ANDREW DICKSON WHITE

THE WARFARE OF SCIENCE

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The Warfare of Science:

Содержание

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TO

HENRY WILLIAMS SAGE,

OF BROOKLYN, N. Y.,

A CHRISTIAN MAN, WHO HAS PROVED THAT HE WELCOMES

ALL TRUTH, AND FEARS NONE,

THIS LITTLE BOOK IS INSCRIBED,

WITH FEELINGS OF

THOROUGH RESPECT AND ESTEEM

PREFATORY NOTE

In its earlier abridged form this address was given as a Phi Beta Kappa oration at Brown University, and, as a lecture, at New York, Boston, New Haven, Ann Arbor, and elsewhere. In that form, substantially, it was published in The Popular Science Monthly. I have now given it careful revision, correcting some errors, and extending it largely by presenting new facts and developing various points of interest in the general discussion. Among the subjects added or rewrought are: in Astronomy, the struggle of Galileo and the retreat of the Church after its victory; in Chemistry and Physics, the compromise between Science and Theology made by Thomas Aquinas, and the unfortunate route taken by Science in consequence; in Anatomy and Medicine, the earlier growth of ecclesiastical distrust of these sciences; in Scientific Education, the dealings of various European universities with scientific studies; in Political and Social Science, a more complete statement of the opposition of the Church, on Scriptural grounds, to the taking of interest for money; and, in the conclusion, a more careful summing up. If I have seemed to encumber the text with notes, it has been in the intention to leave no important assertion unsupported; and in the hope that others—less engrossed with administrative care than myself—may find in them indications for more extended studies in various parts of the struggle which I have but sketched.

A. D. W.

Cornell University, *March, 1876*.

THE WARFARE OF SCIENCE

I purpose to present an outline of the great, sacred struggle for the liberty of science—a struggle which has lasted for so many centuries, and which yet continues. A hard contest it has been; a war waged longer, with battles fiercer, with sieges more persistent, with strategy more shrewd than in any of the comparatively transient warfare of Cæsar or Napoleon or Moltke.

I shall ask you to go with me through some of the most protracted sieges, and over some of the hardest-fought battle-fields of this war. We will look well at the combatants; we will listen to the battle-cries; we will note the strategy of leaders, the cut and thrust of champions, the weight of missiles, the temper of weapons; we will look also at the truces and treaties, and note the delusive impotency of all compromises in which the warriors for scientific truth have consented to receive direction or bias from the best of men uninspired by the scientific spirit, or unfamiliar with scientific methods.

My thesis, which, by an historical study of this warfare, I expect to develop, is the following: *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 to 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 of religion and of science. I say "invariably." I mean exactly that. It is a rule to which history shows not one exception.

It would seem, logically, that this statement cannot be gainsaid. God's truths must agree, whether discovered by looking within upon the soul, or without upon the world. A truth written upon the human heart to-day, in its full play of emotions or passions, cannot be at any real variance even with a truth written upon a fossil whose poor life ebbed forth millions of years ago.

This being so, it would also seem a truth irrefragable, that the search for each of these kinds of truth must be followed out on its own lines, by its own methods, to its own results, without any interference from investigators on other lines, or by other methods. And it would also seem logical to work on in absolute confidence that whatever, at any moment, may seem to be the relative positions of the two different bands of workers, they must at last come together, for Truth is one.

But logic is not history. History is full of interferences which have cost the earth dear. Strangest of all, some of the direst of them have been made by the best of men, actuated by the purest motives, and seeking the noblest results. These interferences, and the struggle against them, make up the warfare of science.

One statement more, to clear the ground. You will not understand me at all to say that religion has done nothing for

science. It has done much for it. The work of Christianity has been mighty indeed. Through these two thousand years, despite the waste of its energies on all the things its Blessed Founder most earnestly condemned—on fetich and subtlety and war and pomp—it has undermined servitude, mitigated tyranny, given hope to the hopeless, comfort to the afflicted, light to the blind, bread to the starving, joy to the dying, and this work continues. And its work for science, too, has been great. It has fostered science often. Nay, it has nourished that feeling of self-sacrifice for human good, which has nerved some of the bravest men for these battles.

Unfortunately, a devoted army of good men started centuries ago with the idea that independent scientific investigation is unsafe—that theology must intervene to superintend its methods, and the Biblical record, as an historical compendium and scientific treatise, be taken as a standard to determine its results. So began this great modern war.

GEOGRAPHY

The first typical battle-field to which I would refer is that of Geography—the simplest elementary doctrine of the earth's shape and surface.

Among the legacies of thought left by the ancient world to the modern, were certain ideas of the rotundity of the earth. These ideas were vague; they were mixed with absurdities; but they were *germ ideas*, and, after the barbarian storm which ushered in the modern world had begun to clear away, these germ ideas began to bud and bloom in the minds of a few thinking men, and these men hazarded the suggestion that the earth is round—is a globe. [1]

The greatest and most earnest men of the time took fright at once. To them, the idea of the earth's rotundity seemed fraught with dangers to Scripture: by which, of course, they meant *their interpretation* of Scripture.

Among the first who took up arms against the new thinkers was Eusebius. He endeavored to turn off these ideas by bringing science into contempt, and by making the innovators understand

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[1] Most fruitful among these were those given by Plato in the *Timæus*. See, also, Grote on Plato's doctrine of the rotundity of the earth. Also *Sir G. C. Lewis's Astronomy of the Ancients*, London, 1862, chap. iii., sec. i. and note. Cicero's mention of the antipodes and reference to the passage in the *Timæus* are even more remarkable than the original, in that they much more clearly foreshadow the modern doctrine. See *Academic Questions*, ii., xxxix. Also, *Tusc. Quest.*, i., xxviii., and v., xxiv.

that he and the fathers of the Church despised all such inquiries. Speaking of the innovations in physical science, 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." [2]

Lactantius asserted the ideas of those studying astronomy to be "mad and senseless." [3]

But the attempt to "flank" the little phalanx of thinkers did not succeed, of course. Even such men as Lactantius and Eusebius cannot pooh-pooh down a new scientific idea. The little band of thinkers went on, and the doctrine of the rotundity of the earth naturally led to the consideration of the tenants of the earth's surface, and another germ idea was warmed into life—the idea of the existence of the antipodes, the idea of the existence of countries and men on the hemisphere opposite to ours. [4]

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[2] See *Eusebius*, *Præp. Ev.*, xv., 61.

[3] See *Lactantius*, *Inst.*, 1., iii., chap. 3. Also, citations in *Whewell*, *Hist. Induct. Sciences*, Lond., 1857, vol. i., p. 194. To understand the embarrassment thus caused to scientific men at a later period, see *Letter of Agricola to Joachimus Vadianus* in 1514. Agricola asks Vadianus to give his views regarding the antipodes, saying that he himself does not know what to do, between the Fathers on one side and learned men of modern times on the other. On the other hand, for the embarrassment caused to the Church by this mistaken zeal of the Fathers, see Kepler's references and Fromund's replies; also *De Morgan*, *Paradoxes*, p. 58. Kepler appears to have taken great delight in throwing the views of Lactantius into the teeth of his adversaries.

[4] *Another germ idea*, etc. See *Plato*, *Timæus*, 62 C., Jowett's translation, N. Y. ed. Also *Phædo*, pp. 449, *et seq.* Also *Cicero*, *Academic Quest.*, and *Tusc. Disput.*, *ubi supra*. For citations and summaries, see *Whewell*, *Hist. Induct. Sciences*, vol. i., p. 189, and *St. Martin*, *Hist. de la Géog.*, Paris, 1873, p. 96. Also *Leopardi*, *Saggio sopra gli*

At this the war-spirit waxed hot. Those great and good men determined to fight. To all of them such doctrines seemed dangerous; to most of them they seemed damnable. St. Basil and St. Ambrose [5] were tolerant enough to allow that a man might be saved who believed the earth to be round, and inhabited on its opposite sides; but the great majority of the Fathers of the Church utterly denied the possibility of salvation to such misbelievers.

Lactantius asks: "… 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?… But if you inquire from those who defend these marvelous fictions, why all things do not fall into that lower part of the heaven, they reply that such is the nature of things, that heavy bodies are borne toward the middle, like the spokes of a wheel; while light bodies, such as clouds, smoke, and fire, tend from the centre toward the heavens on all sides. Now, I am at loss what to say of those who, when they have once erred, steadily persevere in their folly, and defend one vain thing by another."

St. Augustine seems inclined to yield a little in regard to the rotundity of the earth, but he fights the idea that men exist on the other side of the earth, saying that "Scripture speaks of no

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errori popolari degli antichi, Firenze, 1851, chap. xii., p. 184, *et seq.*

[5] For opinion of Basil, Ambrose, and others, see *Lecky*, *Hist. of Rationalism in Europe*, New York, 1872, vol. i., p. 279, note. Also, *Letronne*, in *Revue des Deux Mondes*, March, 1834.

such descendants of Adam."

But this did not avail to check the idea. What may be called the flank movement, as represented by Eusebius, had failed. The direct battle given by Lactantius, Augustine, and others, had failed; in the sixth century, therefore, the opponents of the new ideas built a great fortress and retired into that. It was well built and well braced. It was nothing less than a complete theory of the world, based upon the literal interpretation of texts of Scripture, and its author was Cosmas Indicopleustes. [6]

According to Cosmas, the earth is a parallelogram, flat, and surrounded by four great seas. At the outer edges of these seas rise immense walls closing in the whole structure. These walls support the vault of the heavens, whose edges are cemented to the walls; walls and vault shut in the earth and all the heavenly bodies. The whole of this theologic, scientific fortress was built most carefully, and, as was then thought, most scripturally.

Starting with the expression, *Το ἁγιον κοσμικόν*, applied in the ninth chapter of Hebrews to the tabernacle in the desert, he insists, with other interpreters of his time, that it gives a key to the whole construction of the world. The universe is, therefore, made

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[6] For Lactantius, see *Instit.*, iii., 24, translation in the Ante-Nicene Library; also, citations in *Whewell*, i., 196, and in *St. Martin*, *Histoire de la Géographie*, pp. 216, 217. For St. Augustine's opinion, see the *Civ. D.*, xvi., 9, where this great Father of the Church shows that the existence of the antipodes "nulla ratione credendum est." Also, citations in *Buckle's Posthumous Works*, vol. ii., p. 645. For a notice of the views of Cosmas in connection with those of Lactantius, Augustine, St. John Chrysostom, and others, see *Schoell*, *Histoire de la Littérature Grecque*, vol. vii., pp. 37, *et seq.*

on the plan of the Jewish Tabernacle—box-like and oblong.

Coming to details, he quotes those grand 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," [7] and the passage in Job, which speaks of the "pillars of heaven." [8] He turns all that splendid and precious poetry into a prosaic statement, and gathers therefrom, as he thinks, treasures for science.

This vast box is then 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, where 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," [9] 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," [10] casts that outburst of poetry into his crucible with the other texts, and, after subjecting them to sundry peculiar processes, brings out the theory that over this first vault is a vast cistern containing the waters. He then takes the expression in Genesis regarding

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[7] Isaiah xl. 22.

[8] Job xxvi. 11.

[9] Genesis i. 6.

[10] Psalm cxlviii. 4.

the "windows of heaven," [11] and establishes a doctrine regarding the regulation of the rain, which is afterward supplemented by the doctrine that the angels not only push and pull the heavenly bodies, to light the earth, but also open and close the windows of heaven to water it.

To find the character of the surface of the earth, Cosmas studies the table of shew-bread in the Tabernacle. The dimensions of that table prove to him that the earth is flat and twice as long as broad; the four corners of the table symbolize the four seasons. 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 great pit at night, and was pulled out in the morning. Nothing can be more touching in its simplicity than Cosmas's closing of his great argument. He bursts forth in raptures, declaring that Moses, the prophets, evangelists, and apostles, agree to the truth of his doctrine. [12]

Such was the fortress built against human science in the sixth

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[11] Genesis vii. 11.

[12] See *Montfaucon*, *Collectio Nova Patrum*, Paris, 1706, vol ii., p. 188; also pp. 298, 299. The text is illustrated with engravings showing walls and solid vault (firmament), with the whole apparatus of "fountains of the great deep," "windows of heaven," angels, and the mountain behind which the sun is drawn. For an imperfect reduction of one of them, see article *Maps* in *Knight's Dictionary of Mechanics*, New York, 1875. For still another theory, very droll, and thought out on similar principles, see Mungo Park, cited in *De Morgan*, *Paradoxes*, 309. For Cosmas's joyful summing up, see *Montfaucon*, *Collectio Nova Patrum*, vol. ii., p. 255.

century, by Cosmas; and it stood. The innovators attacked it in vain. The greatest minds in the Church devoted themselves to buttressing it with new texts, and throwing out new outworks of theologic reasoning. It stood firm for two hundred years, when a bishop—Virgilius of Salzburg—asserts his belief in the existence of the antipodes.

It happened that there then stood in Germany, in the 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 to the apostles; his genius for Christian work made him, unwillingly, Primate of Germany; his devotion afterward led him, willingly, to martyrdom. There sat, too, at that time, on the papal throne, a great Christian statesman—Pope Zachary. Boniface immediately declares against the revival of such a terrible heresy as the existence of the antipodes. He declares that it amounts to the declaration that there are men on the earth beyond the reach of the means of salvation; he attacks Virgilius; he calls on Zachary for aid; effective measures are taken, and we hear no more of Virgilius or his doctrine.

Six hundred years pass away, and in the fourteenth century two men publicly assert the doctrine. The first of these, Peter of Abano, escapes punishment by natural death; the second, known as Cecco d'Ascoli, a man of seventy years, is burned alive. Nor was that all the punishment: that great painter, Orcagna, whose terrible works you may see on the walls of the Campo Santa at Pisa, immortalized Cecco by representing him in the flames of

hell. [13]

Still the idea lived and moved, and a hundred years later we find the theologian Tostatus protesting against the doctrine of the antipodes as "unsafe." He has invented a new missile—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." This is just before the time of Columbus.

Columbus is the next warrior. The world has heard of his battles: how the Bishop of Ceuta worsted him in Portugal; how at the Junta of Salamanca the theologians overwhelmed him with quotations from the Psalms, from St. Paul, and from St. Augustine. [14] And even after Columbus was triumphant, and after his voyage had greatly strengthened the theory of the

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[13] Virgil of Salzburg. See *Neander's History of the Christian Church*, Torrey's translation, vol. iii., p. 63. Since Bayle, there has been much loose writing about Virgil's case. See *Whewell*, p. 197; but for best choice of authorities and most careful winnowing out of conclusions, see *De Morgan*, pp. 24-26. For very full notes as to pagan and Christian advocates of doctrine of rotundity of the earth and of antipodes, and for extract from Zachary's letter, see *Migne*, *Patrologia*, vol. vi., p. 426, and vol. xli., p. 487. For Peter of Abano, or Apono, as he is often called, see *Tiraboschi*; also, *Ginguené*, vol. ii., p. 293; also *Naudé*, *Histoire des Grands hommes accusés de Magie*. For Cecco d'Ascoli, see *Montucla*, *Histoire des Mathématiques*, i., 528; also, *Daunou*, *Études Historiques*, vol. vi., p. 320. Concerning Orcagna's representation of Cecco in flames of hell, see *Renan*, *Averroès et l'Averroisme*, Paris, 1867, p. 328.

[14] For Columbus before the Junta of Salamanca, see *Irving's Columbus*, Murray's edition, vol. ii., pp. 405-410. *Figuier*, *Savants du Moyen Age*, etc., vol. ii., p. 394, *et seq.* Also, *Humboldt*, *Histoire de la Géographie du Nouveau Continent*.

earth's sphericity, the Church, by its highest authority, was again solemnly committed to the theory of the earth's flatness. In 1493 Pope Alexander VI. issues a bull laying down a line of demarkation upon the earth as a flat disk; this line was drawn from north to south, west of the Azores and Canary Islands; and the Pope, in the plenitude of his knowledge and powers, declared that all lands discovered east of this line should belong to the Portuguese, and all discovered west of it should belong to the Spaniards. This was hailed as an exercise of divinely illuminated power in the Church; but in a few years difficulties arose. The Portuguese claimed Brazil, and, of course, had no difficulty in showing that it could be reached by sailing to the east of the line, provided the sailing were sufficiently long-continued. The bull of Pope Alexander quietly passed into the catalogue of ludicrous errors. [15]

But in 1519 Science gains a crushing victory. Magalhaens makes his famous voyages. He proves the earth to be round, for his great expedition circumnavigates it; he proves the doctrine of the antipodes, for he sees the men of the antipodes; [16] but even this does not end the war. Many earnest and good men oppose the doctrine for two hundred years longer. Then the French astronomers make their measurements of degrees in equatorial

[15] See *Daunou*, *Études Historiques*, vol. ii., p. 417.

[16] For effect of Magalhaens's voyages, and the reluctance to yield to proof, see *Henri Martin*, *Histoire de France*, vol. xiv., p. 395; *St. Martin's Histoire de la Géog.*, p. 369; *Peschel*, *Geschichte des Zeitalters der Entdeckungen*, concluding chapters; and for an admirable summary, *Draper*, *Hist. Int. Dev. of Europe*, pp. 451-453.

and polar regions, and add to other 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, perfectly, then and then only this war of twelve centuries ended. [17]

And now, what was the result of this war? The efforts of Eusebius and Lactantius to deaden scientific thought; the efforts of Augustine to combat it; the efforts of Cosmas to stop it by dogmatism; the efforts of Boniface, and Zachary, and others to stop it by force, conscientious as they all were, had resulted in what? Simply in forcing into many noble minds this most unfortunate conviction, that Science and Religion are enemies; simply in driving away from religion hosts of the best men in all those centuries. The result was wholly bad. No optimism can change that verdict.

On the other hand, what was gained by the warriors of science for religion? Simply, a far more ennobling conception of the world, and a far truer conception of Him who made and who sustains it.

Which is the more consistent with a great, true religion—the cosmography of Cosmas, or that of Isaac Newton? Which presents the nobler food for religious thought—the diatribes of Lactantius, or the astronomical discourses of Thomas Chalmers?

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[17] For general statement as to supplementary proof by measurement of degrees, and by pendulum, see *Somerville*, *Phys. Geog.*, chapter i, § 6, note. Also *Humboldt*, *Cosmos*, vol. ii., p. 736, and v., pp. 16, 32. Also *Montucla*, iv., 138.

ASTRONOMY

The next great battle was fought on a question relating to the *position of the earth among the heavenly bodies*. On one side, the great body of conscientious religious men planted themselves firmly on the geocentric doctrine—the doctrine that the earth is the centre, and that the sun and planets revolve about it. The doctrine was old, and of the highest respectability. [18] The very name, Ptolemaic theory, carried weight. It had been elaborated until it accounted well for the phenomena. Exact textual interpreters of Scripture cherished it, for it agreed with the letter of the sacred text. [19]

But, most important of all, it was stamped with the seal of St. Thomas Aquinas. The sainted theologian—the glory of the Mediæval Church, the "angelic doctor"—he to whom it was believed an image of the Crucified had spoken words praising his writings—had shown in his treatise on the Heaven and Earth, by philosophy, theology, and revelation, that the position of the

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[18] *Respectability of Geocentric Theory*, *Plato's Authority for it* etc., see *Grote's Plato*, vol. iii., p. 257. Also, *Sir G. C. Lewis*, *Astronomy of the Ancients*, chap, iii., sec. i., for a very thoughtful statement of Plato's view, and differing from ancient statements. For plausible elaboration of it, see *Fromundus*, *Anti-Aristarchus*, Antwerp, 1631. Also *Melanchthon*, *Initia Doctrinæ Physicæ*.

[19] For supposed agreement of Scripture with Ptolemaic theory, see Fromundus, *passim*, Melanchthon, and a host of other writers.

earth must be in the centre. [20]

Still the germs of the heliocentric theory [21] had been planted long before, and well planted; it had seemed ready even to bloom forth in the fifth century, from the mind of Martianus Capella, and in the fifteenth from the mind of Cardinal de Cusa; but it could not be forgotten that St. Thomas had elaborated the opposite view; the chill of dogmatism was still over the earth, and up to the beginning of the sixteenth century there had come to this great truth neither bloom nor fruitage. [22]

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[20] See *St. Thomas Aquinas*, *Liber de Cœlo et Mundo*, sec. xx.

[21] For *Germs of Heliocentric Theory planted long before*, etc., see *Sir G. C. Lewis*; also, *Draper*, *Intellectual Development of Europe*, p. 512; and for a succinct statement of the claims of Pythagoras, Philolaus, Aristarchus, and Martianus Capella, see *Hœfer*, *Hist. de l'Astronomie*, 1873, p. 107, *et seq.* For germs among thinkers of India, see *Whewell*, vol. i., p. 277. Also, *Whitney*, *Oriental and Linguistic Studies*, New York, 1874; *Essay on the Lunar Zodiac*, p. 345.

[22] For general statement of De Cusa's work, see *Draper*, *Intellectual Development of Europe*, p. 512. For skillful use of De Cusa's view in order to mitigate censure upon the Church for its treatment of Copernicus's discovery, see an article in the *Catholic World* for January, 1869. For a very exact statement, in a spirit of judicial fairness, see *Whewell*, *History of the Inductive Sciences*, p. 275 and pp. 379, 380. In the latter, Whewell cites the exact words of De Cusa in the *De Docta Ignorantia*, and sums up in these words: "This train of thought might be a preparation for the reception of the Copernican system; but it is very different from the doctrine that the sun is the centre of the planetary system." In the previous passage, Whewell says that De Cusa "propounded the doctrine of the motion of the earth, more, however, as a paradox than as a reality. We cannot consider this as any distinct anticipation of a profound and consistent view of the truth." For Aristotle's views and their elaboration by St. Thomas Aquinas, see the treatise *De Cœlo et Mundo*. It is curious to see how even such a biographer of St. Thomas as Archbishop Vaughan slurs over the angelic doctor's errors. See *Vaughan's Life and Labors of St. Thomas of Aquin*, pp. 459, 460.

Quietly, however, the soil was receiving enrichment, and the air warmth. The processes of mathematics were constantly improved, the heavenly bodies were steadily though silently observed; and at length appeared, afar off from the centres of thought, on the borders of Poland, a plain, simple-minded scholar, who first fairly uttered to the 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, and that man was Nicholas Kopernik. [23]

Kopernik had been a professor at Rome, but, as this truth grew within him, he seemed to feel that at Rome he was no longer safe. [24]

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[23] For improvement of mathematical processes, see *Draper*, *Intellectual Development of Europe*, 513. In looking at this and other admirable summaries, one feels that Prof. Tyndall was not altogether right in lamenting, in his farewell address at New York, that Dr. Draper has devoted so much of his time to historical studies.

[24] Kopernik's danger at Rome. The *Catholic World* for January, 1869, cites a recent 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 idea Whewell seems utterly to disprove, avails nothing against the overwhelming testimony that Copernicus felt himself in danger—testimony which the after-history of the Copernican theory renders invincible. The very title of Fromundus's book, already cited, published within a few miles of the archbishop's own cathedral, and sanctioned expressly by the theological Faculty of that same University of Louvain in 1630, utterly refutes the archbishop's idea that the Church was inclined to treat Copernicus kindly. The title is as follows:"Anti-Aristarchus | Sive | Orbis-Terræ | Immobilis | In quo decretum S. Congregationis S. R. E. | Cardinalium | IↃC. XVI adversus Pytha | gorico-Copernicanos editum defenditur

To publish this thought was dangerous indeed, and for more than thirty years it lay slumbering in the minds of Kopernik and the friends to whom he had privately intrusted it.

At last he prepares his great work on the *Revolution of the Heavenly Bodies*, and dedicates it to the pope himself. He next seeks a place of publication. He dares not send it to Rome, for there are the rulers of the older Church ready to seize it. He dares not send it to Wittenberg, for there are the leaders of Protestantism no less hostile. It is therefore intrusted to Osiander, of Nuremberg. [25]

But, at the last moment, Osiander's courage fails him. He dares not launch the new thought boldly. He writes a groveling preface; endeavors to excuse Kopernik for his novel idea. He inserts the apologetic lie that Kopernik propounds the doctrine of the movement of the earth, not as a *fact*, but as an *hypothesis*; he declares that it is lawful for an astronomer to indulge his *imagination*, and that this is what Kopernik has done.

| Antwerpiæ MDCXXXI."*L'Epinois*, *Galilée*, Paris, 1867, lays stress, p. 14, on the broaching of the doctrine by De Cusa, in 1435, and by Widmanstadt, in 1533, and their kind treatment by Eugenius IV. and Clement VII., but this is absolutely worthless in denying the papal policy afterward. *Lange*, *Geschichte des Materialismus*, vol. i., pp. 217, 218, while admitting that De Cusa and Widmanstadt sustained this idea and received honors from their respective popes, shows that, when the Church gave it serious consideration, it was condemned. There is nothing in this view unreasonable. It would be a parallel case to that of Leo X., at first inclined toward Luther and the others, in their "squabbles with the begging friars," and afterward forced to oppose them. That Copernicus felt the danger, is evident, among other things, by the expression in the preface, "*Statim me explodendum cum tali opinione clamitant.*"

[25] For dangers at Wittenberg, see *Lange*, *Geschichte des Materialismus*, vol. i., p. 217.

Thus was the greatest and most ennobling, perhaps, of scientific truths—a truth not less ennobling to religion than to science—forced, in coming into the world, to sneak and crawl. [26]

On the 24th of May, 1543, the newly-printed book first arrived at the house of Kopernik. It was put into his hands; but he was on his death-bed. A few hours later he was beyond the reach of those mistaken, conscientious men, whose consciences 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 life-long labors, no mention of his great discovery. There were graven upon it affecting words, which may be thus simply translated: "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

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[26] 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." See *Apologia Tychonis* in *Kepleri Opera Omnia*, Frisch's edition, vol. i., p. 246. Kepler holds Osiander entirely responsible for this preface. Bertrand, in his *Fondateurs de l'Astronomie Moderne*, gives its text, and thinks it possible that Copernicus may have yielded "in pure condescension toward his disciple." But this idea is utterly at variance with expressions in Copernicus's own dedicatory letter to the pope, which follows the preface. For a good summary of the argument, see *Figuier*, *Savants de la Renaissance*, pp. 378, 379. See, also, citation from Gassendi's life of Copernicus, in *Flammarion*, *Vie de Copernic*, p. 124. Mr. John Fiske, accurate as he usually is, in his recent *Outlines of Cosmic Philosophy*, appears to have followed Laplace, Delambre, and Petit into the error of supposing that Copernicus, and not Osiander, is responsible for the preface.

write on his tombstone a memorial of his discovery. [27]

The book was taken in hand by the proper authorities. In due time it was solemnly condemned; to read it was to risk damnation; and the world accepted the decree. [28] The earnest theologians of the period immediately wheeled their batteries of sacred learning to support the Church in its effort to beat back the terrible doctrine that the earth revolves about the sun. Among the most vigorous of them in Northern Europe was Fromundus. From the shadow of the Cathedral of Antwerp he sent forth his famous treatise, the *Anti-Aristarchus*, full of the strongest arguments against the new theory. His very title-page

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[27] *Figuier*, *Savants de la Renaissance*, p. 380. Also, *Flammarion*, *Vie de Copernic*, p. 190.

[28] The "proper authorities" in this case 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 is sanctioned by the highest Church authority, and required to be universally accepted by the Church. Three of four editions of the "Index" in my own possession 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. See, especially, Index of 1664, issued under order of Alexander VII., and that of 1761, under Benedict XIV. Copernicus's work was prohibited in the Index "*donec corrigatur*." Kepler said that it ought to be worded "*donec explicetur*." See *Bertrand*, *Fondateurs de l'Astronomie Moderne*, p. 57. *De Morgan*, pp. 57-60, gives the corrections required by the Index of 1620. Their main aim seems to be to reduce Copernicus to the groveling level of Osiander, making of his discovery a mere hypothesis; but occasionally they require a virtual giving up of the whole Copernican doctrine, e. g., "correction" insisted upon for cap. 8, p. 6. For scholarly account of the relation of the Prohibitory and Expurgatory Indexes to each other, see *Mendham*, *Literary Policy of the Church of Rome*.

was a contemptuous insult to the memory of Kopernik, since it paraded the assumption that the new truth was only an old and exploded theory of Aristarchus. He 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 the passage from Ecclesiastes, "the earth standeth fast forever." To show the utter futility of the Copernican ideas, he indulges in scientific reasoning as he understands it—declaring that, if the hated theory were true, "the wind would constantly blow from the east; we should with great difficulty hear sounds against such a wind;" that "buildings, and the earth itself, would fly off with such a rapid motion;" and, greatest weapon of all, he works up, by the use of Aristotle and Thomas Aquinas, a demonstration from theology and science combined, that the earth must stand in the centre, and that the sun must revolve about it. [29]

Doubtless many will at once exclaim against the Roman Catholic Church for this. Justice compels me to say that the founders of Protestantism were no less zealous against the new scientific doctrine. Said Martin Luther: "People gave ear to an upstart astrologer, who strove to show that the earth revolves, not

[29] See Fromundus's book, cited above, *passim*, but especially the heading of chapter vi., and the argument in chaps, x. and xi. For interesting reference to one of Fromundus's arguments, showing by a mixture of mathematics and theology, that the earth is the centre of the universe, see *Quetelet*, *Histoire des Sciences Mathématiques et Physiques*, Bruxelles, 1864, p. 170.

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 Kopernik. In his treatise, *Initia Doctrinæ Physicæ*, 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 passages from the Psalms and from 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 centre of the universe." [30]

And Protestant people were not a whit behind Catholic

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[30] See *Luther's Tischreden*, *Irmischer's Ausgabe*. Also, *Melanchthon's Initia Doctrinæ Physicæ*. This treatise is cited under a mistaken title by the *Catholic World*, September, 1870. The correct title is as given above. It will be found in the *Corpus Reformatorum*, ed. *Bretschneider*, Halle, 1846. (For the above passage, see vol. xiii., pp. 216, 217.) Also, *Lange*, *Geschichte des Materialismus*, vol. i., p. 217. Also, *Prowe*, *Ueber die Abhängigkeit des Copernicus*, Thorn, 1865, p. 4. Also, note, pp. 5 and 6, where text is given in full.

in following out these teachings. The people of Elbing made themselves merry over a farce in which Kopernik was the main object of ridicule. The people of Nuremberg, a great Protestant centre, caused a medal to be struck, with inscriptions ridiculing the philosopher and his theory. [31]

Then was tried, also, one piece of strategy very common formerly in battles between theologians themselves. It consists in loud shoutings that the doctrine attacked is outworn, and already refuted—that various distinguished gentlemen have proved it false—that it is not a living truth, but a detected lie—that, if the world listens to it, that is simply because the world is ignorant. This strategy was brought to bear on Kopernik. It was shown that his doctrine was simply a revival of the Pythagorean notion, which had been thoroughly exploded. Fromundus, as we have seen in his title-page and throughout his book, delights in referring to the doctrine of the revolution of the planets around the sun, as "that Pythagorean notion." This mode of warfare was imitated by the lesser opponents, and produced, for some time, considerable effect. [32]

But the new truth could neither be laughed down nor forced down. Many minds had received it; only one tongue dared utter it. This new warrior was that strange mortal, Giordano Bruno. He was hunted from land to land, until, at last, he turns on his

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[31] For treatment of Copernican ideas by the people, see *Catholic World*, as above.

[32] See title-page of Fromundus's work cited in note at bottom of p. 392; also, Melanchthon, *ubi supra*.

pursuers with fearful invectives. For this he is imprisoned six years, then burned alive and his ashes scattered to the winds. Still the new truth lived on; it could not be killed. Within ten years after the martyrdom of Bruno, [33] after a world of troubles and persecutions, the truth of the doctrine of Kopernik was established by the telescope of Galileo. [34]

Herein was fulfilled one of the most touching of prophecies. Years before, the enemies of Kopernik had said to him, "If your doctrines were true, Venus would show phases like the moon." Kopernik answered: "You are right; I know not what to say; but God is good, and will in time find an answer to this objection." [35] The God-given answer came when the rude telescope of Galileo showed the phases of Venus.

On this new champion, Galileo, 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

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[33] See *Bartholmess*, *Vie de Jordano Bruno*, Paris, 1846, vol. i., pp. 121 and 212, *et seq.* Also *Berti*, *Vita di Giordano Bruno*, Firenze, 1868, chapter xvi. Also *Whewell*, i., 294, 295. That Whewell is somewhat hasty in attributing Bruno's punishment entirely to the *Spaccio della Bestia Trionfante* will be evident, in spite of Montucla, to any one who reads the account of the persecution in Bartholmess or Berti; and, even if Whewell be right, the *Spaccio* would never have been written, but for Bruno's indignation at ecclesiastical oppression. See *Tiraboschi*, vol. xi., p. 435.

[34] *Delambre*, *Histoire de l'Astronomie moderne*, discours préliminaire, p. xiv. Also *Laplace*, *Système du Monde*, vol. i., p. 326, and for more careful statement, *Kepleri Opera Omnia*, edit. Frisch, tom. ii., p. 464.

[35] *Cantu*, *Histoire Universelle*, vol. xv., p. 473.

Church, attacked him with sham science; earnest preachers attacked him with perverted Scripture! [36]

I shall present this warfare at some length, because, so far as I can find, no careful outline of it has been given in our language, since the whole history was placed in a new light by the revelation of the trial documents in the Vatican Library, published for the first time by M. de l'Epinois in 1867.

The first important attack on Galileo began when he announced that his telescope had revealed the moons of the planet Jupiter; the enemy saw that this strengthened the Copernican theory, and gave battle immediately.

The whole theory was denounced as impossible and impious. Professors, bred in the mixed science favored by the Church, [37] argued that the Bible clearly 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

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[36] A very curious example of this sham science is seen in the argument, frequently used at the 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 him to test the matter by dropping a stone from the topmast of a ship. But the most beautiful thing of all is that Benzenburg has experimentally demonstrated just such an aberration in falling bodies as is mathematically required by the diurnal motion of the earth. See *Jevons*, *Principles of Science*, vol. i., p. 453, and ii., pp. 310, 311.

[37] See Delambre as to the discovery of the satellites of Jupiter being the turning-point with the heliocentric doctrine. As to its effects on Bacon, see *Jevons*, *Principles of Science*, vol. ii., p. 298.

seven churches of Asia: [38] theologians showed the destructive consequences which must logically result to fundamental Christian truths: bishops and priests uttered impressive warnings to their flocks; and multitudes of the faithful besought the Inquisition to protect the fold by dealing speedily and sharply with the heretic.

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 declared that by making such an argument his heresy was only rendered more detestable; that he was "worse than Luther or Calvin."

In vain did he 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 see them, denounced them 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." [39]

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

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[38] For argument drawn from the candlestick and seven churches, see Delambre.

[39] *Libri*, vol. iv., p. 211. *De Morgan*, *Paradoxes*, p. 26, for account of Father Clavius. It is interesting to know that Clavius, in his last years, acknowledged that "the whole system of the heavens is broken down, and must be mended."

are fixed so firm that they cannot be moved," and that the sun "runneth about from one end of heaven to the other." [40]

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 was the first of a series of sharper weapons; for before Caccini finishes, he insists that "geometry is of the devil," and that "mathematicians should be banished as the authors of all heresies;" and, for this, the Church authorities gave Caccini promotion. [41]

Father Lorini proved that the doctrine was not only "heretical," but "atheistic," and besought the Inquisition to intervene. The Bishop of Fiesole screamed in rage against the Copernican system, and proposed to denounce Galileo 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 doctrines of Kopernik and Galileo as unscriptural.

But by far the most terrible champion who appeared against him was Bellarmin, one of the greatest of theologians, and one of the poorest of scientists. He was earnest, sincere, learned, but made the fearful mistake for the world of applying to science, direct, literal interpretation of Scripture. [42]

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[40] *Cantu*, *Histoire Universelle*, vol. xv., p. 478.

[41] For Caccini's attack, see *Delambre*, *Hist. de l'Astron.*, disc. prélim., p. xxii.; also, *Libri*, *Hist. des Sciences Math.*, vol. iv., p. 232; also, *Martin*, *Galilée*, pp. 43, 44.

[42] For Bellarmin's view, see *Quinet*, *Jesuits*, vol. ii., p. 189. For other objectors and

The weapons which men of Bellarmin's stamp used were theological. They held up before the world the dreadful consequences which must result to Christian theology were the doctrine to prevail that the heavenly bodies revolve about the sun, and not about the earth. Their most tremendous theologic engine against Galileo was the idea that his pretended discovery "vitiated the whole Christian plan of salvation." Father Lecazre declared that it "cast suspicion on the doctrine of the Incarnation." Others declared that it "upset the whole basis of theology; that, if the earth is a planet, and one among several planets, it cannot be that any such great things have been done especially 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 these inhabitants be descended from Adam? How can they trace back their origin to Noah's ark? How can they have been redeemed by the Saviour?" [43]

Nor was this argument confined to the theologians of the Roman Church; Melanchthon, Protestant as he was, had already used it in his attacks upon the ideas of Kopernik and his school. [44]

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

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objections, see *Libri*, *Histoire des Sciences Mathématiques en Italie*, vol. iv., pp. 233, 234; also, *Martin*, *Vie de Galilée*.

[43] See Trouessart, cited in *Flammarion*, *Mondes Imaginaires et Réels*, sixième édition, pp. 315, 316.

[44] *Initia Doctrinæ Physicæ*, pp. 220, 221.

But the little telescope of Galileo still swept the heavens, and the next revelation announced was the system of mountains and valleys in the moon. This was a signal for another attack. It was declared that this, coupled with the statement that the moon shines by light reflected from the sun, was a contradiction of the statement in Genesis that the moon is a "great light" like the sun. 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.

The next struggle was aroused when the hated telescope revealed spots upon the sun, and their motion, which indicated the sun's rotation. Monsignor Elci, head of the University of Pisa, forbade the Professor of Astronomy, Castelli, to mention these spots. Father Busaeus, at the University of Innspruck, forbade the astronomer Scheiner to allow the new discovery to be known there. At the College of Douay and the University of Louvain it was expressly placed under the ban, and this became the general rule among the Catholic universities and colleges of Europe. The Spanish universities were specially intolerant of this and similar ideas, [45] and up to a recent period they were strictly forbidden in the most important university of all—that of Salamanca. In 1820 the Abbé Settele, professor at the College of Rome, having announced a work on Optics and Astronomy, the master of the

[45] See *Ticknor*, *Hist. of Span. Literature*, vol. iii.

sacred palace, under the authority of the old decrees against the teachings of Kopernik and Galileo, forbade the publication, and it was not until 1822 that Pope Pius VII. sanctioned a decision of the Inquisition permitting such teachings. [46]

Such are the consequences of placing the instruction of men's minds in the hands of those mainly absorbed in the work of saving men's souls. [47] Nothing could be more in accordance with the idea recently put forth by the Bishop of Montpellier, that the Church is alone fully empowered to promulgate scientific truth or direct university instruction; but science gained the victory here also. News came of observations of the solar spots, not only from Galileo in Italy, but from Fabricius in Holland. Father Scheiner then endeavors to make the usual treaty; he promulgates a pseudo-scientific theory—a statement based on a "religious science"—which only provokes derision.

But the war grew more and more bitter, and the principal weapons in it are worth examining. They are very easily examined; you may pick them up on any of the battle-fields of science; but on that field they were used with more effect than on almost any other. These weapons are two epithets: "Infidel" and "Atheist."

The battle-fields of science are thickly strewn with these. They have been used against almost every man who has ever done

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[46] See *Th. Martin*, *Galilée*, pp. 34, 208, and 266.

[47] See *Martin*, *Galilée*, pp. 34 and 208; also a curious note in the earlier English editions, *Lyell*, *Principles of Geology*, Introduction.

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, philanthropists. The deepest Christian life, the most noble Christian character, have not availed to shield combatants. Christians like Isaac Newton and Pascal and John Locke and John Milton, and even Howard and Fénelon, have had these weapons 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; and 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 prevented the rendering of any due honors to him at his burial. [48]

These epithets can hardly be classed with civilized weapons. They are burning arrows. They set fire to great masses of popular prejudices; smoke rises to obscure the real questions; fire bursts forth at times to destroy the attacked party. They are poisoned. They go to the hearts of loving women, they alienate dear children; they injure the man after life is ended, for they leave poisoned wounds in the hearts of those who loved him best—fears for his eternal happiness—dread of the Divine displeasure. Of course, in these days, these weapons, though often effective in disturbing good men and in scaring good women, are somewhat

[48] For curious exemplification of the way in which these weapons have been hurled, see lists of persons charged with "infidelity" and "atheism," in *Le Dictionnaire des Athées*, Paris, An. viii. Also, *Lecky*, *History of Rationalism*, vol. ii., p. 50. For case of Descartes, see *Saisset*, *Descartes et ses précurseurs*, pp. 103, 110.

blunted. Indeed, they not unfrequently injure assailants more than assailed. So it was not in the days of Galileo; they were then in all their sharpness and venom.

Yet far more vile than the use even of these weapons—vile indeed beyond belief—was the attack by the Archbishop of Pisa.

It is a remark made by one of the most moderate and judicially fair of modern philosophic historians, that, of all organizations this world has known, the Roman Church has caused most undeserved woe and shed most innocent blood; but, in the whole terrible succession of Torquemadas and Arbues and Granvilles, the vilest enemy of the human race is probably this same Archbishop of Pisa.

This man, whose cathedral is more truly consecrated by the remembrance of Galileo's observation of the lamp swinging before its altar, than by all the church services of a thousand years, began a siege against the great philosopher.

Galileo, after his discoveries had been denounced as contrary to Scripture, had been induced to write to the Duchess Christine and to his friend Castelli two letters, to show that his discoveries might be reconciled to Scripture. The archbishop saw his opportunity: he determined to get hold of these letters and exhibit them as proofs that Galileo had uttered heretical views of theology and the Scriptures, and thus to bring the astronomer hopelessly 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 inquisitors against Galileo, professes to Castelli the greatest admiration of Galileo's genius, and a sincere desire to know more of his discoveries. Castelli is seduced by this; but Galileo sturdily forbids sending the letter, and the archbishop is obliged to resort 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, priests, bishops, archbishops, cardinals, and even the future Pope Urban VIII. himself. It is most suggestive to see in this crisis of the Church, on the eve of the greatest errors in church policy the world has known, in all the efforts and deliberations of these consecrated leaders of the Church, at the tomb of the Prince of the Apostles, no more sign of the guidance or presence of the Holy Spirit than in a caucus of New York politicians.

But the opposing powers were too strong. In 1615 Galileo is summoned by the Inquisition to Rome, and the mine, which had been so long preparing, was sprung. Pope Paul V. and the cardinal inquisitors order eleven theologians of the Inquisition to examine these two propositions which had been extracted from Galileo's letters on the solar spots: *First*, that the sun does not move about the earth; *secondly*, that the earth does move about the sun. The eleven theologians solemnly considered these points, and in about a month rendered a solemn decision that "the

first proposition, *that the sun is the centre, and does not revolve about the earth, is foolish, absurd, false in theology, and heretical, because expressly contrary to Holy Scripture; and that the second proposition, that the earth is not the centre, but revolves about the sun, is absurd, false in philosophy, and, from a theological point of view, at least opposed to the true faith*." [49]

The pope himself, Paul V., now intervenes; he orders that Galileo be brought before the Inquisition. Then the great man of science in that age is brought face to face with the greatest theologian: Galileo is confronted by Cardinal Bellarmin. Bellarmin shows Galileo the error of his opinion, and orders him to renounce it. De Lauda, fortified by a letter from the pope, ordering the astronomer to be placed in the dungeon of the Inquisition should he refuse to yield, commands him to "*abandon entirely the opinion that the sun is the centre of the universe, and that the earth moves*, and to abstain from sustaining, teaching, or defending that opinion in any manner whatever, orally or by writing." [50]

Galileo bowed to this order, was allowed to retire, and the whole proceeding was kept secret.

About ten days later, on March 5, 1616, the Congregation of the Index, moved thereto, as we have seen, and as the letters and documents now brought to light show, by Pope Paul V.,

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[49] See the original documents in *Epinois*, pp. 34-36. Martin's translation does not seem exactly correct.

[50] See full official text in *Epinois*.

solemnly rendered their decree: that the doctrine of the double movement of the earth about its axis and about the sun is *false and entirely contrary to Holy Scripture*; that this opinion must neither be taught nor defended. The same decree condemned the writings of Kopernik, and *all writings which affirm the motion of the earth*. The great work of Kopernik was interdicted until corrected in accordance with the views of the Inquisition; and the works of Galileo and Kepler, though not mentioned by name, were included among those implicitly condemned as "affirming the motion of the earth."

The condemnations were inscribed upon the *Index*, and to the Index was prefixed the usual papal bull giving its monitions the 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. Human science had apparently lost the great decisive battle.

For some time Galileo remained at Rome perfectly submissive. [51] Pope Paul V. petted him, and all seemed happy in the ending of the long war.

But, returning to Florence, something of his old scientific ardor stirred within him; and at last Cardinal Barberini, who had seemed liberal and friendly, having been made pope under the name of Urban VIII., Galileo conceived new hopes, and again

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[51] See proofs of this in *Martin*. The reader should be reminded that the archives exposed within the past few years have made the statements of early writers untrustworthy on very many of the nicer points.

in a published work alluded favorably to the Copernican system. New troubles ensued. Galileo was induced to visit Rome again, and Pope Urban tried to cajole him into silence, and personally took the trouble to try to show the astronomer his errors by argument. Other opponents were less considerate. Works appeared attacking his ideas—works all the more unmanly, since their authors knew how Galileo was restrained by force from defending himself; and, as if to accumulate proofs of the fitness of the Church to take charge of advanced instruction, his salary as professor at the University of Pisa was taken from him. Sapping and mining began. Just as the Archbishop of Pisa some years before had tried to betray Galileo 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."

And here science again loses ground. Galileo had announced his intention of writing upon the theory of the tides, but he retreated, and thus was lost a great treatise to the world.

For the final assault, the park of heavy artillery was at last wheeled into place. You see it on all the scientific battle-fields. It consists of general denunciation; and Father Melchior Inchofer, of the Jesuits, brought his artillery to bear well on Galileo with this declaration: that the opinion of the earth's motion is, of all heresies, the most abominable, the most pernicious, the most scandalous; that the immobility of the earth is thrice sacred; that

argument against the immortality of the soul, the Creator, the incarnation, etc., should be tolerated sooner than an argument to prove that the earth moves. [52]

But this state of things could not be endured forever. Urged beyond forbearance, Galileo prepares a careful treatise in the form of a dialogue, exhibiting the arguments for and against the Copernican and Ptolemaic systems. He then offers to submit to any conditions the Church tribunals may impose, if they will but allow it to be printed. At last they consent, imposing the most humiliating condition of all, which was a preface written by Father Ricciardi and signed by Galileo, in which the whole work was virtually exhibited as a play of the imagination, and not at all as opposed to the truth laid down in 1616 by the Inquisition.

The new work met with prodigious success; it put new weapons into the hands of the supporters of the Copernican theory. The preface only embittered the contest; it was laughed at from one end of Europe to the other as ironical. This aroused the enemy. The Jesuits, Dominicans, and the great majority of the clergy, returned to the attack more violent than ever; and Pope Urban VIII., his personal pride being touched, after some halting joined the clerical forces.

The first important piece of strategy was to forbid the sale of the work; but the first edition had already been exhausted and spread throughout Europe. Urban now became angry, and

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[52] See *Inchofer's Tractatus Syllepticus*, cited in Galileo's letter to Deodati, July 28, 1634.

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 say that "nothing that could be done could now hinder the earth from revolving." He was dismissed, 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 by express order of Pope Urban, and, as is now thoroughly established by documentary evidence, forced to abjure under threats, and subjected to imprisonment by command of Urban, the Inquisition deferring in the most servile manner to the papal authority.

The rest of the story the world knows by heart; none of the recent attempts have succeeded in mystifying it. The whole world will remember forever how Galileo was subjected certainly to indignity and imprisonment equivalent to physical torture; [53] how he 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

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[53] It is not probable that torture in the ordinary sense was administered to Galileo, though it was threatened. See *Th. Martin*, *Vie de Galilée*, for a fair summing up of the case. For text of the abjuration, see *Epinois*; also, *Private Life of Galileo*, Appendix.

face of all coming ages, to perjure himself; and, to complete his dishonor, he was obliged to swear to denounce to the Inquisition any other man of science whom he should discover to be supporting heresy—the "heresy of the movement of the earth."

Nor was this all. To the end of his life, nay, after his life was ended, this bitter persecution was continued, on the supposition that the great truths he revealed were hurtful to religion. After a brief stay in the dungeons of the Inquisition, he was kept in exile from family, friends, all his noble employments, and held rigidly to his promise not even 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 a recommittal to his dungeon. When, at last, a special commissioner had reported to the ecclesiastical authorities that Galileo had become blind and wasted away with disease and sorrow, he was allowed but little more liberty, and that little tempered by the close surveillance of the ecclesiastical authorities. He was forced to bear contemptible attacks on himself and on his works in silence; he lived to see his ideas 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." [54]

Nor did the persecution cease with his death. Galileo had begged to be buried in his family tomb in Santa Croce; the

[54] *Martin*, p. 227.

request was denied: his friends wished to erect a monument over him; this, too, was refused. Pope Urban said to the embassador 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." [55]

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 Pierozzi dare to write his epitaph. Not until a hundred years after did Nelli dare transfer his remains to Santa Croce and erect above them a suitable monument. Even then the old conscientious hostility burst out: 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 first been submitted to its censorship. Nor has that old conscientious consistency in hatred yet fully relented; hardly a generation since has not seen some 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. [56]

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[55] *Martin*, p. 243.

[56] For the persecution of Galileo's memory, see *Th. Martin*, chaps. ix and x. For documentary proofs, see *de l'Epinois*. For a collection of the slanderous theories

invented against Galileo, see *Martin*, final chapters and appendix. Both these authors are devoted to the Church, but, unlike Monsignor Marini, are too upright to resort to the pious fraud of suppressing documents or interpolating pretended facts.

Конец ознакомительного фрагмента.