From Copernicus to Galileo

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I take the opportunity of presenting this subject, not only on account of its interest as one of the great developments of history, but quite as much for the light that it throws upon the atmosphere of present day life. In our time it is almost impossible for us to think of the Universe in any other terms than that of the Copernican conception with the sun as the center of our Solar system, and the Solar system itself but one of many such, all tied in together in the great universe moving through space. But at the time when Copernicus was born, 1473, in the town of Thorn, Poland, no one even dreamed that he lived in such a Universe. To be sure two or three stray thinkers had considered the possibility of this as the explanation of the mysteries of the movements of the heavenly bodies, but at this time the whole weight of education, science, theology, politics, state and ecclesiastical were dedicated to the proposition that the earth is the center of things, the fixed body about which every other moves. More than that, they were dedicated to the proposition that theology was a fixed center or authority to which even science must bow its head. At this time, as you can see by the date, the important practical demonstration by Columbus that the earth is round had not been made. Although scientific men upon theoretical grounds held to the idea that the earth is a sphere, it needed the demonstration of navigators to make it a practical certainty. Even those who held to the idea that the earth is round had no idea that it was not the center of the Universe. But by the year 1510 this man, Copernicus, had become convinced that the sun was the fixed body of our planetary system and that the earth and other planets revolved about it. This idea he began to propound privately at that time. From that time on until the tragic death of Galileo in 1642, the battle raged. Strange as it may seem it was not until the year 1822, on the 11th of September that the Cardinals of the Holy inquisition agreed that "the printing and

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[1] While this text has no explicit date, the paper is identical to the paper from the clearly dated "Remarks at Tenth Anniversary," and perhaps not coincidentally 1942 was the tercentenary of Galileo's death.

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."[2]

This covers a period of 123 years from the time Copernicus began to talk of his ideas to the death of Galileo, and a period of 312 [years] to the time that the most reactionary organization of importance in the world was willing to [accept] demonstrated facts of science as true. Some appreciation of this first great conflict between authority and freedom, between dogma and truth, is necessary in order to appreciate the nature of the conflicts, the character of the forces interested, and above all the fundamental principles involved in the problems of modern life. For after all, while the questions of the facts at stake in the controversy over the problems of astronomy are important, the fundamental principles of importance was whether truth should be [a] source of authority, or authority the alleged source of truth. That conflict is still on, and with increasing intensity is being forced into our range of vision today. With surprising ignorance in various forms, and clothing, the old beast of authority is being presented to us as the panacea for all our evils, social, individual, intellectual, moral, and artistic. History has demonstrated the viciousness of this kind of a master.

But let me briefly recount the facts of this dramatic battle between authority and freedom as guiding principles in life. On the 24th of May 1543, a newly printed book was placed into the hands of Copernicus as he lay on his death bed. It was his life work, *Revolutions of the Heavenly Bodies.* The book was dedicated to the Pope, and presented to the new idea, not as a truth but as an hypothesis. A few hours later Copernicus was dead. For nearly forty years Copernicus had held the views contained in this book, and had talked [of] them in private conversations. They were published when it was too late to injure him.

Here and there this seed of Copernicus fell on fertile soil. Under its teaching the great Kepler found himself, and became an apostle of the new idea. Through it Kepler and Galileo came to understand each other. Galileo writes to his new found friend Kepler that "he has long been a convinced Copernican."[3] Those who

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[2] This change in the stance of the Holy Inquisition came from the Inquisitor-General under the sanction of Pope Leo XII.

[3] An August 1597 letter from Galileo to Copernicus is quoted in Harald Höffding's A History of Modern Philosophy, Trans. B. E. Meyer, London: Macmillan and Co., 1908, p. 174. The language as

were convinced Copernicans were of a world by themselves. Among others of this inner circle was the Monk Bruno, a strange haunting figure he has been called. To him this new Copernican idea was the reagent that crystalized the fluid passion of youth into the solid precipitate of manhood. He took up the message with all the ardor of an apostle, and went from one end of Europe to the other proclaiming the system according to Copernicus. He himself made some valuable contributions to the theory. He was the true martyr to the new world conception. Finally he finds himself before the Roman Inquisition to face his decree that "he should be dealt with as mercifully as possible without the shedding of blood."[4] This was the fixed formula for death by fire. His answer to the tribunal was as fearless as his life had been. "It is you that tremble at your sentence more than I."[5] But in the year 1608 a Dutchman placed two lenses together in a tube and looked at objects only to find that they looked nearer and larger than they really were. Galileo, hearing of the incident, made for himself a similar instrument the following year. He turned this new and wonderful instrument towards the heavens, and began to tell the world what he saw. The moon with mountains and valleys. The satellites of Jupiter, the spots on the sun, and the resulting conclusion that the sun itself revolved. Here was something serious. The dead Copernicus, and his book with an hypothesis of a moving earth had not become widely known. Bruno, who had defied the powers had been take care [of], but this man Galileo with his strange instrument was daily flaunting his new truth in their faces. The opposition began to take effect. In 1611 he exhibited publicly the spots on the sun through his telescope in the garden of Cardinal Banbini at Rome. Finally goaded on by the opposition, he wrote a letter to Abbe Castelli in which he declares that the scriptures are not books of science but books of morals, that they are not be relied upon as science. Then the Dominicans began to attack him from their pulpits. He was summoned to Rome to appear before the inquisition. He was sentenced to either renounce these heretical opinions or suffer imprisonment. He renounced them. And the Congregation of the Index of March 5, 1616 denounced the new system of the universe as "that false Pythagorean doctrine utterly contrary to Holy Scripture." After this Galileo enjoyed the favor of the Church, and was admitted to several audiences with the Pope Urban VIII. In 1632 he became so bold as to publish a book entitled, *The System of the World.*

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quoted here is not identical to the quotation above, but the meaning is effectively identical.

[4] This was the pronouncement of San Severino in February 1660.

[5] Bruno's response to San Severino on his sentence.

It is in the form of a dialogue between two philosophers and an objector. This again brought him before the tribunal of the Church. He was condemned and subjected to most humiliating treatment in spite of his age and physical infirmities. He was condemned to imprisonment during the pleasure of the Inquisition, his writings were prohibited by public edict, and he was directed to recite once each week the seven penitential psalms. Thus the old man, one of the gentlest and most lovable of his age, lived out the remaining years of his life in disgrace. In 1637 he became totally blind. Shortly after he lost his hearing, and in Jan. 1642 a prisoner of the Inquisition he died. Even in his death he was denied the right to make a will, he was refused burial in consecrated ground, and his friends were prohibited from erecting a monument over his grave. In this manner did the great man Galileo do his work, and in this manner was he treated.

But what was the nature of the objections which the recognized authorities of the times, the priests of religion, the followers of the Carpenter, presented to the new truth about the universe? Let me quote some of the statements that were made concerning it. Cardinal Bellarmine, the greatest theologian of the time declared that "His pretended discovery vitiates the whole Christian plan of Salvation." Father Lacazre declared that it "casts suspicion on the doctrine of the incarnation." Another asserted that

> 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 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 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?[6]

Epithets of infidel and atheist were hurled at all these men as they are now. Such the great theologians of the Inquisition after an official examination of the ideas of Galileo rendered their decision in the following words, "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

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[6] These quotations, Bellarmin's, Lecazre's and the anonymous one, appear in this order essentially exactly as Davis has them in the text in Andrew Dickson White's *The Warfare of Science With Theology in Christendom,* New York: D. Appleton and Co., 1896, p. 134.

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."[7] These were not the vaporings of the ignorant among the priests, but the authoritative statements of men in high places. Ballarmine issues the decree of the inquisition, "in the name of his Holiness the Pope, and the whole congregation of the Holy Office." In the vast number of books that were then published then to forever destroy this pernicious doctrine, some of the leading arguments contained in them throw light on the nature of the controversy. For example,

> Animals, which move, have limbs and muscles; the earth has not limbs and muscles, therefore it does not move. It is angels who make Saturn, Jupiter, the sun etc. turn around. If the earth revolves, it must 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.[8]

Again,

> 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 the sink of impurity, among these heavenly bodies, which are pure divine things.[9]

Again,

> The Scripture always represents the earth is at rest, the sun and the 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.[10]

Again,

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[7] Quoted in Andrew Dickson White's *The Warfare of Science With Theology in Christendom,* New York: D. Appleton and Co., 1896, p. 137.

[8] Quoted in Andrew Dickson White's *The Warfare of Science With Theology in Christendom,* New York: D. Appleton and Co., 1896, p. 145; and taken from from Scipio Chiaramonti's *Against the Author of The Two Chief World Systems,* 1633.

[9] Quoted in Andrew Dickson White's *The Warfare of Science With Theology in Christendom,* New York: D. Appleton and Co., 1896, p. 145; and taken from Venturi (Cav. Giambattista): "Memorie e lettere inedite finora o disperse di Galileo Galilei." Modena, 1818-1821.

[10] Quoted in Andrew Dickson White's *The Warfare of Science With Theology in Christendom,* New York: D. Appleton and Co., 1896, p. 145.

> These writings must be prohibited, because they teach certain principles about the position and motion of the terrestrial globe repugnant to Holy Scripture and the Catholic interpretation of it, not as hypothesis but as established facts.[11]

But not alone the Catholic Church, but the leaders of Protestantism were fighting these ideas. Both the Lutheran, and the Calvinistic branches as well as the Church of England took side with the Catholic Church in this matter and on precisely the same grounds, namely that these doctrines were contrary to scripture.

Why then was this opposition? It is most apparent. The whole structure of the Church and religion at that time was built upon the principle of external authority. That which authority declared to be true, must be true. The visible symbol of this authority was, in the Catholic Church, the Bible as interpreted by the Church, in the Protestant Church, the Bible as a self-interpreting deposit of supernatural wisdom. To defenders of the system, this new conception of the universe was an attack on their whole preconceived scheme of things. Their principle of authority prevented them from submitting the proposition to the test of experiment and fact. Its truth or falsity could be determined only on the basis of scriptural argument. Their fundamental principle was at stake. Because Copernicus, Kepler, Bruno, and Galileo appealed to the argument of fact and the nature of things, this method was ignoring the only true method. Here we come upon the heart of the controversy, in one of its aspects. The method of authority as against the method of science. For four hundred years, the orthodox religious bodies have been fighting a losing fight in its defense of the lost cause of external authority.

Even today this method is still defended. In the matter of social questions the assertion is made that the only solution is in obedience to the teaching of the Church, or to the teaching of Christ. Even today, he who denies the method, or rejects the authority, is called atheist, or infidel. Quite apart from all the facts, all the wonderful discoveries that have been made in the name of science during the past four hundred years, the one great important thing the one gleaning of infinite wisdom that has been threshed out from the straw of experience, is this of the method of science, the free experiment for the determination

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[11] Quoted in Andrew Dickson White's *The Warfare of Science With Theology in Christendom,* New York: D. Appleton and Co., 1896, p. 145.

of truth. Should we lose all the products of this method of investigation, but retain our grip on this method, we would soon rediscover all that we had lost. But on the other hand, having retained all the products, and lost our perception of the method, we would soon drop back into the atmosphere, the principles and the methods of the Inquisition. In this there is much at stake. The fact that the Bible was the symbol for authority in the Middle ages, must not blind us to the possibility that it was only an accidental symbol of a deep principle. Science itself may become the symbol of authority, if we lose sight of the method of science, and further development forestalled. Business, and the balance sheet may become the symbol of authority, and every Copernicus, Bruno and Galileo of today will be outlawed simply because he advocates a principle or a thought contrary to the symbol of authority. The truth is that today no less than four hundred years ago, we are in danger of losing our grip on this method of freedom. That is why I am bringing these facts of the past into view today. It makes little difference whether this gaunt skeleton of authority stalks forth in the clothing of the feudal priest, or orthodox divine, or conventional respectability, or in the ragged clothing of the criminal, or the $60.00 tailor made suit of the businessman. It makes no difference whether Authority wears the garb of the judiciary and hides its machine-like skeleton behind a court of impeachment, or sits in power in the immigration station at Ellis Island, the method is all the same. Against this encroachment of feudal power upon the prerogatives of freedom we must place the standard of the method of science. "Ye shall know the truth and the truth shall make you free."[12] We face many serious problems today. The wide and adventurous seas of futurity stretches out before us. The open mind, the open platform, the open arena of intellectual and moral experiment is the one great hope for tomorrow. Just insofar as we see the door of freedom closing, we see trouble and darkness settling about us. Science has discovered many great truths in the past, but for the many successful experiments, there have been many unsuccessful ones. Nor could the successful ones have been reached but through the unsuccessful. The way to truth is by way of the free experiment, and the free elimination of the unfit, and the clear demonstration of the fit. More important than the defense of any fact or dogma, or any doctrine, is the loyal persistent, fearless devotion to this method of science. Following this we have broken down pretty nearly all the old dogmatic standards of feudalism. It has been our cloud by day

[12] John 8:32.

and our pillar of fire by night[13] that has led us forward through the centuries. It is our guide now. We are dealing with subtle problems in our day, but the principle is the same, the open mind, ready for new truth, ready to risk that truth in the open arena. To this principle, to this method above all else we are dedicated.

Back of it all is the substantial faith in the nature of thigs. Said Bruno to the Inquisition of Authority, "It is you that tremble at your sentence more than I."[14] Legend says that Galileo, when he pronounced his denial of his principles that the earth moved declared under his breath, "It does move."[15] This is the substantial faith of man. It does move. Truth is supreme. Behind you is the everlasting life, and underneath the everlasting arms. Who was the stronger, Galileo and truth, or the social order and error? There is a world of wisdom in the statement of the old Prophets of Israel, when in their appeal for justice, they declared, "Thus saith the Lord. It is not I that speak but God that speaketh in me."[16] Today as yesterday the principles are the same. Authority comes to us with many beautiful raiments, but behind them all the skeleton in the closet of civilization.

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[13] See Exodus 13:21-22.

[14] Quoted in Carl Snyder's *The World Machine: The First Phase, The Cosmic Mechanism,* London: Longman's Green, and Co., 1907, p. 180

[15] According to Wikipedia (see https://en.wikipedia.org/wiki/And_yet_it_moves) this was first reported in English in a 1757 book by Giuseppe Baretti, *The Italian Library: Containing An Account of the Lives and Works of the Most Valuable Authors of Italy,* London: A. Millar, p. 52.

[16] See Ezekiel 3:27.