dr. Winchell at the Vanderbilt University in Tennessee showed the same spirit; one of the truest of men, devoted to science but of deeply Christian feeling, he was driven forth for views which centered in the Darwinian theory.

Still more striking was the case of Dr. Woodrow. He had, about 1857, been appointed to a professorship of Natural Science as connected with Revealed Religion, in the Presbyterian Seminary at Columbia, South Carolina. He was a devoted Christian man, and his training had led him to accept the Presbyterian standards of faith. With great gifts for scientific study he visited Europe, made a most conscientious examination of the main questions under discussion, and adopted the chief points in the doctrine of evolution by natural selection. A struggle soon began. A movement hostile to him grew more and more determined, and at last, in spite of the efforts made in his behalf by the directors of the seminary and by a large and broad-minded minority in the representative bodies controlling it, an orthodox storm, raised by the delegates from various

Presbyterian bodies, drove him from his post. Fortunately, he was received into a professorship at the University of South Carolina, where he has since taught with more power than ever before.

This testimony to the faith by American provincial Protestantism was very properly echoed from Spanish provincial Catholicism. In the year 1878 a Spanish colonial man of science, Dr. Chil y Marango, published a work on the Canary Islands. But Dr. Chil had the imprudence to sketch, in his introduction, the modern hypothesis of evolution, and to exhibit some proofs, found in the Canary Islands, of the barbarism of primitive man. The ecclesiastical authorities, under the lead of Bishop Urquinaona y Bidot, at once grappled with this new idea. By a solemn act they declared it *"falsa, impia, scandalosa"*; all persons possessing copies of the work were ordered to surrender them at once to the proper ecclesiastics, and the author was placed under the major excommunication.

But all this opposition may be reckoned among the last expiring convulsions of the old theological theory. Even from the new Catholic University at Washington has come an utterance in favor of the new doctrine, and in other universities in the Old World and in the New the doctrine of evolution by natural selection has asserted its right to full and honest consideration. More than this, it is clearly evident that the stronger men in the Church have, in these latter days, not only relinquished the struggle against science in this field, but have determined frankly and manfully to make an alliance with it. In two very remarkable lectures given in 1892 at the parish church of Rochdale, Wilson, Archdeacon of Manchester, not only accepted Darwinism as true, but wrought it with great argumentative power into a higher view of Christianity; and what is of great significance, these sermons were published by the same Society for the Promotion of Christian Knowledge which only a few years before had published the most bitter attacks against the Darwinian theory. So, too, during the year 1893, Prof. Henry Drummond, whose praise is in all the dissenting churches, developed a similar view most brilliantly in a series of lectures delivered before the American Chautauqua schools, and published in one of the most widespread of English orthodox newspapers.

Whatever additional factors may be added to natural selection -- and Darwin himself fully admitted that there might be others -- the theory of an evolution process in the formation of the universe and of animated nature is established, and the old theory of direct creation is gone forever. In place

of it science has given us conceptions far more noble, and opened the way to an argument for design infinitely more beautiful than any ever developed by theology.

Continue

Attacks on Darwin and his theories in:
- **England**
- **America**

Formation of sacro-scientific organizations to combat the theory of evolution:
- **France**
- **Germany**

Conversion of Lyell to the theory of evolution

The attack on Darwin's Descent of Man

Difference between this and the former attack

Hostility to Darwinism in America

Change in the tone of the controversy -- Attempts at compromise

Dying-out of opposition to evolution

Last outbursts of theological hostility

Final victory of evolution

CHAPTER 2 GEOGRAPHY

Continue

2.1 The Form of the Earth

[Click Here for Section Outline]

Among various primitive tribes we find survivals of a primitive idea that the earth is a flat table or disk, covered, domed, or canopied by the sky, and that the sky rests upon the mountains as pillars. Such a belief is entirely natural; it conforms to the appearance of things, and hence at a very early period entered into various theologies.

In the civilizations of Chaldea and Egypt it was very fully developed. The Assyrian inscriptions deciphered in these latter years represent the god Marduk as in the beginning creating the heavens and the earth: the earth rests upon the waters; within it is the realm of the dead; above it is spread "the firmament" -- a solid dome coming down to the horizon on all sides and resting upon foundations laid in the "great waters" which extend around the earth.

On the east and west sides of this domed firmament are doors, through which the sun enters in the morning and departs at night; above it extends another ocean, which goes down to the ocean surrounding the earth at the horizon on all sides, and which is supported and kept away from the earth by the firmament. Above the firmament and the upper ocean which it supports is the interior of heaven.

The Egyptians considered the earth as a table, flat and oblong, the sky being its ceiling -- a huge "firmament" of metal. At the four corners of the earth were the pillars supporting this firmament, and on this solid sky were the "waters above the heavens." They believed that, when chaos was taking form, one of the gods by main force raised the waters on high and spread them out over the firmament; that on the under side of this solid vault, or ceiling, or firmament, the stars were suspended to light the earth, and that the rains were caused by the letting down of the waters through its windows. This idea and others connected with it seem to have taken strong hold of the Egyptian priestly caste, entering into their theology and sacred science: ceilings of great temples, with stars, constellations, planets, and signs of the zodiac figured upon them, remain today as striking evidences of this.

In Persia we have theories of geography based upon similar conceptions and embalmed in sacred texts.

From these and doubtless from earlier sources common to them all came geographical legacies to the Hebrews. Various passages in their sacred books, many of them noble in conception and beautiful in form, regarding "the foundation of the earth upon the waters," "the fountains of the great deep," "the compass upon the face of the depth," the "firmament," the "corners of the earth," the "pillars of heaven," the "waters above the firmament," the "windows of heaven," and "doors of heaven," point us back to both these ancient springs of thought.

But, as civilization was developed, there were evolved, especially among the Greeks, ideas of the earth's sphericity. The Pythagoreans, Plato, and Aristotle especially cherished them. These ideas were vague, they were mixed with absurdities, but they were germ ideas, and even amid the luxuriant growth of theology in the early Christian Church these germs began struggling into life in the minds of a few thinking men, and these men renewed the suggestion that the earth is a globe.[footnote]

A few of the larger-minded fathers of the Church, influenced possibly by Pythagorean traditions, but certainly by Aristotle and Plato, were willing to accept this view, but the majority of them took fright at once. To them it seemed fraught with dangers to Scripture, by which, of course, they meant their interpretation of Scripture. Among the first who took up arms against it was Eusebius. In view of the New Testament texts indicating the end of the world is imminent, he endeavored to turn off this idea by bringing scientific studies into contempt. Speaking of investigators, he said, "It is not through ignorance of the things admired by them, but through contempt of their useless labor, that we think little of these matters, turning our souls to better things." Basil of Cæsarea declared it "a matter of no interest to us whether the earth is a sphere or a cylinder or a disk, or concave in the middle like a fan." Lactantius referred to the ideas of those studying astronomy as "bad and senseless," and opposed the doctrine of the earth's sphericity both from Scripture and reason. St. John Chrysostom also exerted his influence against this scientific belief; and Ephraem Syrus, the greatest man of the old Syrian Church, widely known as the "lute of the Holy Ghost," opposed it no less earnestly.

But the strictly biblical men of science, such eminent fathers and bishops

as Theophilus of Antioch in the second century, and Clement of Alexandria in the third, with others in centuries following, were not content with merely opposing what they stigmatized as an old heathen theory; they drew from their Bibles a new Christian theory, to which one Church authority added one idea and another, until it was fully developed. Taking the survival of various early traditions, given in the seventh verse of the first chapter of Genesis, they insisted on the clear declarations of Scripture that the earth was, at creation, arched over with a solid vault, "a firmament," and to this they added the passages from Isaiah and the Psalms, in which it declared that the heavens are stretched out "like a curtain," and again "like a tent to dwell in." The universe, then, is like a house: the earth is its ground floor, the firmament its ceiling, under which the Almighty hangs out the sun to rule the day and the moon and stars to rule the night. This ceiling is also the floor of the apartment above, and in this is a cistern, shaped, as one of the authorities says, "like a bathing-tank," and containing "the waters which are above the firmament." These waters are let down upon the earth by the Almighty and his angels through the "windows of heaven." As to the movement of the sun, there was a citation of various passages in Genesis, mixed with metaphysics in various proportions, and this was thought to give ample proofs from the Bible that the earth could not be a sphere.

In the sixth century this development culminated in what was nothing less than a complete and detailed system of the universe, claiming to be based upon Scripture, its author being the Egyptian monk Cosmas Indicopleustes. Egypt was a great treasure-house of theological thought to various religions of antiquity, and Cosmas appears to have urged upon the early Church this Egyptian idea of the construction of the world, just as another Egyptian ecclesiastic, Athanasius, urged upon the Church the Egyptian idea of a triune deity ruling the world. According to Cosmas, the earth is a parallelogram, flat, and surrounded by four seas. It is four hundred days' journey long and two hundred broad. At the outer edges of these four seas arise massive walls closing in the whole structure and supporting the firmament or vault of the heavens, whose edges are cemented to the walls. These walls enclose the earth and all the heavenly bodies.

The whole of this theologico-scientific structure was built most carefully and, as was then thought, most scripturally. Starting with the expression applied in the ninth chapter of Hebrews to the tabernacle in the desert, Cosmas insists, with other interpreters of his time, that it gives the key to the whole construction of the world. The universe is, therefore, made on

the plan of the Jewish tabernacle -- boxlike and oblong. Going into details, he quotes the sublime words of Isaiah: "It is He that sitteth upon the circle of the earth;... that stretcheth out the heavens like a curtain, and spreadeth them out like a tent to dwell in"; and the passage in Job which speaks of the "pillars of heaven." He works all this into his system, and reveals, as he thinks, treasures of science.

This vast box is divided into two compartments, one above the other. In the first of these, men live and stars move; and it extends up to the first solid vault, or firmament, above which live the angels, a main part of whose business it is to push and pull the sun and planets to and fro. Next, he takes the text, "Let there be a firmament in the midst of the waters, and let it divide the waters from the waters," and other texts from Genesis; to these he adds the text from the Psalms, "Praise him, ye heaven of heavens, and ye waters that be above the heavens" then casts all, and these growths of thought into his crucible together, finally brings out the theory that over this first vault is a vast cistern containing "the waters." He then takes the expression in Genesis regarding the "windows of heaven" and establishes a doctrine regarding the regulation of the rain, to the effect that the angels not only push and pull the heavenly bodies to light the earth, but also open and close the heavenly windows to water it.

To understand the surface of the earth, Cosmas, following the methods of interpretation which Origen and other early fathers of the Church had established, studies the table of shew-bread in the Jewish tabernacle. The surface of this table proves to him that the earth is flat, and its dimensions prove that the earth is twice as long as broad; its four corners symbolize the four seasons; the twelve loaves of bread, the twelve months; the hollow about the table proves that the ocean surrounds the earth. To account for the movement of the sun, Cosmas suggests that at the north of the earth is a great mountain, and that at night the sun is carried behind this; but some of the commentators ventured to express a doubt here: they thought that the sun was pushed into a pit at night and pulled out in the morning.

Nothing can be more touching in its simplicity than Cosmas' summing up of his great argument, He declares, "We say therefore with Isaiah that the heaven embracing the universe is a vault, with Job that it is joined to the earth, and with Moses that the length of the earth is greater than its breadth." The treatise closes with rapturous assertions that not only

Moses and the prophets, but also angels and apostles, agree to the truth of his doctrine, and that at the last day God will condemn all who do not accept it.

Although this theory was drawn from Scripture, it was also, as we have seen, the result of an evolution of theological thought begun long before the scriptural texts on which it rested were written. It was not at all strange that Cosmas, Egyptian as he was, should have received this old Nile-born doctrine, as we see it indicated today in the structure of Egyptian temples, and that he should have developed it by the aid of the Jewish Scriptures; but the theological world knew nothing of this more remote evolution from pagan germs; it was received as virtually inspired, and was soon regarded as a fortress of scriptural truth. Some of the foremost men in the Church devoted themselves to buttressing it with new texts and throwing about it new outworks of theological reasoning; the great body of the faithful considered it a direct gift from the Almighty. Even in the later centuries of the Middle Ages John of San Geminiano made a desperate attempt to save it. Like Cosmas, he takes the Jewish tabernacle as his starting-point, and shows how all the newer ideas can be reconciled with the biblical accounts of its shape, dimensions, and furniture.

From this old conception of the universe as a sort of house, with heaven as its upper story and the earth as its ground floor, flowed important theological ideas into heathen, Jewish, and Christian mythologies. Common to them all are legends regarding attempts of mortals to invade the upper apartment from the lower. Of such are the Greek legends of the Aloidæ, who sought to reach heaven by piling up mountains, and were cast down; the Chaldean and Hebrew legends of the wicked who at Babel sought to build "a tower whose top may reach heaven," which Jehovah went down from heaven to see, and which he brought to naught by the "confusion of tongues"; the Hindu legend of the tree which sought to grow into heaven and which Brahma blasted; and the Mexican legend of the giants who sought to reach heaven by building the Pyramid of Cholula, and who were overthrown by fire from above.

Myths having this geographical idea as their germ developed in luxuriance through thousands of years. Ascensions to heaven and descents from it, "translations," "assumptions," "annunciations," mortals "caught up" into it and returning, angels flying between it and the earth, thunderbolts hurled down from it, mighty winds issuing from its corners, voices speaking from

the upper floor to men on the lower, temporary openings of the floor of heaven to reveal the blessedness of the good, "signs and wonders" hung out from it to warn the wicked, interventions of every kind -- from the heathen gods coming down on every sort of errand, and Jehovah coming down to walk in Eden in the cool of the day, to St. Mark swooping down into the market-place of Venice to break the shackles of a slave -- all these are but features in a vast evolution of myths arising largely from this geographical germ.

Nor did this evolution end here. Naturally, in this view of things, if heaven was a loft, hell was a cellar; and if there were ascensions into one, there were descents into the other. Hell being so near, interferences by its occupants with the dwellers of the earth just above were constant, and form a vast chapter in medieval literature. Dante made this conception of the location of hell still more vivid, and we find some forms of it serious barriers to geographical investigation. Many a bold navigator, who was quite ready to brave pirates and tempests, trembled at the thought of tumbling with his ship into one of the openings into hell which a widespread belief placed in the Atlantic at some unknown distance from Europe. This terror among sailors was one of the main obstacles in the great voyage of Columbus. In a medieval textbook, giving science the form of a dialogue, occur the following question and answer: "Why is the sun so red in the evening?" "Because he looketh down upon hell."

But the ancient germ of scientific truth in geography -- the idea of the earth's sphericity -- still lived. Although the great majority of the early fathers of the Church, and especially Lactantius, had sought to crush it beneath the utterances attributed to Isaiah, David, and St. Paul, the better opinion of Eudoxus and Aristotle could not be forgotten. Clement of Alexandria and Origen had even supported it. Ambrose and Augustine had tolerated it, and, after Cosmas had held sway a hundred years, it received new life from a great churchman of southern Europe, Isidore of Seville, who, however fettered by the dominant theology in many other things, braved it in this. In the eighth century a similar declaration was made in the north of Europe by another great Church authority, Bede. Against the new life thus given to the old truth, the sacred theory struggled long and vigorously but in vain. Eminent authorities in later ages, like Albert the Great, St. Thomas Aquinas, Dante, and Vincent of Beauvais, felt obliged to accept the doctrine of the earth's sphericity, and as we approach the modern period we find its truth acknowledged by the vast majority of

thinking men. The Reformation did not at first yield fully to this better theory. Luther, Melanchthon, and Calvin were very strict in their adherence to the exact letter of Scripture. Even Zwingli, broad as his views generally were, was closely bound down in this matter, and held to the opinion of the fathers that a great firmament, or floor, separated the heavens from the earth; that above it were the waters and angels, and below it the earth and man.

The main scope given to independent thought on this general subject among the Reformers was in a few minor speculations regarding the universe which encompassed Eden, the exact character of the conversation of the serpent with Eve, and the like.

In the times immediately following the Reformation matters were even worse. The interpretations of Scripture by Luther and Calvin became as sacred to their followers as the Scripture itself. When Calixt ventured, in interpreting the Psalms, to question the accepted belief that "the waters above the heavens" were contained in a vast receptacle upheld by a solid vault, he was bitterly denounced as heretical.

In the latter part of the sixteenth century Musæus interpreted the accounts in Genesis to mean that first God made the heavens for the roof or vault, and left it there on high swinging until three days later he put the earth under it. But the new scientific thought as to the earth's form had gained the day. The most sturdy believers were obliged to adjust their biblical theories to it as best they could.

Continue

Primitive conception of the earth as flat:
- **In Chaldea and Egypt**
- **In Persia**
- **Among the Hebrews**

Evolution, among the Greeks, of the idea of its sphericity

Opposition of the early Church

Evolution of a sacred theory, drawn from the Bible:
- **Its completion by Cosmas Indicopleustes**
- **Its influence on Christian thought**

Survival of the idea of the earth's sphericity -- its acceptance by Isidore and Bede

Its struggle and final victory

The agency of the Pythagoreans in first spreading the doctrine of the earth's sphericity is generally acknowledged, but the first clear and full utterance of it to the world was by Aristotle. Cicero's mention of the antipodes, and his reference to the passage in Plato's *Timæus*, are even more remarkable than the latter, in that they much more clearly foreshadow the modern doctrine.

2.2 The Delineation of the Earth

[Click Here for Section Outline]

Every great people of antiquity, as a rule, regarded its own central city or most holy place as necessarily the center of the earth.

The Chaldeans held that their "holy house of the gods" was the center. The Egyptians sketched the world under the form of a human figure, in which Egypt was the heart, and the center of it Thebes. For the Assyrians, it was Babylon; for the Hindus, it was Mount Meru; for the Greeks, so far as the civilized world was concerned, Olympus or the temple at Delphi; for the modern Mohammedans, it is Mecca and its sacred stone; the Chinese, to this day, speak of their empire as the "middle kingdom." It was in accordance, then, with a simple tendency of human thought that the Jews believed the center of the world to be Jerusalem.

The book of Ezekiel speaks of Jerusalem as in the middle of the earth, and all other parts of the world as set around the holy city. Throughout the "ages of faith" this was very generally accepted as a direct revelation from the Almighty regarding the earth's form. St. Jerome, the greatest authority of the early Church upon the Bible, declared, on the strength of this utterance of the prophet, that Jerusalem could be nowhere but at the earth's center; in the ninth century Archbishop Rabanus Maurus reiterated the same argument; in the eleventh century Hugh of St. Victor gave to the doctrine another scriptural demonstration; and Pope Urban, in his great sermon at Clermont urging the Franks to the crusade, declared, "Jerusalem is the middle point of the earth"; in the thirteenth century an ecclesiastical writer much in vogue, the monk Cæsarius of Heisterbach, declared, "As the heart in the midst of the body, so is Jerusalem situated in the midst of our inhabited earth," -- "so it was that Christ was crucified at the center of the earth." Dante accepted this view of Jerusalem as a certainty, wedding it to immortal verse; and in the pious book of travels ascribed to Sir John Mandeville, so widely read in the Middle Ages, it is declared that Jerusalem is at the center of the world, and that a spear standing erect at the Holy Sepulchre casts no shadow at the equinox.

Ezekiel's statement thus became the standard of orthodoxy to early map-makers. The map of the world at Hereford Cathedral, the maps of Andrea

Bianco, Marino Sanuto, and a multitude of others fixed this view in men's minds, and doubtless discouraged during many generations any scientific statements tending to unbalance this geographical center revealed in Scripture.[footnote]

Nor did medieval thinkers rest with this conception. In accordance with the dominant view that physical truth must be sought by theological reasoning, the doctrine was evolved that not only the site of the cross on Calvary marked the geographical center of the world, but that on this very spot had stood the tree which bore the forbidden fruit in Eden. Thus was geography made to reconcile all parts of the great theological plan. This doctrine was hailed with joy by multitudes; and we find in the works of medieval pilgrims to Palestine, again and again, evidence that this had become precious truth to them, both in theology and geography. Even as late as 1664 the eminent French priest Eugène Roger, in his published ***Travels in Palestine***, dwelt upon the thirty-eighth chapter of Ezekiel, coupled with a text from Isaiah, to prove that the exact center of the earth is a spot marked on the pavement of the Church of the Holy Sepulchre, and that on this spot once stood the tree which bore the forbidden fruit and the cross of Christ. [footnote]

Nor was this the only misconception which forced its way from our sacred writings into medieval map-making: two others were almost as marked. First of these was the vague terror inspired by Gog and Magog. Few passages in the Old Testament are more sublime than the denunciation of these great enemies by Ezekiel; and the well-known statement in the Apocalypse fastened the Hebrew feeling regarding them with a new meaning into the mind of the early Church: hence it was that the medieval map-makers took great pains to delineate these monsters and their habitations on the maps. For centuries no map was considered orthodox which did not show them.

The second conception was derived from the mention in our sacred books of the "four winds." Hence came a vivid belief in their real existence, and their delineation on the maps, generally as colossal heads with distended cheeks, blowing vigorously toward Jerusalem.

After these conceptions had mainly disappeared we find here and there evidences of the difficulty men found in giving up the scriptural idea of direct personal interference by agents of Heaven in the ordinary

phenomena of Nature: thus, in a noted map of the sixteenth century representing the earth as a sphere, there is at each pole a crank, with an angel laboriously turning the earth by means of it; and, in another map, the hand of the Almighty, thrust forth from the clouds, holds the earth suspended by a rope and spins it with his thumb and fingers. Even as late as the middle of the seventeenth century Heylin, the most authoritative English geographer of the time, shows a like tendency to mix science and theology. He warps each to help the other, as follows: "Water, making but one globe with the earth, is yet higher than it. This appears, first, because it is a body not so heavy; secondly, it is observed by sailors that their ships move faster to the shore than from it, whereof no reason can be given but the height of the water above the land; thirdly, to such as stand on the shore the sea seems to swell into the form of a round hill till it puts a bound upon our sight. Now that the sea, hovering thus over and above the earth, doth not overwhelm it, can be ascribed only to his Providence who 'hath made the waters to stand on an heap that they turn not again to cover the earth.'"

Continue

Belief of every ancient people that its own central place was the center of the earth

Hebrew conviction that the earth's center was at Jerusalem

Acceptance of this view by Christianity

Influence of other Hebrew conceptions -- Gog and Magog, the "four winds," the waters "on a heap"

As to the Greeks, we have typical statements in the *Eumenides* of Æschylus, where the stone on the altar at Delphi is repeatedly called "the earth's navel" -- which is precisely the expression used regarding Jersalem in the Septuagint translation of Ezekiel. The proof text on which the medieval geographers mainly relied as to the form of the earth were Ezekiel 5:5 and 38:12. The progress of geographical knowledge evidently caused them to be softened down somewhat in our King Jame's version.

Quoting one myth in the work *Pilgrimage of the Russian Abbot Daniel*, edited by Sir C. W. Wilson: "At the time of our Lord's crucifixion, when he gave up the ghost on the cross, the veil of the temple was rent, and the rock above Adam's skull opened, and the blood and water which flowed from Christ's side ran down through the fissure upon the skull, thus washing away the sins of men."

2.3 The Inhabitants of the Earth

[Click Here for Section Outline]

Even while the doctrine of the sphericity of the earth was undecided, another question had been suggested which theologians finally came to consider of far greater importance. The doctrine of the sphericity of the earth naturally led to thought regarding its inhabitants, and another ancient germ was warmed into life -- the idea of antipodes: of human beings on the earth's opposite sides.

In the Greek and Roman world this idea had found supporters and opponents, Cicero and Pliny being among the former, and Epicurus, Lucretius, and Plutarch among the latter. Thus the problem came into the early Church unsolved.

Among the first churchmen to take it up was, in the East, St. Gregory Nazianzen, who showed that to sail beyond Gibraltar was impossible; and, in the West, Lactantius, who asked: "Is there any one so senseless as to believe that there are men whose footsteps are higher than their heads?... that the crops and trees grow downward?... that the rains and snow and hail fall upward toward the earth?... I am at a loss what to say of those who, when they have once erred, steadily persevere in their folly and defend one vain thing by another."

In all this contention by Gregory and Lactantius there was nothing to be especially regretted, for, whatever their motive, they simply supported their inherited belief on grounds of natural law and probability.

Unfortunately, the discussion was not long allowed to rest on these scientific and philosophical grounds; other Christian thinkers followed, who in their ardor adduced texts of Scripture, and soon the question had become theological; hostility to the belief in antipodes became dogmatic. The universal Church was arrayed against it, and in front of the vast phalanx stood, to a man, the fathers.

To all of them this idea seemed dangerous; to most of them it seemed damnable. St. Basil and St. Ambrose were tolerant enough to allow that a man might be saved who thought the earth inhabited on its opposite sides;

but the great majority of the fathers doubted the possibility of salvation to such misbelievers.

The great champion of the orthodox view was St. Augustine. Though he seemed inclined to yield a little in regard to the sphericity of the earth, he fought the idea that men exist on the other side of it, saying that "Scripture speaks of no such descendants of Adam." He insists that men could not be allowed by the Almighty to live there, since if they did they could not see Christ at His second coming descending through the air. But his most cogent appeal, one which we find echoed from theologian to theologian during a thousand years afterward, is to the nineteenth Psalm, and to its confirmation in the Epistle to the Romans; to the words, "Their line is gone out through all the earth, and their words to the end of the world." He dwells with great force on the fact that St. Paul based one of his most powerful arguments upon this declaration regarding the preachers of the gospel, and that he declared even more explicitly that "Verily, their sound went into all the earth, and their words unto the ends of the world." Thenceforth we find it constantly declared that, as those preachers did not go to the antipodes, no antipodes can exist; and hence that the supporters of this geographical doctrine "give the lie direct to King David and to St. Paul, and therefore to the Holy Ghost." Thus the great Bishop of Hippo taught the whole world for over a thousand years that, as there was no preaching of the gospel on the opposite side of the earth, there could be no human beings there.

The great authority of Augustine, and the cogency of his scriptural argument, held the Church firmly against the doctrine of the antipodes; all schools of interpretation were now agreed -- the followers of the allegorical tendencies of Alexandria, the strictly literal exegetes of Syria, the more eclectic theologians of the West. For over a thousand years it was held in the Church, "always, everywhere, and by all," that there could not be human beings on the opposite sides of the earth, even if the earth had opposite sides; and, when attacked by gainsayers, the great mass of true believers, from the fourth century to the fifteenth, simply used that opiate which had so soothing an effect on John Henry Newman in the nineteenth century -- *securus judicat orbis terrarum*.

Yet gainsayers still appeared. That the doctrine of the antipodes continued to have life, is shown by the fact that in the sixth century Procopius of Gaza attacks it with a tremendous argument. He declares that, if there be men

on the other side of the earth, Christ must have gone there and suffered a second time to save them; and, therefore, that there must have been there, as necessary preliminaries to his coming, a duplicate Eden, Adam, serpent, and deluge.

Cosmas Indicopleustes also attacked the doctrine with special bitterness, citing a passage from St. Luke to prove that antipodes are theologically impossible.

At the end of the sixth century came a man from whom much might be expected -- St. Isidore of Seville. He had pondered over ancient thought in science, and, as we have seen, had dared proclaim his belief in the sphericity of the earth; but with that he stopped. As to the antipodes, the authority of the Psalmist, St. Paul, and St. Augustine silences him; he shuns the whole question as unlawful, subjects reason to faith, and declares that men cannot and ought not to exist on opposite sides of the earth.

Under such pressure this scientific truth seems to have disappeared for nearly two hundred years; but by the eighth century the sphericity of the earth had come to be generally accepted among the leaders of thought, and now the doctrine of the antipodes was again asserted by a bishop, Virgil of Salzburg.

There then stood in Germany, in those first years of the eighth century, one of the greatest and noblest of men -- St. Boniface. His learning was of the best then known. In labors he was a worthy successor of the apostles; his genius for Christian work made him unwillingly primate of Germany; his devotion to duty led him willingly to martyrdom. There sat, too, at that time, on the papal throne a great Christian statesman -- Pope Zachary. Boniface immediately declared against the revival of such a heresy as the doctrine of the antipodes; he stigmatized it as an assertion that there are men beyond the reach of the appointed means of salvation; he attacked Virgil, and called on Pope Zachary for aid.

The Pope, as the infallible teacher of Christendom, made a strong response. He cited passages from the book of Job and the Wisdom of Solomon against the doctrine of the antipodes; he declared it "perverse, iniquitous, and against Virgil's own soul," and indicated a purpose of driving him from his bishopric. Whether this purpose was carried out or not, the

old theological view, by virtue of the Pope's divinely ordered and protected "inerrancy," was re-established, and the doctrine that the earth has inhabitants on but one of its sides became more than ever orthodox, and precious in the mind of the Church.

This decision seems to have been regarded as final, and five centuries later the great encyclopedist of the Middle Ages, Vincent of Beauvais, though he accepts the sphericity of the earth, treats the doctrine of the antipodes as disproved, because contrary to Scripture. Yet the doctrine still lived. Just as it had been previously revived by William of Conches and then laid to rest, so now it is somewhat timidly brought out in the thirteenth century by no less a personage than Albert the Great, the most noted man of science in that time. But his utterances are perhaps purposely obscure. Again it disappears beneath the theological wave, and a hundred years later Nicolas d'Oresme, geographer of the King of France, a light of science, is forced to yield to the clear teaching of the Scripture as cited by St. Augustine.

Nor was this the worst. In Italy, at the beginning of the fourteenth century, the Church thought it necessary to deal with questions of this sort by rack and fagot. In 1316 Peter of Abano, famous as a physician, having promulgated this with other obnoxious doctrines in science, only escaped the Inquisition by death; and in 1327 Cecco d'Ascoli, noted as an astronomer, was for this and other results of thought, which brought him under suspicion of sorcery, driven from his professorship at Bologna and burned alive at Florence. Nor was this all his punishment: Orcagna, whose terrible frescoes still exist on the walls of the Campo Santo at Pisa, immortalized Cecco by representing him in the flames of hell.

Years rolled on, and there came in the fifteenth century one from whom the world had a right to expect much. Pierre d'Ailly, by force of thought and study, had risen to be Provost of the College of St. Die in Lorraine; his ability had made that little village a center of scientific thought for all Europe, and finally made him Archbishop of Cambray and a cardinal. Toward the end of the fifteenth century was printed what Cardinal d'Ailly had written long before as a summing up of his best thought and research -- the collection of essays known as the ***Ymago Mundi***. It gives us one of the most striking examples in history of a great man in theological fetters. As he approaches this question he states it with such clearness that we expect to hear him assert the truth; but there stands the argument of St.

Augustine; there, too, stand the biblical texts on which it is founded -- the text from the Psalms and the explicit declaration of St. Paul to the Romans, "Their sound went into all the earth, and their words unto the ends of the world." D'Ailly attempts to reason, but he is overawed, and gives to the world virtually nothing.

Still, the doctrine of the antipodes lived and moved: so much so that the eminent Spanish theologian Tostatus, even as late as the age of Columbus, felt called upon to protest against it as "unsafe." He had shaped the old missile of St. Augustine into the following syllogism: "The apostles were commanded to go into all the world and to preach the gospel to every creature; they did not go to any such part of the world as the antipodes; they did not preach to any creatures there: *ergo*, no antipodes exist."

The warfare of Columbus the world knows well: how the Bishop of Ceuta worsted him in Portugal; how sundry wise men of Spain confronted him with the usual quotations from the Psalms, from St. Paul, and from St. Augustine; how, even after he was triumphant, and after his voyage had greatly strengthened the theory of the earth's sphericity, with which the theory of the antipodes was so closely connected, the Church by its highest authority solemnly stumbled and persisted in going astray. In 1493 Pope Alexander VI, having been appealed to as an umpire between the claims of Spain and Portugal to the newly discovered parts of the earth, issued a bull laying down upon the earth's surface a line of demarcation between the two powers. This line was drawn from north to south a hundred leagues west of the Azores; and the Pope in the plenitude of his knowledge declared that all lands discovered east of this line should belong to the Portuguese, and all west of it should belong to the Spaniards. This was hailed as an exercise of divinely illuminated power by the Church; but difficulties arose, and in 1506 another attempt was made by Pope Julius II to draw the line three hundred and seventy leagues west of the Cape Verde Islands. This, again, was supposed to bring divine wisdom to settle the question; but, shortly, overwhelming difficulties arose; for the Portuguese claimed Brazil, and, of course, had no difficulty in showing that they could reach it by sailing to the east of the line, provided they sailed long enough. The lines laid down by Popes Alexander and Julius may still be found upon the maps of the period, but their bulls have quietly passed into the catalogue of ludicrous errors.

Yet the theological barriers to this geographical truth yielded but slowly.

Plain as it had become to scholars, they hesitated to declare it to the world at large. Eleven hundred years had passed since St. Augustine had proved its antagonism to Scripture, when Gregory Reysch gave forth his famous encyclopedia, the ***Margarita Philosophica***. Edition after edition was issued, and everywhere appeared in it the orthodox statements; but they were evidently strained to the breaking point; for while, in treating of the antipodes, Reysch refers respectfully to St. Augustine as objecting to the scientific doctrine, he is careful not to cite Scripture against it, and not less careful to suggest geographical reasoning in favor of it.

But in 1519 science gains a crushing victory. Magellan makes his famous voyage. He proves the earth to be round, for his expedition circumnavigates it; he proves the doctrine of the antipodes, for his shipmates see the peoples of the antipodes. Yet even this does not end the war. Many conscientious men oppose the doctrine for two hundred years longer. Then the French astronomers make their measurements of degrees in equatorial and polar regions, and add to their proofs that of the lengthened pendulum. When this was done, when the deductions of science were seen to be established by the simple test of measurement, beautifully and perfectly, and when a long line of trustworthy explorers, including devoted missionaries, had sent home accounts of the antipodes, then, and then only, this war of twelve centuries ended.

Such was the main result of this long war; but there were other results not so fortunate. The efforts of Eusebius, Basil, and Lactantius to deaden scientific thought; the efforts of Augustine to combat it; the efforts of Cosmas to crush it by dogmatism; the efforts of Boniface and Zachary to crush it by force, conscientious as they all were, had resulted simply in impressing upon many leading minds the conviction that science and religion are enemies.

On the other hand, what was gained by the warriors of science for religion? Certainly a far more worthy conception of the world, and a far more ennobling conception of that power which pervades and directs it. Which is more consistent with a great religion, the cosmography of Cosmas or that of Isaac Newton? Which presents a nobler field for religious thought, the diatribes of Lactantius or the calm statements of Humboldt?[footnote]

Continue

The idea of antipodes

Its opposition by the Christian Church -- Gregory Nazianzen, Lactantius, Basil, Ambrose, Augustine, Procopius of Gaza, Cosmas, Isidore

Virgil of Salzburg's assertion of it in the eighth century

Its revival by William of Conches and Albert the Great in the thirteenth

Surrender of it by Nicolas d'Oresme

Fate of Peter of Abano and Cecco d'Ascoli

Timidity of Pierre d'Ailly and Tostatus

Theological hindrance of Columbus

Pope Alexander VI's demarcation line

Cautious conservatism of Gregory Reysch

Magellan and the victory of science

The good missionary says, in Grimston's quaint translation, "Whatsoever Lactantius saieth, wee that live now at Peru, and inhabite that parte of the worlde which is opposite to Asia and their Antipodes, finde not ourselves to bee hanging in the aire, our heades downward and our feete on high."

2.4 The Size of the Earth

[Click Here for Section Outline]

But at an early period another subject in geography had stirred the minds of thinking men -- *the earth's size*. Various ancient investigators had by different methods reached measurements more or less near the truth; these methods were continued into the Middle Ages, supplemented by new thought, and among the more striking results were those obtained by Roger Bacon and Gerbert, afterward Pope Sylvester II. They handed down to after-time the torch of knowledge, but, as their reward among their contemporaries, they fell under the charge of sorcery.

Far more consonant with the theological spirit of the Middle Ages was a solution of the problem from Scripture, and this solution deserves to be given as an example of a very curious theological error, chancing to result in the establishment of a great truth. The second book of Esdras, which among Protestants is placed in the Apocrypha, was held by many of the foremost men of the ancient Church as fully inspired: though Jerome looked with suspicion on this book, it was regarded as prophetic by Clement of Alexandria, Tertullian, and Ambrose, and the Church acquiesced in that view. In the Eastern Church it held an especially high place, and in the Western Church, before the Reformation, was generally considered by the most eminent authorities to be part of the sacred canon. In the sixth chapter of this book there is a summary of the works of creation, and in it occur the following verses:

"Upon the third day thou didst command that the waters should be gathered in the seventh part of the earth; six parts hast thou dried up and kept them to the intent that of these some, being planted of God and tilled, might serve thee."

"Upon the fifth day thou saidst unto the seventh part where the waters were gathered, that it should bring forth living creatures, fowls and fishes, and so it came to pass."

These statements were reiterated in other verses, and were naturally considered as of controlling authority.

Among the scholars who pondered on this as on all things likely to increase knowledge was Cardinal Pierre d'Ailly. As we have seen, this great man, while he denied the existence of the antipodes, as St. Augustine had done, believed firmly in the sphericity of the earth, and, interpreting these statements of the book of Esdras in connection with this belief, he held that, as only one seventh of the earth's surface was covered by water, the ocean between the west coast of Europe and the east coast of Asia could not be very wide. Knowing, as he thought, the extent of the land upon the globe, he felt that in view of this divinely authorized statement the globe must be much smaller, and the land of "Zipango," reached by Marco Polo, on the extreme east coast of Asia, much nearer than had been generally believed.

On this point he laid stress in his great work, the ***Ymago Mundi***, and an edition of it having been published in the days when Columbus was thinking most closely upon the problem of a westward voyage, it naturally exercised much influence upon his reasonings. Among the treasures of the library at Seville, there is nothing more interesting than a copy of this work annotated by Columbus himself: from this very copy it was that Columbus obtained confirmation of his belief that the passage across the ocean to Marco Polo's land of Zipango in Asia was short. But for this error, based upon a text supposed to be inspired, it is unlikely that Columbus could have secured the necessary support for his voyage. It is a curious fact that this single theological error thus promoted a series of voyages which completely destroyed not only this but every other conception of geography based upon the sacred writings.

Continue

Scientific attempts at measuring the earth

The sacred solution of the problem

Fortunate influence of the blunder upon Columbus

2.5 The Character of the Earth's Surface

[Click Here for Section Outline]

It would be hardly just to dismiss the struggle for geographical truth without referring to one passage more in the history of the Protestant Church, for it shows clearly the difficulties in the way of the simplest statement of geographical truth which conflicted with the words of the sacred books.

In the year 1553 Michael Servetus was on trial for his life at Geneva on the charge of Arianism. Servetus had rendered many services to scientific truth, and one of these was an edition of Ptolemy's ***Geography***, in which Judea was spoken of, not as "a land flowing with milk and honey," but, in strict accordance with the truth, as, in the main, meager, barren, and inhospitable. In his trial this simple statement of geographical fact was used against him by his arch-enemy John Calvin with fearful power. In vain did Servetus plead that he had simply drawn the words from a previous edition of Ptolemy; in vain did he declare that this statement was a simple geographical truth of which there were ample proofs: it was answered that such language "necessarily inculpated Moses, and grievously outraged the Holy Ghost."

In summing up the action of the Church upon geography, we must say, then, that the dogmas developed in strict adherence to Scripture and the conceptions held in the Church during many centuries "always, everywhere, and by all," were, on the whole, steadily hostile to truth; but it is only just to make a distinction here between the religious and the theological spirit. To the religious spirit are largely due several of the noblest among the great voyages of discovery. A deep longing to extend the realms of Christianity influenced the minds of Prince John of Portugal, in his great series of efforts along the African coast; of Vasco da Gama, in his circumnavigation of the Cape of Good Hope; of Magellan, in his voyage around the world; and doubtless found a place among the more worldly motives of Columbus.

Thus, in this field, from the supremacy accorded to theology, we find resulting that tendency to dogmatism which has shown itself in all ages the deadly foe not only of scientific inquiry but of the higher religious spirit itself, while from the love of truth for truth's sake, which has been the inspiration

of all fruitful work in science, nothing but advantage has ever resulted to religion.

Continue

Servetus and the charge of denying the fertility of Judea

Contrast between the theological and the religious spirit in their effects on science

CHAPTER 3 ASTRONOMY

Continue

3.1 The Old Sacred Theory of the Universe

[Click Here for Section Outline]

The next great series of battles was fought over the relations of the visible heavens to the earth.

In the early Church, in view of the doctrine so prominent in the New Testament, that the earth was soon to be destroyed, and that there were to be "new heavens and a new earth," astronomy, like other branches of science, was generally looked upon as futile. Why study the old heavens and the old earth, when they were so soon to be replaced with something infinitely better? This feeling appears in St. Augustine's famous utterance, "What concern is it to me whether the heavens as a sphere enclose the earth in the middle of the world or overhang it on either side?"

As to the heavenly bodies, theologians looked on them as at best only objects of pious speculation. Regarding their nature the fathers of the Church were divided. Origen, and others with him, thought them living beings possessed of souls, and this belief was mainly based upon the scriptural vision of the Morning Stars. Singing together, and upon the beautiful appeal to the "stars and light" in the song of the three children -- the ***Benedicite*** -- which the Anglican communion has so wisely retained in its Liturgy.

Other fathers thought the stars abiding-places of the angels, and that stars were moved by angels. The Gnostics thought the stars spiritual beings governed by angels, and appointed not to cause earthly events but to indicate them.

As to the heavens in general, the prevailing view in the Church was based upon the scriptural declarations that a solid vault -- a "firmament" -- was extended above the earth, and that the heavenly bodies were simply lights hung within it. This was for a time held very tenaciously. St. Philastrius, in his famous treatise on heresies, pronounced it a heresy to deny that the stars are brought out by God from his treasure-house and hung in the sky every evening; any other view he declared "false to the Catholic faith." This view also survived in the sacred theory established so firmly by Cosmas in the sixth century. Having established his plan of the universe

upon various texts in the Old and New Testaments, and having made it a vast oblong box, covered by the solid "firmament," he brought in additional texts from Scripture to account for the planetary movements, and developed at length the theory that the sun and planets are moved and the "windows of heaven" opened and shut by angels appointed for that purpose.

How intensely real this way of looking at the universe was, we find in the writings of St. Isidore, the greatest leader of orthodox thought in the seventh century. He affirms that since the fall of man, and on account of it, the sun and moon shine with a feebler light; but he proves from a text in Isaiah that when the world shall be fully redeemed these "great lights" will shine again in all their early splendor. But, despite these authorities and their theological finalities, the evolution of scientific thought continued, its main germ being the geocentric doctrine -- the doctrine that the earth is the center, and that the sun and planets revolve about it.

This doctrine was of the highest respectability: it had been developed at a very early period, and had been elaborated until it accounted well for the apparent movements of the heavenly bodies; its final name, "Ptolemaic theory," carried weight; and, having thus come from antiquity into the Christian world, St. Clement of Alexandria demonstrated that the altar in the Jewish tabernacle was "a symbol of the earth placed in the middle of the universe": nothing more was needed; the geocentric theory was fully adopted by the Church and universally held to agree with the letter and spirit of Scripture.

Wrought into this foundation, and based upon it, there was developed in the Middle Ages, mainly out of fragments of Chaldean and other early theories preserved in the Hebrew Scriptures, a new sacred system of astronomy, which became one of the great treasures of the universal Church -- the last word of revelation.

Three great men mainly reared this structure. First was the unknown who gave to the world the treatises ascribed to Dionysius the Areopagite. It was unhesitatingly believed that these were the work of St. Paul's Athenian convert, and therefore virtually of St. Paul himself. Though now known to be spurious, they were then considered a treasure of inspiration, and an emperor of the East sent them to an emperor of the West as the most worthy of gifts. In the ninth century they were widely circulated in western

Europe, and became a fruitful source of thought, especially on the whole celestial hierarchy. Thus the old ideas of astronomy were vastly developed, and the heavenly hosts were classed and named in accordance with indications scattered through the sacred Scriptures.

The next of these three great theologians was Peter Lombard, professor at the University of Paris. About the middle of the twelfth century he gave forth his collection of ***Sentences***, or ***Statements by the Fathers***, and this remained until the end of the Middle Ages the universal manual of theology. In it was especially developed the theological view of man's relation to the universe. The author tells the world: "Just as man is made for the sake of God -- that is, that he may serve Him, -- so the universe is made for the sake of man -- that is, that it may serve *him*; therefore is man placed at the middle point of the universe, that he may both serve and be served."

The vast significance of this view, and its power in resisting any real astronomical science, we shall see, especially in the time of Galileo.

The great triad of thinkers culminated in St. Thomas Aquinas -- the sainted theologian, the glory of the medieval Church, the "Angelic Doctor," the most marvelous intellect between Aristotle and Newton; he to whom it was believed that an image of the Crucified had spoken words praising his writings. Large of mind, strong, acute, yet just -- even more than just -- to his opponents, he gave forth, in the latter half of the thirteenth century, his encyclopedia of theology, the ***Summa Theologica***. In this he carried the sacred theory of the universe to its full development. With great power and clearness he brought the whole vast system, material and spiritual, into its relations to God and man.

Thus was the vast system developed by these three leaders of medieval thought; and now came the man who wrought it yet more deeply into European belief, the poet divinely inspired who made the system part of the world's *life*. Pictured by Dante, the empyrean and the concentric heavens, paradise, purgatory, and hell, were seen of all men; the God Triune, seated on his throne upon the circle of the heavens, as real as the Pope seated in the chair of St. Peter; the seraphim, cherubim, and thrones, surrounding the Almighty, as real as the cardinals surrounding the Pope; the three great orders of angels in heaven, as real as the three great orders, bishops, priests, and deacons, on earth; and the whole system of spheres, each revolving within the one above it, and all moving about the

earth, subject to the *primum mobile*, as real as the feudal system of western Europe, subject to the Emperor.

Let us look into this vast creation -- the highest achievement of theology -- somewhat more closely.

Its first feature shows a development out of earlier theological ideas. The earth is no longer a flat plain enclosed by four walls and solidly vaulted above, as theologians of previous centuries had believed it, under the inspiration of Cosmas; it is no longer a mere flat disk, with sun, moon, and stars hung up to give it light, as the earlier cathedral sculptors had figured it; it has become a globe at the center of the universe. Encompassing it are successive transparent spheres, rotated by angels about the earth, and each carrying one or more of the heavenly bodies with it: that nearest the earth carrying the moon; the next, Mercury; the next, Venus; the next, the Sun; the next three, Mars, Jupiter, and Saturn; the eighth carrying the fixed stars. The ninth was the *primum mobile*, and enclosing all was the tenth heaven -- the Empyrean. This was immovable -- the boundary between creation and the great outer void; and here, in a light which no one can enter, the Triune God sat enthroned, the "music of the spheres" rising to Him as they moved. Thus was the old heathen doctrine of the spheres made Christian.

In attendance upon the Divine Majesty, thus enthroned, are vast hosts of angels, who are divided into three hierarchies, one serving in the empyrean, one in the heavens, between the empyrean and the earth, and one on the earth.

Each of these hierarchies is divided into three choirs, or orders; the first, into the orders of Seraphim, Cherubim, and Thrones; and the main occupation of these is to chant incessantly -- to "continually cry" the divine praises.

The order of Thrones conveys God's will to the second hierarchy, which serves in the movable heavens. This second hierarchy is also made up of three orders. The first of these, the order of Dominions, receives the divine commands; the second, the order of Powers, moves the heavens, sun, moon, planets, and stars, opens and shuts the "windows of heaven," and brings to pass all other celestial phenomena; the third, the order of Empire, guards the others.

The third and lowest hierarchy is also made up of three orders. First of these are the Principalities, the guardian spirits of nations and kingdoms. Next come Archangels; these protect religion, and bear the prayers of the saints to the foot of God's throne. Finally come Angels; these care for earthly affairs in general, one being appointed to each mortal, and others taking charge of the qualities of plants, metals, stones, and the like. Throughout the whole system, from the great Triune God to the lowest group of angels, we see at work the mystic power attached to the triangle and sacred number three -- the same which gave the triune idea to ancient Hindu theology, which developed the triune deities in Egypt, and which transmitted this theological gift to the Christian world, especially through the Egyptian Athanasius.

Below the earth is hell. This is tenanted by the angels who rebelled under the lead of Lucifer, prince of the seraphim -- the former favorite of the Trinity; but, of these rebellious angels, some still rove among the planetary spheres, and give trouble to the good angels; others pervade the atmosphere about the earth, carrying lightning, storm, drought, and hail; others infest earthly society, tempting men to sin; but Peter Lombard and St. Thomas Aquinas take pains to show that the work of these devils is, after all, but to discipline man or to mete out deserved punishment.

All this vast scheme had been so riveted into the Ptolemaic view by the use of biblical texts and theological reasonings that the resultant system of the universe was considered impregnable and final. To attack it was blasphemy.

It stood for centuries. Great theological men of science, like Vincent of Beauvais and Cardinal d'Ailly, devoted themselves to showing not only that it was supported by Scripture, but that it supported Scripture. Thus was the geocentric theory embedded in the beliefs and aspirations, in the hopes and fears, of Christendom down to the middle of the sixteenth century. **[footnote]**

Continue

The early Church's conviction of the uselessness of astronomy

The growth of a sacred theory -- Origen, the Gnostics, Philastrius, Cosmas, Isidore

The geocentric, or Ptolemaic, theory -- its origin, and its acceptance by the Christian world

Development of the new sacred system of astronomy:

- **The pseudo-Dionysius, Peter Lombard, Thomas Aquinas**
- **Its popularization by Dante**
- **Its details**
- **Its persistence to modern times**

The present writer once heard a lecture in Cairo, from an eminent Scotch Doctor of Medicine, to account for the ancient Hindu and Egyptian sacred threes and trinities. The lecturer's theory was that, when Jehovah came down into the Garden of Eden and walked with Adam in "the cool of the day," he explained his triune character to Adam, and that from Adam it was spread abroad to the various ancient nations.

3.2 The Heliocentric Theory

[Click Here for Section Outline]

But, on the other hand, there had been planted, long before, the germs of a heliocentric theory. In the sixth century before our era, Pythagoras, and after him Philolaus, had suggested the movement of the earth and planets about a central fire; and, three centuries later, Aristarchus had restated the main truth with striking precision. Here comes in a proof that the antagonism between theological and scientific methods is not confined to Christianity; for this statement brought upon Aristarchus the charge of blasphemy, and drew after it a cloud of prejudice which hid the truth for six hundred years. Not until the fifth century of our era did it timidly appear in the thoughts of Martianus Capella: then it was again lost to sight for a thousand years, until in the fifteenth century, distorted and imperfect, it appeared in the writings of Cardinal Nicholas de Cusa.

But in the shade cast by the vast system which had grown from the minds of the great theologians and from the heart of the great poet there had come to this truth neither bloom nor fruitage.

Quietly, however, the soil was receiving enrichment and the air warmth. The processes of mathematics were constantly improved, the heavenly bodies were steadily observed, and at length appeared, far from the centers of thought, on the borders of Poland, a plain, simple-minded scholar, who first fairly uttered to the modern world the truth -- now so commonplace, then so astounding -- that the sun and planets do not revolve about the earth, but that the earth and planets revolve about the sun: this man was Nicholas Copernicus.

Copernicus had been a professor at Rome, and even as early as 1500 had announced his doctrine there, but more in the way of a scientific curiosity or paradox, as it had been previously held by Cardinal de Cusa, than as the statement of a system representing a great fact in Nature. About thirty years later one of his disciples, Widmanstadt, had explained it to Clement VII; but it still remained a mere hypothesis, and soon, like so many others, disappeared from the public view. But to Copernicus, steadily studying the subject, it became more and more a reality, and as this truth grew within him he seemed to feel that at Rome he was no longer safe. To announce

his discovery there as a theory or a paradox might amuse the papal court, but to announce it as a truth -- as *the* truth -- was a far different matter. He therefore returned to his little town in Poland.

To publish his thought as it had now developed was evidently dangerous even there, and for more than thirty years it lay slumbering in the mind of Copernicus and of the friends to whom he had privately entrusted it.

At last he prepared his great work on the ***Revolutions of the Heavenly Bodies***, and dedicated it to the Pope himself. He next sought a place of publication. He dared not send it to Rome, for there were the rulers of the older Church ready to seize it; he dared not send it to Wittenberg, for there were the leaders of Protestantism no less hostile; he therefore entrusted it to Osiander, at Nuremberg.[footnote]

But Osiander's courage failed him: he dared not launch the new thought boldly. He wrote a groveling preface, endeavoring to excuse Copernicus for his novel idea, and in this he inserted the apologetic lie that Copernicus had propounded the doctrine of the earth's movement not as a fact, but as a hypothesis. He declared that it was lawful for an astronomer to indulge his imagination, and that this was what Copernicus had done.

Thus was the greatest and most ennobling, perhaps, of scientific truths -- a truth not less ennobling to religion than to science -- forced, in coming before the world, to sneak and crawl.[footnote]

On the 24th of May, 1543, the newly printed book arrived at the house of Copernicus. It was put into his hands; but he was on his deathbed. A few hours later he was beyond the reach of the conscientious men who would have blotted his reputation and perhaps have destroyed his life.

Yet not wholly beyond their reach. Even death could not be trusted to shield him. There seems to have been fear of vengeance upon his corpse, for on his tombstone was placed no record of his lifelong labors, no mention of his great discovery; but there was graven upon it simply a prayer: "I ask not the grace accorded to Paul; not that given to Peter; give me only the favor which Thou didst show to the thief on the cross." Not till thirty years after did a friend dare write on his tombstone a memorial of his discovery.

The preface of Osiander, pretending that the book of Copernicus suggested a hypothesis instead of announcing a truth, served its purpose well. During nearly seventy years the Church authorities evidently thought it best not to stir the matter, and in some cases professors like Calganini were allowed to present the new view purely as a hypothesis. There were, indeed, mutterings from time to time on the theological side, but there was no great demonstration against the system until 1616. Then, when the Copernican doctrine was upheld by Galileo as a *truth*, and proved to be a truth by his telescope, the book was taken in hand by the Roman curia. The statements of Copernicus were condemned, "until they should be corrected"; and the corrections required were simply such as would substitute for his conclusions the old Ptolemaic theory.

That this was their purpose was seen in that year when Galileo was forbidden to teach or discuss the Copernican theory, and when were forbidden "all books which affirm the motion of the earth." Henceforth to read the work of Copernicus was to risk damnation, and the world accepted the decree.[footnote] The strongest minds were thus held fast. If they could not believe the old system, they must *pretend* that they believed it; -- and this, even after the great circumnavigation of the globe had done so much to open the eyes of the world! Very striking is the case of the eminent Jesuit missionary Joseph Acosta, whose great work on the ***Natural and Moral History of the Indies***, published in the last quarter of the sixteenth century, exploded so many astronomical and geographical errors. Though at times curiously credulous, he told the truth as far as he dared; but as to the movement of the heavenly bodies he remained orthodox -- declaring, "I have seen the two poles, whereon the heavens turn as upon their axletrees."

There was, indeed, in Europe one man who might have done much to check this current of unreason which was to sweep away so many thoughtful men on the one hand from scientific knowledge, and so many on the other from Christianity. This was Peter Apian. He was one of the great mathematical and astronomical scholars of the time. His brilliant abilities had made him the astronomical teacher of the Emperor Charles V. His work on geography had brought him a world-wide reputation; his work on astronomy brought him a patent of nobility; his improvements in mathematical processes and astronomical instruments brought him the praise of Kepler and a place in the history of science: never had a true man better opportunity to do a great deed. When Copernicus' work

appeared, Apian was at the height of his reputation and power: a quiet, earnest plea from him, even if it had been only for ordinary fairness and a suspension of judgment, must have carried much weight. His devoted pupil, Charles V, who sat on the thrones of Germany and Spain, must at least have given a hearing to such a plea. But, unfortunately, Apian was a professor in an institution of learning under the strictest Church control -- the University of Ingolstadt. His foremost duty was to teach *safe* science -- to keep science within the line of scriptural truth as interpreted by theological professors. His great opportunity was lost. Apian continued to maunder over the Ptolemaic theory and astrology in his lecture-room. The attack on the Copernican theory he neither supported nor opposed; he was silent; and the cause of his silence should never be forgotten so long as any Church asserts its title to control university instruction.

Doubtless many will exclaim against the Roman Catholic Church for this; but the simple truth is that Protestantism was no less zealous against the new scientific doctrine. All branches of the Protestant Church -- Lutheran, Calvinist, Anglican -- vied with each other in denouncing the Copernican doctrine as contrary to Scripture; and, at a later period, the Puritans showed the same tendency.

Said Martin Luther: "People gave ear to an upstart astrologer who strove to show that the earth revolves, not the heavens or the firmament, the sun and the moon. Whoever wishes to appear clever must devise some new system, which of all systems is of course the very best. This fool wishes to reverse the entire science of astronomy; but sacred Scripture tells us that Joshua commanded the sun to stand still, and not the earth." Melanchthon, mild as he was, was not behind Luther in condemning Copernicus. In his treatise on the ***Elements of Physics***, published six years after Copernicus' death, he says: "The eyes are witnesses that the heavens revolve in the space of twenty-four hours. But certain men, either from the love of novelty, or to make a display of ingenuity, have concluded that the earth moves; and they maintain that neither the eighth sphere nor the sun revolves.... Now, it is a want of honesty and decency to assert such notions publicly, and the example is pernicious. It is the part of a good mind to accept the truth as revealed by God and to acquiesce in it." Melanchthon then cites the passages in the Psalms and Ecclesiastes, which he declares assert positively and clearly that the earth stands fast and that the sun moves around it, and adds eight other proofs of his proposition that "the earth can be nowhere if not in the center of the

universe." So earnest does this mildest of the Reformers become, that he suggests severe measures to restrain such impious teachings as those of Copernicus.

While Lutheranism was thus condemning the theory of the earth's movement, other branches of the Protestant Church did not remain behind. Calvin took the lead, in his ***Commentary on Genesis***, by condemning all who asserted that the earth is not at the center of the universe. He clinched the matter by the usual reference to the first verse of the ninety-third Psalm, and asked, "Who will venture to place the authority of Copernicus above that of the Holy Spirit?" Turretin, Calvin's famous successor, even after Kepler and Newton had virtually completed the theory of Copernicus and Galileo, put forth his compendium of theology, in which he proved, from a multitude of scriptural texts, that the heavens, sun, and moon move about the earth, which stands still in the center. In England we see similar theological efforts, even after they had become evidently futile. Hutchinson's ***Moses' Principia***, Dr. Samuel Pike's ***Sacred Philosophy***, the writings of Horne, Bishop Horsley, and President Forbes contain most earnest attacks upon the ideas of Newton, such attacks being based upon Scripture. Dr. John Owen, so famous in the annals of Puritanism, declared the Copernican system a "delusive and arbitrary hypothesis, contrary to Scripture"; and even John Wesley declared the new ideas to "tend toward infidelity."

And Protestant peoples were not a whit behind Catholic in following out such teachings. The people of Elbing made themselves merry over a farce in which Copernicus was the main object of ridicule. The people of Nuremberg, a Protestant stronghold, caused a medal to be struck with inscriptions ridiculing the philosopher and his theory.

Why the people at large took this view is easily understood when we note the attitude of the guardians of learning, both Catholic and Protestant, in that age. It throws great light upon sundry claims by modern theologians to take charge of public instruction and of the evolution of science. So important was it thought to have "sound learning" guarded and "safe science" taught, that in many of the universities, as late as the end of the seventeenth century, professors were forced to take an oath not to hold the "Pythagorean" -- that is, the Copernican -- idea as to the movement of the heavenly bodies. As the contest went on, professors were forbidden to make known to students the facts revealed by the telescope. Special

orders to this effect were issued by the ecclesiastical authorities to the universities and colleges of Pisa, Innsbruck, Louvain, Douay, Salamanca, and others. During generations we find the authorities of these Universities boasting that these godless doctrines were kept away from their students. It is touching to hear such boasts made then, just as it is touching now to hear sundry excellent university authorities boast that they discourage the reading of Mill, Spencer, and Darwin. Nor were such attempts to keep the truth from students confined to the Roman Catholic institutions of learning. Strange as it may seem, nowhere were the facts confirming the Copernican theory more carefully kept out of sight than at Wittenberg -- the university of Luther and Melanchthon. About the middle of the sixteenth century there were at that center of Protestant instruction two astronomers of a very high order, Rheticus and Reinhold; both of these, after thorough study, had convinced themselves that the Copernican system was true, but neither of them was allowed to tell this truth to his students. Neither in his lecture announcements nor in his published works did Rheticus venture to make the new system known, and he at last gave up his professorship and left Wittenberg, that he might have freedom to seek and tell the truth. Reinhold was even more wretchedly humiliated. Convinced of the truth of the new theory, he was obliged to advocate the old; if he mentioned the Copernican ideas, he was compelled to overlay them with the Ptolemaic. Even this was not thought safe enough, and in 1571 the subject was entrusted to Peucer. He was eminently "sound," and denounced the Copernican theory in his lectures as "absurd, and unfit to be introduced into the schools."

To clinch anti-scientific ideas more firmly into German Protestant teaching, Rector Hensel wrote a textbook for schools entitled ***The Restored Mosaic System of the World***, which showed the Copernican astronomy to be unscriptural.

Doubtless this has a far-off sound; yet its echo comes very near modern Protestantism in the expulsion of Dr. Woodrow by the Presbyterian authorities in South Carolina; the expulsion of Prof. Winchell by the Methodist Episcopal authorities in Tennessee; the expulsion of Prof. Toy by Baptist authorities in Kentucky; the expulsion of the professors at Beirut under authority of American Protestant divines -- all for holding the doctrines of modern science, and in the last years of the nineteenth century.

But the new truth could not be concealed; it could neither be laughed down nor frowned down. Many minds had received it, but within the hearing of the papacy only one tongue appears to have dared to utter it clearly. This new warrior was that strange mortal, Giordano Bruno. He was hunted from land to land, until at last he turned on his pursuers with fearful invectives. For this he was entrapped at Venice, imprisoned during six years in the dungeons of the Inquisition at Rome, then burned alive, and his ashes scattered to the winds. Still, the new truth lived on. Ten years after the martyrdom of Bruno the truth of Copernicus' doctrine was established by the telescope of Galileo.

Herein was fulfilled one of the most touching of prophecies. Years before, the opponents of Copernicus had said to him, "If your doctrines were true, Venus would show phases like the moon." Copernicus answered: "You are right; I know not what to say; but God is good, and will in time find an answer to this objection." The God-given answer came when, in 1611, the crude telescope of Galileo showed the phases of Venus.

Continue

Its rise among the Greeks -- Pythagoras, Philolaus, Aristarchus

Its suppression by the charge of blasphemy

Its loss from sight for six hundred years, then for a thousand

Its revival by Nicholas de Cusa and Nicholas Copernicus

Its toleration as a hypothesis

Its prohibition as soon as Galileo teaches it as a truth

Consequent timidity of scholars -- Acosta, Apian

Protestantism not less zealous in opposition than Catholicism -- Luther, Melanchthon, Calvin, Turretin

This opposition especially persistent in England -- Hutchinson, Pike, Horne, Horsley, Forbes, Owen, Wesley

Resulting interferences with freedom of teaching

Giordano Bruno's boldness and his fate

The truth demonstrated by the telescope of Galileo

As to Copernicus' danger at Rome, the *Catholic World* for January, 1869, cites a speech of the Archbishop of Mechlin before the University of Louvain, to the effect that Copernicus defended his theory at Rome, in 1500, before two thousand scholars; also, that another professor taught the system in 1528, and was made apostolic notary by Clement VIII. All this, even if the doctrines taught were identical with those of Copernicus as finally developed -- which is simply not the case -- avails nothing against the overwhelming testimony that Copernicus felt himself in danger -- testimony which the after-history of the Copernican theory renders invincible. That Copernicus felt the danger, is evident, among other things, by the expression in the preface; "Statim me explodendum cum tali opinione clamitant."

Osiander, in a letter to Copernicus, dated April 20, 1541, had endeavored to reconcile him to such a procedure, and ends by saying, "Sic enim placidiores reddideris peripatheticos et theologos quos contradicturos metuis."

The authorities deciding this matter in accordance with the wishes of Pope Paul V and Cardinal Bellarmine were the Congregation of the Index, or cardinals having charge of the *Index Librorum Prohibitorum*. Recent desperate attempts to fasten the responsibility on them as individuals seem ridiculous in view of the simple fact that their work was sanctioned by the highest Church authority, and required to be universally accepted by the Church. Eleven different editions of the *Index* in my own possession prove this. Nearly all of these declare on their title-pages that they are issued by order of the pontiff of the period, and each is prefaced by a special papal bull or letter.

3.3 The War Upon Galileo

[Click Here for Section Outline]

On this new champion, Galileo, the whole war was at last concentrated. His discoveries had clearly taken the Copernican theory out of the list of hypotheses, and had placed it before the world as a truth. Against him, then, the war was long and bitter. The supporters of what was called "sound learning" declared his discoveries deceptions and his announcements blasphemy. Semi-scientific professors, endeavoring to curry favor with the Church, attacked him with sham science; earnest preachers attacked him with perverted Scripture; theologians, inquisitors, congregations of cardinals, and at last two popes dealt with him, and, as was supposed, silenced his impious doctrine forever.[footnote]

I shall present this warfare at some length because, so far as I can find, no careful summary of it has been given in our language, since the whole history was placed in a new light by the revelations of the trial documents in the Vatican Library, honestly published for the first time by L'Épinois in 1867, and since that by Gebler, Berti, Favaro, and others.

The first important attack on Galileo began in 1610, when he announced that his telescope had revealed the moons of the planet Jupiter. The enemy saw that this took the Copernican theory out of the realm of hypothesis, and they gave battle immediately. They denounced both his method and its results as absurd and impious. As to his method, professors bred in the "safe science" favored by the Church argued that the divinely appointed way of arriving at the truth in astronomy was by theological reasoning on texts of Scripture; and, as to his results, they insisted, first, that Aristotle knew nothing of these new revelations; and, next, that the Bible showed by all applicable types that there could be only seven planets; that this was proved by the seven golden candlesticks of the Apocalypse, by the seven-branched candlestick of the tabernacle, and by the seven churches of Asia; that from Galileo's doctrine consequences must logically result destructive to Christian truth. Bishops and priests therefore warned their flocks, and multitudes of the faithful besought the Inquisition to deal speedily and sharply with the heretic.

In vain did Galileo try to prove the existence of satellites by showing them

to the doubters through his telescope: they either declared it impious to look, or, if they did look, denounced the satellites as illusions from the Devil. Good Father Clavius declared that "to see satellites of Jupiter, men had to make an instrument which would create them." In vain did Galileo try to save the great truths he had discovered by his letters to the Benedictine Castelli and the Grand-Duchess Christine, in which he argued that literal biblical interpretation should not be applied to science; it was answered that such an argument only made his heresy more detestable; that he was "worse than Luther or Calvin."

The war on the Copernican theory, which up to that time had been carried on quietly, now flamed forth. It was declared that the doctrine was proved false by the standing still of the sun for Joshua, by the declarations that "the foundations of the earth are fixed so firm that they cannot be moved," and that the sun "runneth about from one end of the heavens to the other."

But the little telescope of Galileo still swept the heavens, and another revelation was announced -- the mountains and valleys in the moon. This brought on another attack. It was declared that this, and the statement that the moon shines by light reflected from the sun, directly contradict the statement in Genesis that the moon is "a great light." To make the matter worse, a painter, placing the moon in a religious picture in its usual position beneath the feet of the Blessed Virgin, outlined on its surface mountains and valleys; this was denounced as a sacrilege logically resulting from the astronomer's heresy.

Still another struggle was aroused when the hated telescope revealed spots upon the sun, and their motion indicating the sun's rotation. Monsignor Elci, head of the University of Pisa, forbade the astronomer Castelli to mention these spots to his students. Father Busaeus, at the University of Innsbruck, forbade the astronomer Scheiner, who had also discovered the spots and proposed a *safe* explanation of them, to allow the new discovery to be known there. At the College of Douay and the University of Louvain this discovery was expressly placed under the ban, and this became the general rule among the Catholic universities and colleges of Europe. The Spanish universities were especially intolerant of this and similar ideas, and up to a recent period their presentation was strictly forbidden in the most important university of all -- that of Salamanca.

Such are the consequences of placing the instruction of men's minds in the

hands of those mainly absorbed in saving men's souls. Nothing could be more in accordance with the idea recently put forth by sundry ecclesiastics, Catholic and Protestant, that the Church alone is empowered to promulgate scientific truth or direct university instruction. But science gained a victory here also. Observations of the solar spots were reported not only from Galileo in Italy, but from Fabricius in Holland. Father Scheiner then endeavored to make the usual compromise between theology and science. He promulgated a pseudo-scientific theory, which only provoked derision.

The war became more and more bitter. The Dominican Father Caccini preached a sermon from the text, "Ye men of Galilee, why stand ye gazing up into heaven?" and this wretched pun upon the great astronomer's name ushered in sharper weapons; for, before Caccini ended, he insisted that "geometry is of the Devil," and that "mathematicians should be banished as the authors of all heresies." The Church authorities gave Caccini promotion.

Father Lorini proved that Galileo's doctrine was not only heretical but "atheistic," and besought the Inquisition to intervene. The Bishop of Fiesole screamed in rage against the Copernican system, publicly insulted Galileo, and denounced him to the Grand-Duke. The Archbishop of Pisa secretly sought to entrap Galileo and deliver him to the Inquisition at Rome. The Archbishop of Florence solemnly condemned the new doctrines as unscriptural; and Paul V, while petting Galileo, and inviting him as the greatest astronomer of the world to visit Rome, was secretly moving the Archbishop of Pisa to pick up evidence against the astronomer.

But by far the most terrible champion who now appeared was Cardinal Bellarmin, one of the greatest theologians the world has known. He was earnest, sincere, and learned, but insisted on making science conform to Scripture. The weapons which men of Bellarmin's stamp used were purely theological. They held up before the world the dreadful consequences which must result to Christian theology were the heavenly bodies proved to revolve about the sun and not about the earth. Their most tremendous dogmatic engine was the statement that "his pretended discovery vitiates the whole Christian plan of salvation." Father Lecazre declared "it casts suspicion on the doctrine of the incarnation." Others declared, "It upsets the whole basis of theology. If the earth is a planet, and only one among several planets, it cannot be that any such great things have been done specially for it as the Christian doctrine teaches. If there are other planets,

since God makes nothing in vain, they must be inhabited; but how can their inhabitants be descended from Adam? How can they trace back their origin to Noah's Ark? How can they have been redeemed by the Savior?" Nor was this argument confined to the theologians of the Roman Church; Melanchthon, Protestant as he was, had already used it in his attacks on Copernicus and his school.

In addition to this prodigious theological engine of war there was kept up a fire of smaller artillery in the shape of texts and scriptural extracts.

But the war grew still more bitter, and some weapons used in it are worth examining. They are very easily examined, for they are to be found on all the battlefields of science; but on that field they were used with more effect than on almost any other. These weapons are the epithets "infidel" and "atheist." They have been used against almost every man who has ever done anything new for his fellow-men. The list of those who have been denounced as "infidel" and "atheist" includes almost all great men of science, general scholars, inventors, and philanthropists. The purest Christian life, the noblest Christian character, have not availed to shield combatants. Christians like Isaac Newton, Pascal, Locke, Milton, and even Fenelon and Howard, have had this weapon hurled against them. Of all proofs of the existence of a God, those of Descartes have been wrought most thoroughly into the minds of modern men; yet the Protestant theologians of Holland sought to bring him to torture and to death by the charge of atheism, and the Roman Catholic theologians of France thwarted him during his life and prevented any due honors to him after his death.

These epithets can hardly be classed with civilized weapons. They are burning arrows; they set fire to masses of popular prejudice, always obscuring the real question, sometimes destroying the attacking party. They are poisoned weapons. They pierce the hearts of loving women; they alienate dear children; they injure a man after life is ended, for they leave poisoned wounds in the hearts of those who loved him best -- fears for his eternal salvation, dread of the Divine wrath upon him. Of course, in these days these weapons, though often effective in vexing good men and in scaring good women, are somewhat blunted; indeed, they not infrequently injure the assailants more than the assailed. So it was not in the days of Galileo; they were then in all their sharpness and venom.

Yet a baser warfare was waged by the Archbishop of Pisa. This man,

whose cathedral derives its most enduring fame from Galileo's deduction of a great natural law from the swinging lamp before its altar, was not an archbishop after the noble mold of Borromeo and Fenelon and Cheverus. Sadly enough for the Church and humanity, he was simply a zealot and intriguer: he perfected the plan for entrapping the great astronomer.

Galileo, after his discoveries had been denounced, had written to his friend Castelli and to the Grand-Duchess Christine two letters to show that his discoveries might be reconciled with Scripture. On a hint from the Inquisition at Rome, the archbishop sought to get hold of these letters and exhibit them as proofs that Galileo had uttered heretical views of theology and of Scripture, and thus to bring him into the clutch of the Inquisition. The archbishop begs Castelli, therefore, to let him see the original letter in the handwriting of Galileo. Castelli declines. The archbishop then, while, as is now revealed, writing constantly and bitterly to the Inquisition against Galileo, professes to Castelli the greatest admiration of Galileo's genius and a sincere desire to know more of his discoveries. This not succeeding, the archbishop at last throws off the mask and resorts to open attack.

The whole struggle to crush Galileo and to save him would be amusing were it not so fraught with evil. There were intrigues and counter-intrigues, plots and counter-plots, lying and spying; and in the thickest of this seething, squabbling, screaming mass of priests, bishops, archbishops, and cardinals, appear two popes, Paul V and Urban VIII. It is most suggestive to see in this crisis of the Church, at the tomb of the prince of the apostles, on the eve of the greatest errors in Church policy the world has known, in all the intrigues and deliberations of these consecrated leaders of the Church, no more evidence of the guidance or presence of the Holy Spirit than in a caucus of New York politicians at Tammany Hall.

But the opposing powers were too strong. In 1615 Galileo was summoned before the Inquisition at Rome, and the mine which had been so long preparing was sprung. Sundry theologians of the Inquisition having been ordered to examine two propositions which had been extracted from Galileo's letters on the solar spots, solemnly considered these points during about a month and rendered their unanimous decision as follows: "The first proposition, that the sun is the center and does not revolve about the earth, is foolish, absurd, false in theology, and heretical, because expressly contrary to Holy Scripture"; and "the second proposition, that the earth is

not the center but revolves about the sun, is absurd, false in philosophy, and, from a theological point of view at least, opposed to the true faith."

The Pope himself, Paul V, now intervened again: he ordered that Galileo be brought before the Inquisition. Then the greatest man of science in that age was brought face to face with the greatest theologian -- Galileo was confronted by Bellarmin. Bellarmin shows Galileo the error of his opinion and orders him to renounce it. De Lauda, fortified by a letter from the Pope, gives orders that the astronomer be placed in the dungeons of the Inquisition should he refuse to yield. Bellarmin now commands Galileo, "in the name of His Holiness the Pope and the whole Congregation of the Holy Office, to relinquish altogether the opinion that the sun is the center of the world and immovable, and that the earth moves, nor henceforth to hold, teach, or defend it in any way whatsoever, verbally or in writing." This injunction Galileo acquiesces in and promises to obey.[footnote]

This was on the 26th of February, 1616. About a fortnight later the Congregation of the Index, moved thereto, as the letters and documents now brought to light show, by Pope Paul, V solemnly rendered a decree that "the doctrine of the double motion of the earth about its axis and about the sun is false, and entirely contrary to Holy Scripture"; and that this opinion must neither be taught nor advocated. The same decree condemned all writings of Copernicus and "all writings which affirm the motion of the earth." The great work of Copernicus was interdicted until corrected in accordance with the views of the Inquisition; and the works of Galileo and Kepler, though not mentioned by name at that time, were included among those implicitly condemned as "affirming the motion of the earth."

The condemnations were inscribed upon the ***Index***; and, finally, the papacy committed itself as an infallible judge and teacher to the world by prefixing to the ***Index*** the usual papal bull giving its monitions the most solemn papal sanction. To teach or even read the works denounced or passages condemned was to risk persecution in this world and damnation in the next. Science had apparently lost the decisive battle.

For a time after this judgment Galileo remained in Rome, apparently hoping to find some way out of this difficulty; but he soon discovered the hollowness of the protestations made to him by ecclesiastics, and, being recalled to Florence, remained in his hermitage near the city in silence,

working steadily, indeed, but not publishing anything save by private letters to friends in various parts of Europe.

But at last a better vista seemed to open for him. Cardinal Barberini, who had seemed liberal and friendly, became pope under the name of Urban VIII. Galileo at this conceived new hopes, and allowed his continued allegiance to the Copernican system to be known. New troubles ensued. Galileo was induced to visit Rome again, and Pope Urban tried to cajole him into silence, personally taking the trouble to show him his errors by argument. Other opponents were less considerate, for works appeared attacking his ideas -- works all the more unmanly, since their authors knew that Galileo was restrained by force from defending himself. Then, too, as if to accumulate proofs of the unfitness of the Church to take charge of advanced instruction, his salary as a professor at the University of Pisa was taken from him, and sapping and mining began. Just as the Archbishop of Pisa some years before had tried to betray him with honeyed words to the Inquisition, so now Father Grassi tried it, and, after various attempts to draw him out by flattery, suddenly denounced his scientific ideas as "leading to a denial of the Real Presence in the Eucharist."

For the final assault upon him a park of heavy artillery was at last wheeled into place. It may be seen on all the scientific battlefields. It consists of general denunciation; and in 1631 Father Melchior Inchofer, of the Jesuits, brought his artillery to bear upon Galileo with this declaration: "The opinion of the earth's motion is of all heresies the most abominable, the most pernicious, the most scandalous; the immovability of the earth is thrice sacred; argument against the immortality of the soul, the existence of God, and the incarnation, should be tolerated sooner than an argument to prove that the earth moves." From the other end of Europe came a powerful echo.

From the shadow of the Cathedral of Antwerp, the noted theologian Fromundus gave forth his famous treatise, the ***Ant-Aristarclius***. Its very title-page was a contemptuous insult to the memory of Copernicus, since it paraded the assumption that the new truth was only an exploded theory of a pagan astronomer. Fromundus declares that "sacred Scripture fights against the Copernicans." To prove that the sun revolves about the earth, he cites the passage in the Psalms which speaks of the sun "which cometh forth as a bridegroom out of his chamber." To prove that the earth stands still, he quotes a passage from Ecclesiastes, "The earth standeth fast

forever." To show the utter futility of the Copernican theory, he declares that, if it were true, "the wind would constantly blow from the east"; and that "buildings and the earth itself would fly off with such a rapid motion that men would have to be provided with claws like cats to enable them to hold fast to the earth's surface." Greatest weapon of all, he works up, by the use of Aristotle and St. Thomas Aquinas, a demonstration from theology and science combined, that the earth *must* stand in the center, and that the sun *must* revolve about it. Nor was it merely fanatics who opposed the truth revealed by Copernicus; such strong men as Jean Bodin, in France, and Sir Thomas Browne, in England, declared against it as evidently contrary to Holy Scripture.

Concentration of the war on this new champion

The first attack

Fresh attacks -- Elci, Busaeus, Caccini, Lorini, Bellarmin

Use of epithets

Attempts to entrap Galileo

His summons before the Inquisition at Rome

The injunction to silence, and the condemnation of the theory of the earth's motion

The work of Copernicus placed on the *Index*

Galileo's seclusion

Renewed attacks upon Galileo -- Inchofer, Fromundus

A very curious example of this sham science employed by theologians is seen in the argument, frequently used at that time, that, if the earth really moved, a stone falling from a height would fall back of the point immediately below its point of starting. This is used by Fromundus with great effect. It appears never to have occurred to them to test the matter by dropping a stone from the topmast of a ship. Benzenburg has experimentally demonstrated just such an aberration in falling bodies as is mathematically required by the diurnal motion of the earth.

I am aware that the theory proposed by Wohlwill and developed be Gebler denies that this promise was ever made by Galileo, and holds that the passage was a forgery devised later by the Church rulers to justify the proceedings of 1632 and 1633. This would make the conduct of the Church worse, but authorities as eminent consider the charge not proved. A careful examination of the documents seems to disprove it.

3.4 Victory of the Church Over Galileo

[Click Here for Section Outline]

While news of triumphant attacks upon him and upon the truth he had established were coming in from all parts of Europe, Galileo prepared a careful treatise in the form of a dialogue, exhibiting the arguments for and against the Copernican and Ptolemaic systems, and offered to submit to any conditions that the Church tribunals might impose, if they would allow it to be printed. At last, after discussions which extended through eight years, they consented, imposing a humiliating condition -- a preface written in accordance with the ideas of Father Ricciardi, Master of the Sacred Palace, and signed by Galileo, in which the Copernican theory was virtually exhibited as a play of the imagination, and not at all as opposed to the Ptolemaic doctrine reasserted in 1616 by the Inquisition under the direction of Pope Paul V.

This new work of Galileo -- the ***Dialogo*** -- appeared in 1632, and met with prodigious success. It put new weapons into the hands of the supporters of the Copernican theory. The pious preface was laughed at from one end of Europe to the other. This roused the enemy; the Jesuits, Dominicans, and the great majority of the clergy returned to the attack more violent than ever, and in the midst of them stood Pope Urban VIII, most bitter of all. His whole power was now thrown against Galileo. He was touched in two points: first, in his personal vanity, for Galileo had put the Pope's arguments into the mouth of one of the persons in the dialogue and their refutation into the mouth of another; but, above all, he was touched in his religious feelings. Again and again His Holiness insisted to all comers on the absolute and specific declarations of Holy Scripture, which prove that the sun and heavenly bodies revolve about the earth, and declared that to gainsay them is simply to dispute revelation. Certainly, if one ecclesiastic more than another ever seemed *not* under the care of the Spirit of Truth, it was Urban VIII in all this matter.

Herein was one of the greatest pieces of ill fortune that has ever befallen the older Church. Had Pope Urban been broad-minded and tolerant like Benedict XIV, or had he been taught moderation by adversity like Pius VII, or had he possessed the large scholarly qualities of Leo XIII, now reigning, the vast scandal of the Galileo case would never have burdened the

Church: instead of devising endless quibbles and special pleadings to escape responsibility for this colossal blunder, its defenders could have claimed forever for the Church the glory of fearlessly initiating a great epoch in human thought.

But it was not so to be. Urban was not merely Pope; he was also a prince of the house of Barberini, and therefore doubly angry that his arguments had been publicly controverted.

The opening strategy of Galileo's enemies was to forbid the sale of his work; but this was soon seen to be unavailing, for the first edition had already been spread throughout Europe. Urban now became more angry than ever, and both Galileo and his works were placed in the hands of the Inquisition. In vain did the good Benedictine Castelli urge that Galileo was entirely respectful to the Church; in vain did he insist that "nothing that can be done can now hinder the earth from revolving." He was dismissed in disgrace, and Galileo was forced to appear in the presence of the dread tribunal without defender or adviser. There, as was so long concealed, but as is now fully revealed, he was menaced with torture again and again by express order of Pope Urban, and, as is also thoroughly established from the trial documents themselves, forced to abjure under threats, and subjected to imprisonment by command of the Pope; the Inquisition deferring in this whole matter to the papal authority. All the long series of attempts made in the supposed interest of the Church to mystify these transactions have at last failed. The world knows now that Galileo was subjected certainly to indignity, to imprisonment, and to threats equivalent to torture, and was at last forced to pronounce publicly and on his knees his recantation, as follows:

"I, Galileo, being in my seventieth year, being a prisoner and on my knees, and before your Eminences, having before my eyes the Holy Gospel, which I touch with my hands, abjure, curse, and detest the error and the heresy of the movement of the earth."

He was vanquished indeed, for he had been forced, in the face of all coming ages, to perjure himself. To complete his dishonor, he was obliged to swear that he would denounce to the Inquisition any other man of science whom he should discover to be supporting the "heresy of the motion of the earth."

Many have wondered at this abjuration, and on account of it have denied to Galileo the title of martyr. But let such gainsayers consider the circumstances. Here was an old man -- one who had reached the allotted threescore years and ten -- broken with disappointments, worn out with labors and cares, dragged from Florence to Rome, with the threat from the Pope himself that if he delayed he should be "brought in chains"; sick in body and mind, given over to his oppressors by the Grand-Duke who ought to have protected him, and on his arrival in Rome threatened with torture. What the Inquisition was he knew well. He could remember as but of yesterday the burning of Giordano Bruno in that same city for scientific and philosophic heresy; he could remember, too, that only eight years before this very time de Dominis, Archbishop of Spalatro, having been seized by the Inquisition for scientific and other heresies, had died in a dungeon, and that his body and his writings had been publicly burned.

To the end of his life -- nay, after his life was ended -- the persecution of Galileo was continued. He was kept in exile from his family, from his friends, from his noble employments, and was held rigidly to his promise not to speak of his theory. When, in the midst of intense bodily sufferings from disease, and mental sufferings from calamities in his family, he besought some little liberty, he was met with threats of committal to a dungeon. When, at last, a special commission had reported to the ecclesiastical authorities that he had become blind and wasted with disease and sorrow, he was allowed a little more liberty, but that little was hampered by close surveillance. He was forced to bear contemptible attacks on himself and on his works in silence; to see the men who had befriended him severely punished; Father Castelli banished; Ricciardi, the Master of the Sacred Palace, and Ciampoli, the papal secretary, thrown out of their positions by Pope Urban, and the Inquisitor at Florence reprimanded for having given permission to print Galileo's work. He lived to see the truths he had established carefully weeded out from all the Church colleges and universities in Europe; and, when in a scientific work he happened to be spoken of as "renowned," the Inquisition ordered the substitution of the word "notorious."

And now measures were taken to complete the destruction of the Copernican theory, with Galileo's proofs of it. On the 16th of June, 1633, the Holy Congregation, with the permission of the reigning Pope, ordered the sentence upon Galileo, and his recantation, to be sent to all the papal nuncios throughout Europe, as well as to all archbishops, bishops, and

inquisitors in Italy and this document gave orders that the sentence and abjuration be made known "to your vicars, that you and all professors of philosophy and mathematics may have knowledge of it, that they may know why we proceeded against the said Galileo, and recognize the gravity of his error, in order that they may avoid it, and thus not incur the penalties which they would have to suffer in case they fell into the same."

As a consequence, the processors of mathematics and astronomy in various universities of Europe were assembled and these documents were read to them. To the theological authorities this gave great satisfaction. The Rector of the University of Douay, referring to the opinion of Galileo, wrote to the papal nuncio at Brussels: "The professors of our university are so opposed to this fanatical opinion that they have always held that it must be banished from the schools. In our English college at Douay this paradox has never been approved and never will be."

Still another step was taken: the Inquisitors were ordered, especially in Italy, not to permit the publication of a new edition of any of Galileo's works, or of any similar writings. On the other hand, theologians were urged, now that Copernicus and Galileo and Kepler were silenced, to reply to them with tongue and pen. Europe was flooded with these theological refutations of the Copernican system.

To make all complete, there was prefixed to the ***Index*** of the Church, forbidding "all writings which affirm the motion of the earth," a bull signed by the reigning Pope, which, by virtue of his infallibility as a divinely guided teacher in matters of faith and morals, clinched this condemnation into the consciences of the whole Christian world.

From the mass of books which appeared under the auspices of the Church immediately after the condemnation of Galileo, for the purpose of rooting out every vestige of the hated Copernican theory from the mind of the world, two may be taken as typical. The first of these was a work by Scipio Chiaramonti, dedicated to Cardinal Barberini. Among his arguments against the double motion of the earth may be cited the following:

"Animals, which move, have limbs and muscles; the earth has no limbs or muscles, therefore it does not move. It is angels who make Saturn, Jupiter, the sun, etc., turn round. If the earth revolves, it must also have

an angel in the center to set it in motion; but only devils live there; it would therefore be a devil who would impart motion to the earth....

"The planets, the sun, the fixed stars, all belong to one species -- namely, that of stars. It seems, therefore, to be a grievous wrong to place the earth, which is a sink of impurity, among these heavenly bodies, which are pure and divine things."

The next, which I select from the mass of similar works, is the ***Anticopernicus Catholicus*** of Polacco. It was intended to deal a finishing stroke at Galileo's heresy. In this it is declared:

"The Scripture always represents the earth as at rest, and the sun and moon as in motion; or, if these latter bodies are ever represented as at rest, Scripture represents this as the result of a great miracle....

"These writings must be prohibited, because they teach certain principles about the position and motion of the terrestrial globe repugnant to Holy Scripture and to the Catholic interpretation of it, not as hypotheses but as established facts...."

Speaking of Galileo's book, Polacco says that it "smacked of Copernicanism," and that, "when this was shown to the Inquisition, Galileo was thrown into prison and was compelled to utterly abjure the baseness of this erroneous dogma."

As to the authority of the cardinals in their decree, Polacco asserts that, since they are the "Pope's Council" and his "brothers," their work is one, except that the Pope is favored with special divine enlightenment.

Having shown that the authority of the Scriptures, of popes, and of cardinals is against the new astronomy, he gives a refutation based on physics. He asks: "If we concede the motion of the earth, why is it that an arrow shot into the air falls back to the same spot, while the earth and all things on it have in the meantime moved very rapidly toward the east? Who does not see that great confusion would result from this motion?"

Next he argues from metaphysics, as follows: "The Copernican theory of the earth's motion is against the nature of the earth itself, because the earth is not only cold but contains in itself the principle of cold; but cold is

opposed to motion, and even destroys it -- as is evident in animals, which become motionless when they become cold."

Finally, he clinches all with a piece of theological reasoning, as follows: "Since it can certainly be gathered from Scripture that the heavens move above the earth, and since a circular motion requires something immovable around which to move,... the earth is at the center of the universe."

But any sketch of the warfare between theology and science in this field would be incomplete without some reference to the treatment of Galileo after his death. He had begged to be buried in his family tomb in Santa Croce; this request was denied. His friends wished to erect a monument over him; this, too, was refused. Pope Urban said to the ambassador Niccolini that "it would be an evil example for the world if such honors were rendered to a man who had been brought before the Roman Inquisition for an opinion so false and erroneous; who had communicated it to many others, and who had given so great a scandal to Christendom." In accordance, therefore, with the wish of the Pope and the orders of the Inquisition, Galileo was buried ignobly, apart from his family, without fitting ceremony, without monument, without epitaph. Not until forty years after did Pierrozzi dare write an inscription to be placed above his bones; not until a hundred years after did Nelli dare transfer his remains to a suitable position in Santa Croce, and erect a monument above them. Even then the old conscientious hostility burst forth: the Inquisition was besought to prevent such honors to "a man condemned for notorious errors"; and that tribunal refused to allow any epitaph to be placed above him which had not been submitted to its censorship. Nor has that old conscientious consistency in hatred yet fully relented: hardly a generation since has not seen some ecclesiastic, like Marini or de Bonald or Rallaye or de Gabriac, suppressing evidence, or torturing expressions, or inventing theories to blacken the memory of Galileo and save the reputation of the Church. Nay, more: there are school histories, widely used, which, in the supposed interest of the Church, misrepresent in the grossest manner all these transactions in which Galileo was concerned. *Sancta simplicitas!* The Church has no worse enemies than those who devise and teach these perversions. They are simply rooting out, in the long run, from the minds of the more thoughtful scholars, respect for the great organization which such writings are supposed to serve.

The Protestant Church was hardly less energetic against this new

astronomy than the mother Church. The sacred science of the first Lutheran Reformers was transmitted as a precious legacy, and in the next century was made much of by Calovius. His great learning and determined orthodoxy gave him the Lutheran leadership. Utterly refusing to look at ascertained facts, he cited the turning back of the shadow upon King Hezekiah's dial and the standing still of the sun for Joshua, denied the movement of the earth, and denounced the whole new view as clearly opposed to Scripture. To this day his arguments are repeated by sundry orthodox leaders of American Lutheranism.

As to the other branches of the Reformed Church, we have already seen how Calvinists, Anglicans, and, indeed, Protestant sectarians generally, opposed the new truth. In England, among the strict churchmen, the great Dr. South denounced the Royal Society as "irreligious," and among the Puritans the eminent John Owen declared that Newton's discoveries were "built on fallible phenomena and advanced by many arbitrary presumptions against evident testimonies of Scripture." Even Milton seems to have hesitated between the two systems. At the beginning of the eighth book of ***Paradise Lost*** he makes Adam state the difficulties of the Ptolemaic system, and then brings forward an angel to make the usual orthodox answers. Later, Milton seems to lean toward the Copernican theory, for, referring to the earth, he says:

> "Or she from west her silent course advance
> With inoffensive pace, that spinning sleeps
> On her soft axle, while she faces even
> And bears thee soft with the smooth air along."

English orthodoxy continued to assert itself. In 1724 John Hutchinson, professor at Cambridge, published his ***Moses' Principia***, a system of philosophy in which he sought to build up a complete physical system of the universe from the Bible. In this he assaulted the Newtonian theory as "atheistic," and led the way for similar attacks by such Church teachers as Horne, Duncan Forbes, and Jones of Nayland. But one far greater than these involved himself in this view. That same limitation of his reason by the simple statements of Scripture which led John Wesley to declare that, "unless witchcraft is true, nothing in the Bible is true," led him, while giving up the Ptolemaic theory and accepting in a general way the Copernican, to suspect the demonstrations of Newton. Happily, his inborn nobility of character lifted him above any bitterness or persecuting spirit, or any

imposition of doctrinal tests which could prevent those who came after him from finding their way to the truth.

But in the midst of this vast expanse of theological error signs of right reason began to appear, both in England and America. Noteworthy is it that Cotton Mather, bitter as was his orthodoxy regarding witchcraft, accepted, in 1721, the modern astronomy fully, with all its consequences.

In the following year came an even more striking evidence that the new scientific ideas were making their way in England. In 1722 Thomas Burnet published the sixth edition of his ***Sacred Theory of the Earth***. In this he argues, as usual, to establish the scriptural doctrine of the earth's stability; but in his preface he sounds a remarkable warning. He mentions the great mistake into which St. Augustine led the Church regarding the doctrine of the antipodes, and says, "If within a few years or in the next generation it should prove as certain and demonstrable that the earth is moved, as it is now that there are antipodes, those that have been zealous against it, and engaged the Scripture in the controversy, would have the same reason to repent of their forwardness that St. Augustine would now, if he were still alive."

Fortunately, too, Protestantism had no such power to oppose the development of the Copernican ideas as the older Church had enjoyed. Yet there were some things in its warfare against science even more indefensible. In 1772 the famous English expedition for scientific discovery sailed from England under Captain Cook. Greatest by far of all the scientific authorities chosen to accompany it was Dr. Priestley. Sir Joseph Banks had specially invited him. But the clergy of Oxford and Cambridge interfered. Priestley was considered unsound in his views of the Trinity; it was evidently suspected that this might vitiate his astronomical observations; he was rejected, and the expedition crippled.

The orthodox view of astronomy lingered on in other branches of the Protestant Church. In Germany even Leibnitz attacked the Newtonian theory of gravitation on theological grounds, though he found some little consolation in thinking that it might be used to support the Lutheran doctrine of consubstantiation.

In Holland the Calvinistic Church was at first strenuous against the whole new system, but we possess a comical proof that Calvinism even in its

strongholds was powerless against it; for in 1642 Blaer published at Amsterdam his book on the use of globes, and, in order to be on the safe side, devoted one part of his work to the Ptolemaic and the other to the Copernican scheme, leaving the benevolent reader to take his choice.

Nor have efforts to renew the battle in the Protestant Church been wanting in these latter days. The attempt in the Church of England, in 1864, to fetter science, which was brought to ridicule by Herschel, Bowring, and De Morgan; the assemblage of Lutheran clergy at Berlin, in 1868, to protest against "science falsely so called," are examples of these. Fortunately, to the latter came Pastor Knak, and his denunciations of the Copernican theory as absolutely incompatible with a belief in the Bible, dissolved the whole assemblage in ridicule.

In its recent dealings with modern astronomy the wisdom of the Catholic Church in the more civilized countries has prevented its yielding to some astounding errors into which one part of the Protestant Church has fallen heedlessly.

Though various leaders in the older Church have committed the absurd error of allowing a textbook and sundry review articles to appear which grossly misstate the Galileo episode, with the certainty of ultimately undermining confidence in her teachings among her more thoughtful young men, she has kept clear of the folly of continuing to tie her instruction, and the acceptance of our sacred books, to an adoption of the Ptolemaic theory.

Not so with American Lutheranism. In 1873 was published in St. Louis, at the publishing house of the Lutheran Synod of Missouri, a work entitled ***Astronomische Unterredung***, the author being well known as a late president of a Lutheran Teachers' Seminary.

No attack on the whole modern system of astronomy could be more bitter. On the first page of the introduction the author, after stating the two theories, asks, "Which is right?" and says: "It would be very simple to me which is right, if it were only a question of human import. But the wise and truthful God has expressed himself on this matter in the Bible. The entire Holy Scripture settles the question that the earth is the principal body (*Hauptkorper*) of the universe, that it stands fixed, and that sun and moon only serve to light it."

The author then goes on to show from Scripture the folly, not only of Copernicus and Newton, but of a long line of great astronomers in more recent times. He declares: "Let no one understand me as inquiring first where truth is to be found -- in the Bible or with the astronomers. No; I know that beforehand -- that my God never lies, never makes a mistake; out of his mouth comes only truth, when he speaks of the structure of the universe, of the earth, sun, moon, and stars....

"Because the truth of the Holy Scripture is involved in this, therefore the above question is of the highest importance to me.... Scientists and others lean upon the miserable reed (*Rohrstab*) that God teaches only the order of salvation, but not the order of the universe."

Very noteworthy is the fact that this late survival of an ancient belief based upon text worship is found, not in the teachings of any zealous priest of the mother Church, but in those of an eminent professor in that branch of Protestantism which claims special enlightenment.

Nor has the warfare against the dead champions of science been carried on by the older Church alone.

On the 10th of May, 1859, Alexander von Humboldt was buried. His labors had been among the glories of the century, and his funeral was one of the most imposing that Berlin had ever seen. Among those who honored themselves by their presence was the prince regent, afterward the Emperor William I; but of the clergy it was observed that none were present save the officiating clergyman and a few regarded as unorthodox.

Continue

Publication of his Dialogo

Hostility of Pope Urban VIII

Galileo's second trial by the Inquisition

His abjuration

Later persecution of him

Measures to complete the destruction of the Copernican theory

Persecution of Galileo's memory

Protestant hostility to the new astronomy and its champions

3.5 Results of the Victory Over Galileo

[Click Here for Section Outline]

We return now to the sequel of the Galileo case.

Having gained their victory over Galileo, living and dead, having used it to scare into submission the professors of astronomy throughout Europe, conscientious churchmen exulted. Loud was their rejoicing that the "heresy," the "infidelity", the "atheism" involved in believing that the earth revolves about its axis and moves around the sun had been crushed by the great tribunal of the Church, acting in strict obedience to the expressed will of one Pope and the written order of another. As we have seen, all books teaching this hated belief were put upon the ***Index*** of books forbidden to Christians, and that ***Index*** was prefaced by a bull enforcing this condemnation upon the consciences of the faithful throughout the world, and signed by the reigning Pope.

The losses to the world during this complete triumph of theology were even more serious than at first appears: one must especially be mentioned. There was then in Europe one of the greatest thinkers ever given to mankind -- Rene Descartes. Mistaken though many of his reasonings were, they bore a rich fruitage of truth. He had already done a vast work. His theory of vortices -- assuming a uniform material regulated by physical laws -- as the beginning of the visible universe, though it was but a provisional hypothesis, had ended the whole old theory of the heavens with the vaulted firmament and the direction of the planetary movements by angels, which even Kepler had allowed. The scientific warriors had stirred new life in him, and he was working over and summing up in his mighty mind all the researches of his time. The result would have made an epoch in history. His aim was to combine all knowledge and thought into a ***Treatise on the World***, and in view of this he gave eleven years to the study of anatomy alone. But the fate of Galileo robbed him of all hope, of all courage; the battle seemed lost; he gave up his great plan forever.

But ere long it was seen that this triumph of the Church was in reality a prodigious defeat. From all sides came proofs that Copernicus and Galileo were right; and although Pope Urban and the Inquisition held Galileo in strict seclusion, forbidding him even to *speak* regarding the

double motion of the earth; and although this condemnation of "all books which affirm the motion of the earth" was kept on the ***Index***; and although the papal bull still bound the ***Index*** and the condemnations in it on the consciences of the faithful; and although colleges and universities under Church control were compelled to teach the old doctrine -- it was seen by clear-sighted men everywhere that this victory of the Church was a disaster to the victors.

New champions pressed on. Campanella, full of vagaries as he was, wrote his ***Apology for Galileo***, though for that and other heresies, religious, and political, he seven times underwent torture.

And Kepler comes: he leads science on to greater victories. Copernicus, great as he was, could not disentangle scientific reasoning entirely from the theological bias: the doctrines of Aristotle and Thomas Aquinas as to the necessary superiority of the circle had vitiated the minor features of his system, and left breaches in it through which the enemy was not slow to enter; but Kepler sees these errors, and by wonderful genius and vigor he gives to the world the three laws which bear his name, and this fortress of science is complete. He thinks and speaks as one inspired. His battle is severe. He is solemnly warned by the Protestant Consistory of Stuttgart "not to throw Christ's kingdom into confusion with his silly fancies," and as solemnly ordered to "bring his theory of the world into harmony with Scripture": he is sometimes abused, sometimes ridiculed, sometimes imprisoned. Protestants in Styria and Wurtemberg, Catholics in Austria and Bohemia, press upon him but Newton, Halley, Bradley, and other great astronomers follow, and to science remains the victory.

Yet this did not end the war. During the seventeenth century, in France, after all the splendid proofs added by Kepler, no one dared openly teach the Copernican theory, and Cassini, the great astronomer, never declared for it. In 1672 the Jesuit Father Riccioli declared that there were precisely forty-nine arguments for the Copernican theory and seventy-seven against it. Even after the beginning of the eighteenth century -- long after the demonstrations of Sir Isaac Newton -- Bossuet, the great Bishop of Meaux, the foremost theologian that France has ever produced, declared it contrary to Scripture.

Nor did matters seem to improve rapidly during that century. In England, John Hutchinson, as we have seen, published in 1724 his ***Moses'***

Principia maintaining that the Hebrew Scriptures are a perfect system of natural philosophy, and are opposed to the Newtonian system of gravitation; and, as we have also seen, he was followed by a long list of noted men in the Church. In France, two eminent mathematicians published in 1748 an edition of Newton's ***Principia***; but, in order to avert ecclesiastical censure, they felt obliged to prefix to it a statement absolutely false. Three years later, Boscovich, the great mathematician of the Jesuits, used these words: "As for me, full of respect for the Holy Scriptures and the decree of the Holy Inquisition, I regard the earth as immovable; nevertheless, for simplicity in explanation I will argue as if the earth moves; for it is proved that of the two hypotheses the appearances favor this idea."

In Germany, especially in the Protestant part of it, the war was even more bitter, and it lasted through the first half of the eighteenth century. Eminent Lutheran doctors of divinity flooded the country with treatises to prove that the Copernican theory could not be reconciled with Scripture. In the theological seminaries and in many of the universities where clerical influence was strong they seemed to sweep all before them; and yet at the middle of the century we find some of the clearest-headed of them aware of the fact that their cause was lost.

In 1757 the most enlightened perhaps in the whole line of the popes, Benedict XIV, took up the matter, and the Congregation of the ***Index*** secretly allowed the ideas of Copernicus to be tolerated. Yet in 1765 Lalande, the great French astronomer, tried in vain at Rome to induce the authorities to remove Galileo's works from the ***Index***. Even at a date far within our own nineteenth century the authorities of many universities in Catholic Europe, and especially those in Spain, excluded the Newtonian system. In 1771 the greatest of them all, the University of Salamanca, being urged to teach physical science, refused, making answer as follows: "Newton teaches nothing that would make a good logician or metaphysician; and Gassendi and Descartes do not agree so well with revealed truth as Aristotle does."

Vengeance upon the dead also has continued far into our own century. On the 5th of May, 1829, a great multitude assembled at Warsaw to honor the memory of Copernicus and to unveil Thorwaldsen's statue of him.

Copernicus had lived a pious, Christian life; he had been beloved for

unostentatious Christian charity; with his religious belief no fault had ever been found; he was a canon of the Church at Frauenberg, and over his grave had been written the most touching of Christian epitaphs. Naturally, then, the people expected a religious service; all was understood to be arranged for it; the procession marched to the church and waited. The hour passed, and no priest appeared; none could be induced to appear. Copernicus, gentle, charitable, pious, one of the noblest gifts of God to religion as well as to science, was evidently still under the ban. Five years after that, his book was still standing on the ***Index*** of books prohibited to Christians.

The edition of the ***Index*** published in 1819 was as inexorable toward the works of Copernicus and Galileo as its predecessors had been; but in the year 1820 came a crisis. Canon Settele, Professor of Astronomy at Rome, had written an elementary book in which the Copernican system was taken for granted. The Master of the Sacred Palace, Anfossi, as censor of the press, refused to allow the book to be printed unless Settele revised his work and treated the Copernican theory as merely a hypothesis. On this Settele appealed to Pope Pius VII, and the Pope referred the matter to the Congregation of the Holy Office. At last, on the 16th of August, 1820, it was decided that Settele might teach the Copernican system as established, and this decision was approved by the Pope. This aroused considerable discussion, but finally, on the 11th of September, 1822, the cardinals of the Holy Inquisition graciously agreed that "the printing and publication of works treating of the motion of the earth and the stability of the sun, in accordance with the general opinion of modern astronomers, is permitted at Rome." This decree was ratified by Pius VII, but it was not until thirteen years later, in 1835, that there was issued an edition of the ***Index*** from which the condemnation of works defending the double motion of the earth was left out.

This was not a moment too soon, for, as if the previous proofs had not been sufficient, each of the motions of the earth was now absolutely demonstrated anew, so as to be recognized by the ordinary observer. The parallax of fixed stars, shown by Bessel as well as other noted astronomers in 1838, clinched forever the doctrine of the revolution of the earth around the sun, and in 1851 the great experiment of Foucault with the pendulum showed to the human eye the earth in motion around its own axis. To make the matter complete, this experiment was publicly made in one of the churches at Rome by the eminent astronomer, Father Secchi, of the

Jesuits, in 1852 -- just two hundred and twenty years after the Jesuits had done so much to secure Galileo's condemnation.

Continue

Rejoicings of churchmen over the victory

The silencing of Descartes

Persecution of Campanella and of Kepler

Persistence and victory of science

Dilemma of the theologians

Vain attempts to postpone the surrender

3.6 The Retreat of the Church After Its Victory Over Galileo

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Any history of the victory of astronomical science over dogmatic theology would be incomplete without some account of the retreat made by the Church from all its former positions in the Galileo case.

The retreat of the Protestant theologians was not difficult. A little skillful warping of Scripture, a little skillful use of that time-honored phrase, attributed to Cardinal Baronius, that the Bible is given to teach us, not how the heavens go, but how men go to heaven, and a free use of explosive rhetoric against the pursuing army of scientists, sufficed.

But in the older Church it was far less easy. The retreat of the sacro-scientific army of Church apologists lasted through two centuries.

In spite of all that has been said by these apologists, there no longer remains the shadow of a doubt that the papal infallibility was committed fully and irrevocably against the double revolution of the earth. As the documents of Galileo's trial now published show, Paul V, in 1616, pushed on with all his might the condemnation of Galileo and of the works of Copernicus and of all others teaching the motion of the earth around its own axis and around the sun. So, too, in the condemnation of Galileo in 1633, and in all the proceedings which led up to it and which followed it, Urban VIII was the central figure. Without his sanction no action could have been taken.

True, the Pope did not formally sign the decree against the Copernican theory *then*; but this came later. In 1664 Alexander VII prefixed to the ***Index*** containing the condemnations of the works of Copernicus and Galileo and "all books which affirm the motion of the earth" a papal bull signed by himself, binding the contents of the ***Index*** upon the consciences of the faithful. This bull confirmed and approved in express terms, finally, decisively, and infallibly, the condemnation of "all books teaching the movement of the earth and the stability of the sun."

The position of the mother Church had been thus made especially difficult; and the first important move in retreat by the apologists was the statement

that Galileo was condemned, not because he affirmed the motion of the earth, but because he supported it from Scripture. There was a slight appearance of truth in this. Undoubtedly, Galileo's letters to Castelli and the grand duchess, in which he attempted to show that his astronomical doctrines were not opposed to Scripture, gave a new stir to religious bigotry. For a considerable time, then, this quibble served its purpose; even a hundred and fifty years after Galileo's condemnation it was renewed by the Protestant Mallet du Pan, in his wish to gain favor from the older Church.

But nothing can be more absurd, in the light of the original documents recently brought out of the Vatican archives, than to make this contention now. The letters of Galileo to Castelli and the Grand-Duchess were not published until after the condemnation; and, although the Archbishop of Pisa had endeavored to use them against him, they were but casually mentioned in 1616, and entirely left out of view in 1633. What was condemned in 1616 by the Sacred Congregation held in the presence of Pope Paul V, as *"absurd, false in theology, and heretical, because absolutely contrary to Holy Scripture, "* was the proposition that *"the sun is the center about which the earth revolves"*; and what was condemned as *"absurd, false in philosophy, and from a theological point of view, at least, opposed to the true faith,"* was the proposition that *"the earth is not the center of the universe and immovable, but has a diurnal motion."*

And again, what Galileo was made, by express order of Pope Urban, and by the action of the Inquisition under threat of torture, to abjure in 1633, was *"the error and heresy of the movement of the earth."*

What the ***Index*** condemned under sanction of the bull issued by Alexander VII in 1664 was, *"all books teaching the movement of the earth and the stability of the sun."*

What the ***Index***, prefaced by papal bulls, infallibly binding its contents upon the consciences of the faithful, for nearly two hundred years steadily condemned was, ***"all books which affirm the motion of the earth."***

Not one of these condemnations was directed against Galileo "for reconciling his ideas with Scripture."

Having been dislodged from this point, the Church apologists sought cover

under the statement that Galileo was condemned not for heresy, but for contumacy and want of respect toward the Pope.

There was a slight chance, also, for this quibble: no doubt Urban VIII, one of the haughtiest of pontiffs, was induced by Galileo's enemies to think that he had been treated with some lack of proper etiquette: first, by Galileo's adhesion to his own doctrines after his condemnation in 1616; and, next, by his supposed reference in the ***Dialogue*** of 1632 to the arguments which the Pope had used against him.

But it would seem to be a very poor service rendered to the doctrine of papal infallibility to claim that a decision so immense in its consequences could be influenced by the personal resentment of the reigning pontiff.

Again, as to the first point, the very language of the various sentences shows the folly of this assertion; for these sentences speak always of "heresy" and never of "contumacy." As to the last point, the display of the original documents settled that forever. They show Galileo from first to last as most submissive toward the Pope, and patient under the papal arguments and exactions. He had, indeed, expressed his anger at times against his traducers; but to hold this the cause of the judgment against him is to degrade the whole proceedings, and to convict Paul V, Urban VIII, Bellarmin, the other theologians, and the Inquisition, of direct falsehood, since they assigned entirely different reasons for their conduct. From this position, therefore, the assailants retreated.**[footnote]**

The next rally was made about the statement that the persecution of Galileo was the result of a quarrel between Aristotelian professors on one side and professors favoring the experimental method on the other. But this position was attacked and carried by a very simple statement. If the divine guidance of the Church is such that it can be dragged into a professorial squabble, and made the tool of a faction in bringing about a most disastrous condemnation of a proved truth, how did the Church at that time differ from any human organization sunk into decrepitude, managed nominally by simpletons, but really by schemers? If that argument be true, the condition of the Church was even worse than its enemies have declared it; and amid the jeers of an unfeeling world the apologists sought new shelter.

The next point at which a stand was made was the assertion that the

condemnation of Galileo was "provisory"; but this proved a more treacherous shelter than the others. The wording of the decree of condemnation itself is a sufficient answer to this claim. When doctrines have been solemnly declared, as those of Galileo were solemnly declared under sanction of the highest authority in the Church, "contrary to the sacred Scriptures," "opposed to the true faith," and "false and absurd in theology and philosophy" -- to say that such declarations are "provisory" is to say that the truth held by the Church is not immutable; from this, then, the apologists retreated.[footnote]

Still another contention was made, in some respects more curious than any other: it was, mainly, that Galileo "was no more a victim of Catholics than of Protestants; for they more than the Catholic theologians impelled the Pope to the action taken."

But if Protestantism could force the papal hand in a matter of this magnitude, involving vast questions of belief and far-reaching questions of policy, what becomes of "inerrancy" -- of special protection and guidance of the papal authority in matters of faith?

While this retreat from position to position was going on, there was a constant discharge of small-arms, in the shape of innuendoes, hints, and sophistries: every effort was made to blacken Galileo's private character: the irregularities of his early life were dragged forth, and stress was even laid upon breaches of etiquette; but this succeeded so poorly that even as far back as 1850 it was thought necessary to cover the retreat by some more careful strategy.

This new strategy is instructive. The original documents of the Galileo trial had been brought during the Napoleonic conquests to Paris; but in 1846 they were returned to Rome by the French Government, on the express pledge by the papal authorities that they should be published. In 1850, after many delays on various pretexts, the long-expected publication appeared. The personage charged with presenting them to the world was Monsignor Marini. This ecclesiastic was of a kind which has too often afflicted both the Church and the world at large. Despite the solemn promise of the papal court, the wily Marini became the instrument of the Roman authorities in evading the promise. By suppressing a document here, and interpolating a statement there, he managed to give plausible standing ground for nearly every important sophistry ever broached to save

the infallibility of the Church and destroy the reputation of Galileo. He it was who supported the idea that Galileo was "condemned not for heresy, but for contumacy."

The first effect of Monsignor Marini's book seemed useful in covering the retreat of the Church apologists. Aided by him, such vigorous writers as Ward were able to throw up temporary entrenchments between the Roman authorities and the indignation of the world.

But some time later came an investigator very different from Monsignor Marini. This was a Frenchman, M. L'Épinois. Like Marini, L'Épinois was devoted to the Church; but, unlike Marini, he could not lie. Having obtained access in 1867 to the Galileo documents at the Vatican, he published several of the most important, without suppression or pious-fraudulent manipulation. This made all the entrenchments based upon Marini's statements untenable. Another retreat had to be made.

And now came the most desperate effort of all. The apologetic army, reviving an idea which the popes and the Church had spurned for centuries, declared that the popes *as popes* had never condemned the doctrines of Copernicus and Galileo; that they had condemned them as men simply; that therefore the Church had never been committed to them; that the condemnation was made by the cardinals of the Inquisition and ***Index***; and that the Pope had evidently been restrained by interposition of Providence from signing their condemnation. Nothing could show the desperation of the retreating party better than jugglery like this. The fact is, that in the official account of the condemnation by Bellarmin, in 1616, he declares distinctly that he makes this condemnation "in the name of His Holiness the Pope."

Again, from Pope Urban downward, among the Church authorities of the seventeenth century the decision was always acknowledged to be made by the Pope and the Church. Urban VIII spoke of that of 1616 as made by Pope Paul V and the Church, and of that of 1633 as made by himself and the Church. Pope Alexander VII in 1664, in his bull ***Speculatores***, solemnly sanctioned the condemnation of all books affirming the earth's movement.

When Gassendi attempted to raise the point that the decision against Copernicus and Galileo was not sanctioned by the Church as such, an

eminent theological authority, Father Lecazre, rector of the College of Dijon, publicly contradicted him, and declared that it "was not certain cardinals, but the supreme authority of the Church," that had condemned Galileo; and to this statement the Pope and other Church authorities gave consent either openly or by silence. When Descartes and others attempted to raise the same point, they were treated with contempt. Father Castelli, who had devoted himself to Galileo, and knew to his cost just what the condemnation meant and who made it, takes it for granted, in his letter to the papal authorities, that it was made by the Church. Cardinal Querenghi, in his letters; the ambassador Guicciardini, in his dispatches; Polacco, in his refutation; the historian Viviani, in his biography of Galileo -- all writing under Church inspection and approval at the time, took the view that the Pope and the Church condemned Galileo, and this was never denied at Rome. The Inquisition itself, backed by the greatest theologian of the time (Bellarmin), took the same view. Not only does he declare that he makes the condemnation "in the name of His Holiness the Pope," but we have the Roman ***Index***, containing the condemnation for nearly two hundred years, prefaced by a solemn bull of the reigning Pope binding this condemnation on the consciences of the whole Church, and declaring year after year that "all books which affirm the motion of the earth" are damnable. To attempt to face all this, added to the fact that Galileo was required to abjure "the heresy of the movement of the earth" by written order of the Pope, was soon seen to be impossible. Against the assertion that the Pope was not responsible we have all this mass of testimony, and the bull of Alexander VII in 1664.

This contention, then, was at last utterly given up by honest Catholics themselves. In 1870 a Roman Catholic clergy man in England, the Rev. Mr. Roberts, evidently thinking that the time had come to tell the truth, published a book entitled ***The Pontifical Decrees against the Earth's Movement***, and in this exhibited the incontrovertible evidences that the papacy had committed itself and its infallibility fully against the movement of the earth. This Catholic clergyman showed from the original record that Pope Paul V, in 1616, had presided over the tribunal condemning the doctrine of the earth's movement, and ordering Galileo to give up the opinion. He showed that Pope Urban VIII, in 1633, pressed on, directed, and promulgated the final condemnation, making himself in all these ways responsible for it. And, finally, he showed that Pope Alexander VII, in 1664, by his bull -- ***Speculatores Domus Israel*** -- attached to the ***Index***, condemning "all books which affirm the motion of the earth," had absolutely

pledged the papal infallibility against the earth's movement. He also confessed that under the rules laid down by the highest authorities in the Church, and especially by Sixtus V and Pius IX, there was no escape from this conclusion.

Various theologians attempted to evade the force of the argument. Some, like Dr. Ward and Bouix, took refuge in verbal niceties; some, like Dr. Jeremiah Murphy, comforted themselves with declamation. The only result was, that in 1885 came another edition of the Rev. Mr. Roberts' work, even more cogent than the first; and, besides this, an essay by that eminent Catholic, St. George Mivart, acknowledging the Rev. Mr. Roberts' position to be impregnable, and declaring virtually that the Almighty allowed Pope and Church to fall into complete error regarding the Copernican theory, in order to teach them that science lies outside their province, and that the true priesthood of scientific truth rests with scientific investigators alone.

In spite, then, of all casuistry and special pleading, this sturdy honesty ended the controversy among Catholics themselves, so far as fair-minded men are concerned.

In recalling it at this day there stand out from its later phases two efforts at compromise especially instructive, as showing the embarrassment of militant theology in the nineteenth century.

The first of these was made by John Henry Newman in the days when he was hovering between the Anglican and Roman Churches. In one of his sermons before the University of Oxford he spoke as follows:

"Scripture says that the sun moves and the earth is stationary, and science that the earth moves and the sun is comparatively at rest. How can we determine which of these opposite statements is the very truth till we know what motion is? If our idea of motion is but an accidental result of our present senses, neither proposition is true and both are true: neither true philosophically; both true for certain practical purposes in the system in which they are respectively found."

In all anti-theological literature there is no utterance more hopelessly skeptical. And for what were the youth of Oxford led into such bottomless depths of disbelief as to any real existence of truth or any real foundation for it? Simply to save an outworn system of interpretation into which the

gifted preacher happened to be born.

The other utterance was suggested by de Bonald and developed in the ***Dublin Review***, as is understood, by one of Newman's associates. This argument was nothing less than an attempt to retreat under the charge of deception against the Almighty himself. It is as follows: "But it may well be doubted whether the Church did retard the progress of scientific truth. What retarded it was the circumstance that God has thought fit to express many texts of Scripture in words which have every appearance of denying the earth's motion. But it is God who did this, not the Church; and, moreover, since he saw fit so to act as to retard the progress of scientific truth, it would be little to her discredit, even if it were true, that she had followed his example."

This argument, like Mr. Gosse's famous attempt to reconcile geology to Genesis -- by supposing that for some inscrutable purpose God deliberately deceived the thinking world by giving to the earth all the appearances of development through long periods of time, while really creating it in six days, each of an evening and a morning -- seems only to have awakened the amazed pity of thinking men. This, like the argument of Newman, was a last desperate effort of Anglican and Roman divines to save something from the wreckage of dogmatic theology.

All these well-meaning defenders of the faith but wrought into the hearts of great numbers of thinking men the idea that there is a necessary antagonism between science and religion. Like the landsman who lashes himself to the anchor of the sinking ship, they simply attached Christianity by the strongest cords of logic which they could spin to these mistaken ideas in science, and, could they have had their way, the advance of knowledge would have engulfed both together.

On the other hand, what had science done for religion? Simply this: Copernicus, escaping persecution only by death; Giordano Bruno, burned alive as a monster of impiety; Galileo, imprisoned and humiliated as the worst of misbelievers; Kepler, accused of "throwing Christ's kingdom into confusion with his silly fancies"; Newton, bitterly attacked for "dethroning Providence," gave to religion stronger foundations and more ennobling conceptions.

Under the old system, that princely astronomer, Alphonso of Castile, seeing

the inadequacy of the Ptolemaic theory, yet knowing no other, startled Europe with the blasphemy that, if he had been present at creation, he could have suggested a better order of the heavenly bodies. Under the new system, Kepler, filled with a religious spirit, exclaimed, "I do think the thoughts of God." The difference in religious spirit between these two men marks the conquest made in this long struggle by Science for Religion. **[footnote]**

Nothing is more unjust than to cast especial blame for all this resistance to science upon the Roman Church. The Protestant Church, though rarely able to be so severe, has been more blameworthy. The persecution of Galileo and his compeers by the older Church was mainly at the beginning of the seventeenth century; the persecution of Robertson Smith, and Winchell, and Woodrow, and Toy, and the young professors at Beirut, by various Protestant authorities, was near the end of the nineteenth century. Those earlier persecutions by Catholicism were strictly in accordance with principles held at that time by all religionists, Catholic and Protestant, throughout the world; these later persecutions by Protestants were in defiance of principles which all Protestants today hold or pretend to hold, and none make louder claim to hold them than the very sects which persecuted these eminent Christian men of our day, men whose crime was that they were intelligent enough to accept the science of their time, and honest enough to acknowledge it.

Most unjustly, then, would Protestantism taunt Catholicism for excluding knowledge of astronomical truths from European Catholic universities in the seventeenth and eighteenth centuries, while real knowledge of geological and biological and anthropological truth is denied or pitifully diluted in so many American Protestant colleges and universities in the nineteenth century.

Nor has Protestantism the right to point with scorn to the Catholic ***Index***, and to lay stress on the fact that nearly every really important book in the last three centuries has been forbidden by it, so long as young men in so many American Protestant universities and colleges are nursed with "ecclesiastical pap" rather than with real thought, and directed to the works of "solemnly constituted impostors," or to sundry "approved courses of reading," while they are studiously kept aloof from such leaders in modern thought as Darwin, Spencer, Huxley, Draper, and Lecky.

It may indeed be justly claimed by Protestantism that some of the former strongholds of her bigotry have become liberalized; but, on the other hand, Catholicism can point to the fact that Pope Leo XIII, now happily reigning, has made a noble change as regards open dealing with documents. The days of Monsignor Marini, it may be hoped, are gone. The Vatican Library, with its masses of historical material, has been thrown open to Protestant and Catholic scholars alike, and this privilege has been freely used by men representing all shades of religious thought.

As to the older errors, the whole civilized world was at fault, Protestant as well as Catholic. It was not the fault of religion; it was the fault of that short-sighted linking of theological dogmas to scriptural texts which, in utter defiance of the words and works of the Blessed Founder of Christianity, narrow-minded, loud-voiced men are ever prone to substitute for religion. Justly is it said by one of the most eminent among contemporary Anglican divines, that "it is because they have mistaken the dawn for a conflagration that theologians have so often been foes of light."

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The easy path for the Protestant theologians

The difficulties of the older Church -- The papal infallibility fully committed against the Copernican theory

Attempts at evasion:

> ***First plea*: that Galileo was condemned not for affirming the earth's motion, but for supporting it from Scripture -- Its easy refutation**
>
> **Second plea: that he was condemned not for heresy, but for contumacy -- Folly of this assertion**
>
> **Third plea: that it was all a quarrel between Aristotelian professors and those favoring the experimental method**
>
> **Fourth plea: that the condemnation of Galileo was "provisory"**
>
> **Fifth plea: that he was no more a victim of Catholics than of Protestants. Efforts to blacken Galileo's character; to suppress the documents of his trial; their fruitlessness**
>
> **Sixth plea: that the popes as popes had never condemned his theory -- Its confutation from their own mouths**

Abandonment of the contention by honest Catholics

Two efforts at compromise -- Newman, de Bonald

Effect of all this on thinking men

The fault not in Catholicism more than in Protestantism -- not in religion, but in theology

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The invention of the "contumacy" quibble seems due to Monsignor Marini, who appears also to have manipulated the original documents to prove it. Even Whewell was evidently somewhat misled by him, but Whewell wrote before L'Épinois had shown all the documents, and under the supposition that Marini was an honest man.

This argument also seems to have been foisted upon the world by the wily Monsignor Marini.

As a pendant to this ejaculation of Kepler may be cited the words of Linnæus: "Deum omnipotentem a tergo transeuntem vidi et obstupui."

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