

The Open Court

A MONTHLY MAGAZINE

Devoted to the Science of Religion, the Religion of Science, and the
Extension of the Religious Parliament Idea

Editor: DR. PAUL CARUS.
Assistant Editor: T. J. McCORMACK.

Associates: { E. C. HEGELER.
MARY CARUS.

VOL. XIV. (NO. 8)

AUGUST, 1900.

NO. 531

CONTENTS:

Frontispiece. Galileo.

<i>The Struggle Regarding the Position of the Earth. With Several Portraits of Galileo, and Reproductions of Tito Lessi's Painting of Milton's Visit to Galileo and of a Photograph of Galileo's Tomb in Firenze.</i>	
DR. ERNST KRAUSE (Carus Sterne), Berlin	449
<i>The Democratic Christians and the Vatican.</i> PROF. G. M. FIAMINGO, Rome, Italy	475
<i>The Evolution of Angels and Demons in Christian Theology.</i> By R. BRUCE BOSWELL, Chingford, Essex, England	483
<i>Mind-Reading in the Nursery.</i> With Diagrams. EDITOR	502
<i>The Principle of "Like Cures Like" in Greek Legend.</i> With Illustration. EDITOR	509
<i>Cui Bono?</i> A Poem. ELLIS THURTELL, London, England.	509
<i>Book Reviews</i>	510
<i>Homo Alalus.</i> A Poem. L. L. RICE, Nashville, Tenn	512
<i>Notes</i>	512

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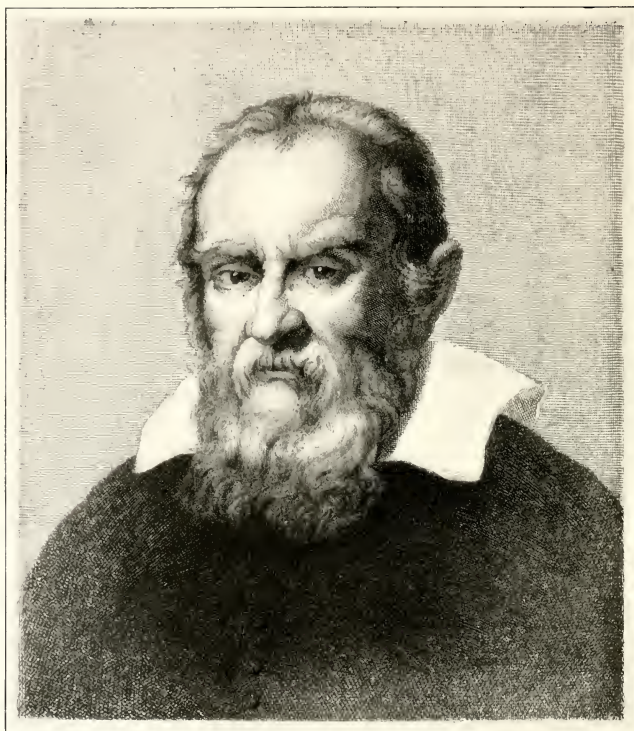
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GALILEO GALILEI.

(1564-1642.)

From an engraving by Jean Baptiste Vandersypen after a Painting by Fr. Broschi.

Frontispiece to the August *Open Court*.

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THE STRUGGLE REGARDING THE POSITION OF THE EARTH.¹

BY CARUS STERNE.

“IT moves, just the same,” Galileo is said to have exclaimed, stamping his foot, after having, before the court of the Holy Inquisition on June 22, 1633, abjured faith in the heretical teaching of the movement of the earth around the sun. But the delightful anecdote belongs, unfortunately, to the great multitude of those which it has latterly become the custom to designate as *esprits d'escalier* (*Treppenwitze*), the after-thoughts of man or of history. Nothing could have been further from the mind of the intimidated scientist than such a defiant recantation, for it would have been neither more nor less than a challenge of the powerful by the weak. If Galileo had felt the slightest inclination to become a martyr to his convictions, like Giordano Bruno, and had he been the stuff of which martyrs are made, he would not have taken that oath. But the anecdote is not without value, for it allows him to voice what he surely at that moment thought and felt in the depths of his soul, and what other adherents of Copernicus, firm in their own faith, may have wished to hear him acknowledge. So it has come about that this unspoken thought, although universally acknowledged to be of later origin, has become a household word. Even now it ceases not to serve as an inspiration when the Church, in spite of such unfortunate experiences, arrogates to herself a decision in questions which do not come under her jurisdiction.

Kant has shown in his work *Religion Within the Bounds of Pure Reason*, that Christianity has been harmed by nothing more than by

¹ Translated from the German by Dr. David Eugene Smith, State Normal School, Brockport, N. Y. The illustrations of the present article are from the collection of Dr. Smith.

the despotism of its official representatives. He points out how the eastern and western Roman Empire, distracted and powerless from raising Christian dogmas to the position of civil laws, became the welcome prey of barbaric nations. Even so do plants and animals, when on the way to dissolution through disease and internal disorder, attract destructive fungi and insects, which hasten their death. In the same way, nothing has more shaken the faith in the correct interpretation of the Bible by the Church, and in the infallibility of the apostolic see, than just this attempt, so wantonly and unnecessarily made, to suppress scientific knowledge that does not even touch the proper teachings of Christianity.

Hence the Roman Catholic Church must even now be grateful to Galileo, that through his compliance and weakness he saved her from applying the torch to his funeral pile. Otherwise she would have been much more seriously afflicted than by the burning of Giordano Bruno (1600). Bruno it is who was condemned not only as an adherent of the Copernican System, which in his *Ash-Wednesday Communion* he defended against the Oxford opponents, and further advocated in a book which appeared the same year, *Concerning the Eternal, the Universe, and the Worlds*, but especially as a free-thinker, who had pursued the regulations of the Church with bitter mockery, and had spoken altogether too frankly of her dogmas. Against the author of *Candle-makers*, who scoffed at the mummery of relics and the hypocrisy of ecclesiastics, who compared Christ to a Centaur, who had attacked with all his strength the foundation-pillar of the Church, the holy Aristotle, she might have been in a necessarily defensive attitude that does not excuse her proceeding, but shows it in a milder light. In Galileo's case, on the contrary, it concerned a scholar, who without making an attack on the teaching of the Church, without deviating in any way from the objects of his physical and astronomical studies, merely wished to lay before the world the results of his investigations. Furthermore the Church, up to that time, had not appeared to consider the teaching of the movement of the earth, in itself, a dangerous heresy, if it was not brought forward, as in Bruno's case, in connexion with scornful attacks on the hierarchy.

The time for this great progress in thought seemed therefore to have arrived; the clamor which had been raised against the courageous ideas of Copernicus and Kepler, might be interpreted as the last impotent cry of rage of the disciples of Aristotle; Galileo therefore decided to follow these august examples, after he had become convinced, through his astronomical observations, of the cor-

rectness of the Copernican view of the world. He was already a man entering the forties when he gave himself up more thoroughly to astronomical research, and had won considerable reputation as a physicist through his studies of the movements of the pendulum, the laws of falling bodies and other physical phenomena. At the same time he recognised the erroneousness of many of the statements and so-called laws of Aristotle, which up to that time had been considered as absolutely correct.

The new star which appeared in 1604 in the sign of Serpentarius, had also drawn his attention to the fact that the proposition of Aristotle as to the immutability of the earth above the moon had no real foundation. Shortly after (1608) he learned that a Dutch optician, Johann Lippershey in Middelburg,¹ had by the combination of several lenses, produced an instrument with which the heavenly bodies could be seen more distinctly. This led him to make for himself a telescope (1609) in order to extend the field of vision, and to gain a deeper insight into the construction of the universe, as well as into the peculiarities of the heavenly bodies, than had thus far been possible to Copernicus, Tycho Brahe, and his friend Kepler. The hoped-for result was attained; he immediately discovered the satellites of Jupiter, described in his *Sidereus Nuncius* (1610), the moon-like phases of Venus and Mercury predicted by Copernicus, and finally the sun-spots (October, 1610) which proved the revolution of the sun on its axis, already taught by Copernicus.

These discoveries were so many confirmations of the Copernican system; the planets were clearly shown to be dark bodies, which, like the moon and earth, received their light from the sun; and the satellites of Jupiter were brought to view as a miniature model of the solar system.

It was not long, however, before the discoveries effected through Galileo's telescope were branded as mere hallucinations and delusions. Then did the master pour forth his troubles to Kepler, his friend to the north of the Alps: "You are the first and almost the only one, who without having seen for himself, gives full credence to my statements. What will you say of the first teachers of Padua, who when I made them the offer, would neither look at the planets or the moon through the telescope, nor even examine the latter? Men of this class regard philosophy as a book like the *Aeneid* or the *Odyssey*, and believe that truth is not to be sought either in the

¹As to Lippershey's priority, which can no longer be doubted, compare Servus, *Geschichte des Fernrohrs*, Berlin, 1886.

world or in nature, but only in a comparison of texts. How you would have laughed, when at Pisa the first teacher in the university there endeavored, in the presence of the grand duke, to draw the new heavenly bodies from the sky with logical demonstrations, as though with magical conjurations ! ”

In the beginning of 1611 a certain monk issued a work in which he declared the existence of Jupiter's moons to be “ irreconcilable with the Bible. ” This was always the last and most dangerous argument that conservatism fell back on, and Galileo refrained long from entering the lists against this prejudice. Kepler indeed, in answer to the disheartened letter in which Galileo expressed his fears, admonished him to stand by Copernicus, letting these other considerations go. “ Have confidence, Galileo, ” he writes, “ and go forward ! If I see correctly, only a few of the more eminent mathematicians of Europe will forsake us, so great is the power of truth. ” Evidently, however, Galileo showed the truer instinct in the matter, distinguishing between his position and Kepler's ; but on the other hand, it was precisely by the caution with which he proceeded, and by his attempts to harmonise the new theories with the Bible, that he brought himself into the greatest danger.

He went to Rome in 1611, in order to convince the most influential dignitaries, through their own eyes, of the reality of the new celestial discoveries. It must be said, too, that all were not so obstinate in their opposition as Cremonini da Cento in Padua, who absolutely refused to look into the devil's glass, not wishing to see the three moons that Jupiter was said to have in excess of the earth's number. Galileo's success, with which he hoped to silence the clericals, seemed to be complete ; a committee of scholars appointed through the agency of Cardinal Robert Bellarmine had acknowledged the reality of the observations ; Pope Paul V. had given him a long audience, and had assured him of his unalterable favor, and even the members of the Society of Jesus had appeared most friendly. The moment for laying aside his caution and publicly acknowledging Copernicus, as he had up to this time done only in letters to trusted friends, seemed to him to have arrived. The step was taken in a work appearing in 1613 under the title *History and Explanation of Sun-Spots*, in which he unreservedly demonstrated the failure of the Ptolemaic system, as taught up to that time, and showed how, by means of the Copernican system, not only the discouraging calculations of astronomers were simplified, but the results of all direct observations tended to prove the

system true. It seemed at first that in Rome the good opinion that his visit and his personality had created would be maintained.

He was assured, even after the appearance of this work, of continued favor, and the hope was even expressed that his work in support of the Copernican system, whose dedication Pope Paul III. had received "with gratification," would assist in obtaining the victory. Cardinal Maffeo Barberini, afterward Pope Urban VIII. and patron of his enemies, also assured him at this time of his admiration.

The number of these enemies and of those who were jealous of him had meanwhile increased somewhat, especially since his work on sun-spots. Without knowing of Galileo's observations, a Jesuit father, Christoph Scheiner, of the University of Ingolstadt, had on the 21st of March, 1611, nearly half a year later than Galileo, discovered spots on the sun, but had not dared to make this observation public, because it contradicted the Aristotelian doctrine of the sun as the emblem of the greatest purity. "I have read Aristotle's writings repeatedly, from one end to the other," his father superior, Theodor Busäus, had said to him when he confided to him his discovery, "and I can assure you that I have found nothing of that of which you speak. Go, my son, calm yourself, and believe me that that which you take for spots on the sun are only defects in your glass or in your eyes."

But Scheiner, nevertheless, did not calm himself, and reported his repeated observations in three letters of the 12th of November, the 13th and 26th of December, 1611, to the learned senator Markus Welser in Augsburg who had them printed under the title *Apelles post tabulam* in 1612, without the knowledge of the author. Galileo thereupon appealed to the fact that he had already in 1610 pointed out this discovery to several friends, and a dispute over priority arose, which, carried on with the usual bitterness of such affairs, helped to stir up the hatred of the Jesuit Scheiner against Galileo. Moreover, a Friesland astronomer, Johann Fabricius, had discovered the sun-spots shortly after Galileo, though this was not known in Italy at the time, and had described them, together with the inferred revolution of the sun on its axis, in a work which appeared in 1611, so that the dispute over priority between Galileo and Scheiner, which left behind so much bitterness, was pointless, since another had preceded them both in publication.

Besides this, professional envy, which is well known to be as strong in learned circles as in other grades of society, seems to have contributed to increase the feeling against Galileo. He had

on account of his important discoveries in physics, made a brilliant record, as the saying is. He had attained a most desirable position in Florence, at the court of the Grand Duke of Tuscany, who was much interested in his work and had, in 1610, given him a place in his service. This seems to have caused one of his envious colleagues, Professor Boscaglia, who taught physics in the Tuscan University at Pisa, to work against him in influential circles. It shows the man, when we learn how he insinuated his opinions in the mind of the Dowager Grand Duchess. Galileo, he said, was an excellent observer, the correctness of whose telescopic work was probably not to be doubted, but who evidently could not interpret them correctly, since the Bible explicitly represents the earth as immovable, and tells in various places of divine miracles by which the sun had been held fast in one point in the sky, or even turned backward.

In this connexion, naturally the first thing considered was the celebrated episode in the book of Joshua, in which the victory of the Jews over the Amorites is described, and the commander-in-chief of the assembled army speaks: "Sun, stand thou still upon Gibeon; and thou, Moon, in the valley of Ajalon." The account continues: "And the sun stood still, and the moon stayed until the people had avenged themselves upon their enemies. Is not this written in the book of Jasher?" A whole day, that is about twelve hours, the sun is said to have remained at the zenith, and when more recent theologians assume that the Bible when it spoke of standing still was only using the language of the people, according to which, even to day, the sun passes over its course, this is but an idle subterfuge. Such also is the attempt to find in these verses merely a poetic expression of admiration for the deeds achieved in the battle with the Amorites, these deeds being so mighty that one could not believe them to have been accomplished in a single day. The Bible rather gives its account from the point of view of a degree of culture which considered entirely practicable the stopping of the sun and moon by means of prayers and conjurations, because it held these bodies to be mere illuminating spheres of moderate size. That the Biblical writers believed these miracles quite literally and regarded it in nowise as poetic fiction is plainly seen from Sirach 46, 5, where it is said: "The sun stood still at the will of Joshua, and one day became as two." The same is also apparent from the experience of King Hezekiah, as related in several places in the Bible and probably by several authors. His prophet Isaiah announced to him that in order to give him a sign,

the sun would go back over part of the course that it had already made, and the shadows on the sun-dial that his father Ahaz had erected actually moved backward ten degrees.¹ It will be conceded that if these stories had not been in the Bible and had not received such a construction, Galileo's trial would not have taken place, and that it all came down to a question of an ignorant superstition.

But the clergy regarded man's understanding even at that time as weak enough to believe in such miracles. As a proof of this may be cited the fact that only a few years after the appearance of Copernicus's work the Joshua miracle was actually attempted and was said to have been observed in the battle of Mühlberg on the 24th of April, 1547. The Spanish author Luigi of Avila claims in his work on the German War to have been an eye-witness of this battle: "The impending defeat was foretold to Frederick the Generous by an evident miracle. The sun appeared like blood, and as if it had delayed its course and added to the length of the day. When we looked attentively we saw that it was higher than it should have been at that hour. The opinion of all in regard to this matter was so unanimous that I certainly dare not repress it."² Florimond von Remond in his *History of Heresy* has cited still other eye-witnesses of this new edition of the Joshua miracle, a wonder immediately celebrated in verse. The Duke of Alba, however, said that he had observed nothing of it, and excused his oversight of such an important circumstance by the fact that in consequence of the resistance of the heretics he had been too busy with events on the earth to concern himself with what was going on in the sky. It would evidently have needed only a slight concession on the part of the commander to make of Charles V. a second Joshua.

But if we return to the martyr to this miracle, it cannot be denied that, in his zeal for the truth and his feeling of the justice of his cause, he was guilty of the imprudence of himself furnishing his watchful antagonists with the weapons by which they were able to reach him. His friend and adherent, the Benedictine father Castelli of Pisa, had in 1613 warned him of the cabals and intrigues formed in consequence of his work on the sun-spots, and that there was a plan to charge him with a crime against religion. Galileo allowed himself to be beguiled by this into entering into the theological side of the question, and he sent his friend a detailed statement of his conception of the interpretation of the Bible.

¹ 2 Kings xx. 8-11; Is. xxxviii. 7-8.

² See the article, Charles V., in Bayle,

“The Bible in itself,” he writes as a good Catholic, “can neither lie nor err, but the same is not true of its interpreters who are so much the more exposed to misunderstanding as the Holy Scriptures use figurative expressions in many places, which may be understood differently.” “Since Holy Scripture,” he continues “in many places not merely allows, but actually demands another interpretation than is apparently shown by the tenor of its words, it seems to me that in mathematical discussions the last place should be conceded to it. For both Book and Nature proceed from



the divine word, the former as inspired by the Holy Ghost, the latter as the carrying out of divine command. In Holy Scripture it was necessary, in order that it be adapted to the understanding of the majority, to say much that is apparently different from its exact meaning; Nature, on the contrary, is inexorable and immutable, unconcerned whether her hidden principles and means of operation are comprehensible or not by human understanding, for which she never deviates from her previously sketched laws. Hence it seems to me that no work of Nature, either which experience brings before our eyes, or which necessarily follows as a

consequence of demonstration, should have doubt cast upon it on account of passages of Scripture. For the Bible contains thousands of words of several meanings, and not every sentence in Holy Scripture is subject to so strict a law as every work in Nature."



AFTER A CONTEMPORARY PRINT.

Although Professor Reusch of Bonn thinks¹ that Galileo's attempts to harmonise the differences arising between science and

¹F. H. Reusch, *Der Prozess Galileis und die Jesuiten*, Bonn, 1879.

the Bible were founded upon the most correct hermeneutic principles, it nevertheless remains an undeniable blunder that in this letter he left the domain of facts and intimated the possibility that even the high clergy might be mistaken in the interpretation of the Bible. Castelli, who seems to have considered his friend's statement as harmless as irrefutable, hastened to allow the letter to become public, and thereby placed a piece of evidence in the hands of Galileo's opponents of which they made use. Soon after, a Dominican monk, Caccini of Florence, in a sermon on a text which seemed made for the occasion, "Ye men of Galilee, why stand ye gazing up into heaven?" thundered against the man who dared attack the infallibility of the orthodox interpretation of the Bible as the result of mere star-gazing. He was joined by Father Lorini, his friend and a member of the same order, who added a denunciation of the erroneous teachings of the Florentine physicist, addressing it to the Holy Office in Rome. It was well received and immediately preliminary and secret proceedings were instituted against the offender.

With that began the ever memorable trial of Galileo. The history of this proceeding having within the last twenty years undergone a revision by some of our most authoritative investigators, it is proper to consider it here somewhat thoroughly. In fact, the Holy See was itself induced, some thirty years ago (1867), to publish the records of this trial, in order to prove that the Church had proceeded at that time with the greatest forbearance against a fickle scholar, one unmindful of his promises, one whose opinions had opposed the general views of the time, and who caused much scandal. An imposing list of books upon Galileo and his trial have appeared since that time, not to speak of innumerable treatises and smaller essays. Mention may be made of only a few of the leading writers: De l'Epinois (1867 and 1878), Henri Martin (1868), Gherardi (1870), Wohlwill (1870 and 1878), Riccardi (1873), Wolynsky (1874 and 1878), Perialisi (1875), Berti (1876 and 1878), Karl von Gebler (1877), Reusch (1879), Campori (1881), Grisar (1882), Favaro (1882 and 1884).¹ These publications go far to show how undiminished is the interest which free investigation even to-day is bringing to this trial.

Galileo, who at the outset knew nothing of these proceedings secretly begun against him, stirred up his adversaries still more by continuing to rely on his just claims in an open letter to the Dow-

¹A complete list of these publications to within two years of date may be obtained by consulting the *Jahrbuch über die Fortschritte der Mathematik*.—Trans.

ager Grand Duchess. "First take care," he writes, "to refute the arguments of Copernicus and his followers, and leave the concern of condemning them as heretical or erroneous to those to whom it belongs; but do not hope from the discreet as well as intelligent fathers of the Church, and from their absolute wisdom which cannot err, that rash decision to which you, urged on by personal interests and passions, would allow yourself to be hurried. For it is indeed beyond doubt that in regard to these or other similar assertions which are not directly *de fide*, His Holiness the Pope has always the absolute power to pronounce them good or to condemn them, but it is not in the power of any human being to cause them to be true or false or other than they are *de facto* from their nature.' These words, as bold as they were true, were certainly not calculated to make his opponents more indulgent.

On receiving news of the proceedings against him in Rome, Galileo hastened thither without waiting for invitation, hoping to conduct his own case, and relying on the support of his former patrons. He was again received politely enough, as he was able to report to his Florentine friends in the beginning of February, 1616, and he once more succeeded in calming the storm. Indeed, the proceedings dwindled to a mere admonition to cease the Copernican teaching, and to a condemnation of the latter. But on the 24th of February, 1616, the commission convened by the Holy Office unanimously arrived at the following decision: that the declaration that the sun forms the center of the universe and is without local movement in space, is "foolish and absurd from a philosophical standpoint," and is "heretical from a religious standpoint, inasmuch as it contradicts the tenets of Holy Scripture in many places, both according to the plain meaning of the words and according to the universal interpretation of the holy fathers and learned theologians."

On the following day, February 25, the committee appointed Cardinal Robert Bellarmine to warn Galileo to renounce the opinion mentioned. If he refused to obey, the positive command should be communicated to him that he "refrain entirely from teaching, supporting, and discussing such a doctrine and opinion. If he did not keep silence in regard to it, he should then be imprisoned."

Whether the last prohibition was really communicated to Galileo, has been the subject of much discussion in recent times. There undoubtedly exists, and is still to be found among the records, a protocol of February 26, 1616, in which this is asserted. In this the threat is added that otherwise the Holy Office would

take action against him, a record which in the resumption of the proceedings sixteen years later was to serve as a foundation for the accusation that Galileo had broken promises made in solemn form. But in recent times, since the publication of the records of the trial, the value of this piece of evidence has on good grounds been more or less firmly called into question.

In the year 1870 Emil Wohlwill,¹ after the most careful examination of the records, put forward the assertion that this protocol was forged. Almost at the same time, and independently of the German investigator, the Italian Silvestro Gherardi² stated the same opinion, basing his argument on the publication of the protocol of the session of the committee of the Office on March 3, 1616, in which Cardinal Bellarmin in the outset reports that "the mathematician Galileo Galilei has been admonished to renounce the opinion, firmly held by him until that time, that the sun is the center of the heavenly bodies, and motionless, while the earth on the contrary moves, and that he had thereupon become quiet." Then follows immediately the note that the work of Nicholas Copernicus, as well as a commentary on the Book of Job by Diego a Stunica, supporting the heliocentric theory, and a work by the Carmelite Paul Anton Foscarini on "the new Pythagorean world-system," should be placed in the Index, which was done through a decree of the 5th of March. As there is not the slightest intimation in this official report of any refusal on the part of Galileo, and of a consequent more severe admonition, Wohlwill and Gherardi, to whom were added later Karl von Gebler,³ Günther, Hase, Martin, Scartazzini, and others, consider this other protocol to be a forgery, made at a later date with the object of giving the resumption of the trial a legal foundation. It is true that not only Catholic but also certain Evangelical writers, such as Reusch, besides de l'Epinois, Berti, and Wolynsky, have championed the genuineness of the composition. Reusch, however, claims it genuine only in the sense that the questionable protocol was merely a draft which was not intended for use, and which afterwards found a place among the documents of the Inquisition, to be used then *bona* or *mala fide* against Galileo. The latter alternative, however, would really be no better than a direct forgery, the suspicion of which can hardly be dismissed.

After his return from Rome, Galileo lived for a time a retired

¹*Der Inquisitionsprozess des Galileo Galilei*, Berlin, 1870.

²*Il processo Galilei*, Firenze, 1870.

³*Galileo Galilei und die römische Kurie*, Stuttgart, 1876.

life at the Villa Bellasguardo in Florence, not caring to accept the invitation of Kepler to come to Germany where he might be free to acknowledge his opinions. He was accustomed at this time to treat the teaching of the movement of the earth as an unlawful hypothesis at best, but his "obedience" was really almost worse than open resistance. He had at that time written a work on the phenomenon of the tide and sent it (1618) to his patron, the Archduke Leopold of Austria, with a note which contained the following words: "Because I am now aware that it is fitting to believe and to obey the decisions of the superiors, they being directed by a higher intelligence to which my mind is too base to soar alone, I regard this work, which I send to you, so far as it rests on the assumption of the two-fold movement of the earth, even though it contains one of the arguments which I brought forward in corroboration of that view, merely as a poem or rather as a dream; as such your Highness may receive it. But even poets at times place a value on one or another of their fancies, so likewise do I place some value on this my dream."

Naturally such utterances always reached the ears of the pious fathers, and roused them to renewed fury. At this time Kepler in Prague, although in the service of his apostolic Majesty, also acknowledged himself as favoring the Copernican theory, and in the same year (1618) in which Galileo's work began to stir up discussions, he made the immortal discovery of the third law governing the movements of the planets. In the same year also occurred the first rising of the Protestants in Prague, which ushered in the Thirty-Years' War. Therefore the Church, at that time under the direction of the Jesuits, believed that it ought to make a ruthless attempt to win back the territory lost through the Reformation, even though the peace and prosperity of the whole of Central Europe should be destroyed thereby. There was felt only too well the close relationship between the new astronomical discoveries and the opposition of the Protestant spirit to the authority of the Church. It is probable that now for the first time was recognised distinctly all that would result from the belief that the earth could no longer, according to the views of Aristotle, be looked upon as the center of the universe, around which everything should turn and all other stars revolve, even as the thoughts and destiny of mankind should circle about the immovable rock of the Church at Rome. When the discovery of America had demonstrated the untenableness of the old opposition to mathematics and the teaching of the antipodes, there was some measure of uncertainty felt as to

what was to be done about the new teachings and discoveries; but now all at once was seen the abyss which was opening in place of the old; sure geocentric foundation for school and Church.

What immeasurable consequences must follow, if the firm ground on which the whole structure rested, were, so to speak, taken away from under it, if the earth were suddenly degraded to the rank of a mere planet, revolving like so many other planets around the sun, and if finally all these planets, which according to Galileo, were only dark worlds, should demand each one its paradise, its work of salvation, and its vicar of God! Indeed why, then, might still other stars not come with similar claims?

The unmistakable need of self-defence was suddenly felt, and attempts were first made to lure Galileo, who now seemed to have got off too easily, from his cautious reserve. To this end the Jesuit father Grassi, under the title *The Astronomical and Philosophical Balances*, launched a polemical work against Galileo, personally attacking him while generally combating the Copernican teaching. Fortunately Galileo seems to have guessed the deeper design of this noose, twisted, with true Jesuitical cleverness, to strangle him or to cause him to break silence. Accordingly he contented himself, in his answer entitled *The Assayer (Il Saggiatore, 1623)*, which is classed among the pearls of Italian literature, with showing his opponent's numerous errors of fact, and the whole weakness of his argument, without allowing himself to be drawn into imprudent expressions. He conceded that all telescopic observations are, to be sure, in entire accord with the Copernican teaching, but as a devout Catholic one must consider the latter as false, since, according to the decision of the professional interpreters, it cannot be brought into accord with the Bible.

The Jesuits, completely mistaken in their expectations, denounced this work, in spite of all this, to the Roman Court of Inquisition. But as Galileo had dedicated it to Cardinal Barberini, who was still well disposed toward him, and who in the meantime had ascended the papal throne as Urban VIII., they accomplished little. Galileo was commended for his obedience to the commands of the Church, and for allowing the testimony of the senses against the teaching of the Church to remain in the background. Encouraged by this, Galileo went himself to Rome the following year (1624), in order if possible to accomplish the setting aside of the prohibition of the Copernican teaching. While in this he was not successful, he was repeatedly received in a friendly manner by the Pope, and the latter, in a letter to the Grand Duke of Tuscany,

even extolled Galileo's fame, which should "shine on earth, as long as Jupiter with his satellites in heaven."

What the provocations of the Jesuits had not been able to do, was brought about by the transient favor of the pope, namely, that Galileo abandoned the caution observed by him up to that time in writings designed for print. He composed a *Dialogue on the Two Most Important Systems of the Universe*, and in it, put the Aristotelian Ptolemaic System so in the shade by the Copernican, that in spite of the author's apparently taking sides with the first, no one could help being convinced of its untenableness, and of the correctness of the latter. In this work two personages appear under the names of deceased scholars and friends of the author, one of whom begs the other to initiate him into the Copernican system, of which there is so much talk now, and this the other does with great force of expression. Meanwhile a listener to the conversation, on whom was bestowed the fatal name of Simplicius, defends the old Aristotelian view of the world with all the insufficient arguments that up to that time had been current.

Of course, the arguments brought forward for Aristotle and Ptolemy proved themselves so weak, and were so promptly refuted, that every one saw merely a defence of an utterly untenable hypothesis. Galileo, it is true, pretended to be on the side of Simplicius and the Church, pointing out how beneficial and necessary had been the prohibition of the latter in regard to so seductive and absolutely irresistible a theory, and how greatly were to be extolled those from whom it had proceeded.

Galileo went again to Rome in the year 1630, in order to lay his work before the Holy Office, and obtain permission to print it. This required tedious negotiations, and the *imprimatur* was granted only through the addition of a singular closing conversation, in which the principal speakers repeat again with emphasis that they have been entirely mistaken, and thank Simplicius for his friendly advances and the communication of his exalted views, as well as for the priceless instruction granted to them. Despite this papal approbation, however, the censor, Nicolo Riccardi, said to Galileo at the outset that the Jesuits would attack his work most relentlessly.

This "Father Monstrous" (*il Padre Mostro*), as he was called on account of his enormous size, was not mistaken. The Jesuits did not doubt that the *Dialogue*, which appeared in print in the beginning of 1632 and was immediately received with approbation, would, by its masterly style and convincing clearness, win over all

educated men and overthrow all their efforts in the education of the young, if it succeeded in penetrating into wider circles. Hence it was necessary to act without delay, and, as always when the end justifies the means, there was found immediately the right means to change to bitter hatred the favor bestowed upon Galileo by the Pope. This was done by spreading abroad the rumor that this insolent creature had dared to introduce him, the Holy Father himself, under the quite too transparent and shameful pseudonym of Simplicius, and to set him in the pillory before all the world.



GALILEO.

From a picture in the Public Library of Oxford ; engraved by J. Baker.

No sensible person will believe to-day that it could really have been Galileo's design to risk in this frivolous way the favor of the Holy Father so indispensable to him; he had obviously in mind Simplicius of Alexandria (died 549), and preferred the name on account of the secondary meaning of simplicity.

But the question might well be suggested whether the Jesuits, who certainly knew exactly what the new book of their arch-enemy

contained, did not perhaps inspire the easy-going Father Riccardi, whom they could easily hoodwink, with the idea of granting the *imprimatur* only on the condition that Simplicius be treated in the conclusion with the greatest reverence, in order to make so much the more probable the slander that the Pope was meant. It would have been a diabolical plan to ruin their adversary past recovery, but it would do honor to their sagacity, for the slander so cleverly brought forward found, as usual, a favorable ear; the Holy Father might even remember having uttered himself occasionally in his



THE VISIT OF MILTON TO GALILEO AT ARCETRI NEAR FLORENCE IN 1638.

Engraved by Ch. Baude from the picture by Tito Lessi, exhibited in the Salon of the Champs Élysées.

repeated conversations with Galileo general objections similar to those Simplicius offers against the Copernican theory. The result was that the Pope, from a warm admirer of Galileo, became a secret enemy, and gave the Jesuits entire liberty of action in the matter. The Catholic authors, it is true, consider it inconceivable that Urban VIII. should have listened to so clumsy a slander, and even Reusch believes that he may infer from some of his utterances that he gave no weight to the talk of his courtiers, but in my opinion these champions of the Jesuits deceive themselves when

they consider the insinuation entirely too clumsy, and forget to give another explanation of the Pope's sudden change of mind.

As early as August, 1632, there was issued in Rome a mandate prohibiting the further circulation of the book published in Florence, on the pretext that the permission to print was obtained in an underhand manner, and that Father Riccardi had been cheated. The Grand Duke of Tuscany, who was very kindly disposed to his court mathematician, but unfortunately was not very energetic, inquired through his ambassador Niccolini in Rome how it came about that a work approved a few weeks before by the Holy See was now forbidden. His answer from Father Riccardi was to the effect that there had been found in the archives of the Holy Office a protocol in which Galileo had sworn sixteen years before to Cardinal Bellarmin "neither to teach, to defend, nor even to discuss" the doctrine in question. This prohibition he had not only transgressed, but had concealed it from the censors, and obtained by artifice the permission to print.

What is to be thought of this pretended protocol has already been said above (p. 459). Even the most cautious critics, who, like Reusch, will not directly assert it to be a forgery, do not believe that it could have been read before Galileo at that time, as no mention of it occurs in the officially executed protocol. The celebrated Cardinal Robert Bellarmine, who is said to have addressed this admonition to Galileo, whose own works were placed in the Index, and to whom is attributed the witty saying, "Among the cardinals there are so few holy ones because they all wish to become the holiest of all" (that is to say, Pope), had been dead for more than ten years, and could no longer be consulted. Proceedings were begun against Riccardi, probably only to satisfy appearances, on the ground of inconsiderate granting of permission to print. But whether because they could find no ground for conviction, or because of his knowledge of the protocol affair, he came out so completely vindicated that he held the office of chief book-censor for the rest of his life.

Galileo's trial before the Inquisition was thereupon begun in great haste. On the 15th of September, 1632, the Tuscan ambassador was informed that the matter would be brought before the court of the Inquisition. A week later notice was issued to the inquisitor of Florence, that Galileo had been found guilty in the preliminary proceedings brought against him of transgressing a prohibition received by him sixteen years before, and that he was to come to Rome as speedily as possible in order to defend himself

before the Holy Office. Galileo was not for a moment in doubt that he was now delivered over to the mercy of the Jesuits, and that in spite of all his intercession he must expect the worst. This is plainly seen from a letter which he wrote in January, 1633, shortly before his departure for Rome, to the Paris lawyer Elias Diodati, stating so clearly the conception of his position that a large portion of his letter may be given here.

“If I ask the theologian,” writes Galileo, “whose work is the sun, the moon, and the earth, their position and their movement, I think he will answer; these are the work of God. If I thereupon ask him further: On what inspiration does Holy Scripture rest? he will answer me: on the inspiration of the Holy Ghost, that is, of God Himself. It follows that the universe is the *work*, Holy Scripture the *word*, of God. If I now ask him further: Does the Holy Ghost ever use words that seem to conflict with the truth, because they are adapted to the uneducated mind and the ordinary intelligence of the common people? he will certainly answer me in agreement with the fathers of the Church, that one does indeed find this in Holy Scripture; that this is its peculiar manner of expression, and that in more than a hundred places the mere literal meaning would show, not heresies, but blasphemies, since in them God himself is represented as capable of anger, repentance, forgetfulness, indolence, etc. If I ask him whether God, in order to make his work comprehensible to the uneducated and unintelligent multitude, has ever altered his creation; whether nature, which is God’s servant, but appears disobedient to man and can never be changed by all his efforts, has not always taken the same course, and does not still take it, I am convinced he will answer me that the moon has always been a sphere, although the people for a long time considered it a bright disk; in short, he will admit that nature has never changed anything to please us, has never fashioned her works differently in accordance with the wishes, the opinions, the credulity of men. If this is so, on what ground should we, while we wish to learn to know the world and its constituent parts, give the preference to God’s word over God’s work? Is the work less complete, less noble than the word? Supposing that the assumption that the earth moves were pronounced heretical, and that later observations, reflexion, the very body of the facts themselves, showed the movement of the earth to be irrefutably proven, would not the authority of the Church be greatly injured under those circumstances? On the contrary, if one assign only the second place to the word, as often as the work seems to oppose it,

one will do no harm to Holy Scripture. A number of years ago, when the great storm rose against Copernicus, I wrote quite a detailed memoir dedicated to Christina of Lorraine, in which, supported by the authority of most of the fathers of the Church, I tried to prove that it is a fatal misuse to call upon the authority of Holy Scripture so often in those questions of science that can be decided by observation. I asked that in future they forbear to use such weapons in discussions of this kind. As soon as I am less troubled I will send you a copy of this memoir. I say less troubled, because I am about to go to Rome, whither the Holy Office has summoned me, having also forbidden the circulation of my *Dialogues*. I hear from a reliable source, that the Jesuit fathers have inspired those in authority with the conviction that this book of mine is more abominable and more harmful to the Church than the writings of Luther and Calvin. . . ."

On the 20th of January, 1633, the old man, seventy years of age at that time, set out on the journey to Rome, but with fewer hopes and with less confidence than he had on his journey a few years before. He reached his destination on the 13th of February, and immediately took up his abode in the palace of the Tuscan ambassador, Niccolini, who naturally prepared for him the kindest reception. Concern for his future, and the journey, in those days so tiresome, had so weakened him that the ambassador feared for his life. On the 12th of April he appeared for the first time before his judges and affirmed that he had never received a prohibition such as that contained in the protocol mentioned. And such is the result of all recent historical criticism, that we dare no longer look in this statement for any conscious untruth, or for evidence of the forgetfulness of an old man. We are forced to believe his assertion that such a prohibition was wholly unknown to him, rather than his further statement that since the admonition received by him, he had no longer considered the Copernican theory as proven and worthy of belief. It is the same with his statement that he did not suppose himself in his *Dialogues* to have defended the Copernican system. The apologists of the Roman proceedings, such as the Barbarini librarian Sante Pieralisi,¹ have naturally not hesitated to conclude from this statement, contrary to all the truth, and from the final complete *Sacrificio dell' intelletto* at the abjuration, that they were dealing not only with a weak broken-down old man, but with an unprincipled, deceitful, obstinate, refractory, and querulous one, against whom the Church had not been able to de-

¹ *Urbano VIII. e Galileo Galilei*, Roma, 1875.

find herself and secure peace in any other way than by means of these successful proceedings,—that in a word Galileo as a man did not deserve the sympathy that perhaps one owed him as a thinker and inquirer. We may possibly deplore this lack of firmness in the aged man, but we have hardly the right to make from it so insulting a reproof as has been done. This reproof rebounds powerless from Galileo and falls with its full weight upon the tormentors who forced him to this conduct. For we must consider that the prospect of torture and the stake never once left the sick old man in the prison of the Inquisition. The burning of Giordano Bruno (1600) and Lucilio Vanini (1619) were still fresh in memory, and Galileo had no desire to be a hero of the faith. He had no longing for the martyr's crown, nor was he a philosopher, whom it might disgrace to give up his convictions; he was simply a naturalist, whose observations were not attacked, but who was only forbidden to give them a precise interpretation.

He remained twenty-three days imprisoned in the palace of the Inquisition, and was brought before his judges four times. On the 16th of June, 1633, a decree was issued by the Holy Office, which arranged the criminal proceedings and threatened Galileo with the rack in case he would not confess the whole truth. On the 21st of June the last trial examination took place, of which it is said in the extant verdict pronounced on the following day: "As it seemed to us, however, that the whole truth was not told by you in regard to your purpose, we considered it necessary to have recourse to the *examen rigorosum* against you, where you answered as a Catholic."

From this official document some recent critics wish to draw the conclusion that the popular idea, that Galileo was tortured in order to extort his recantation, had foundation. It is significant enough that popular sentiment believed the ecclesiastical court capable of this inhuman proceeding towards a feeble old man who had always been found tractable. Nevertheless, it must be admitted that actual torture is just as little proved by the existing protocol as the contrary, for the expression *examen rigorosum* was at that time used as well for an examination in which the instruments of torture actually came into use, as for one in which they were shown and explained only as means of threatening in case the accused would not confess without it. So the *prospect* of torture was not spared him in any case, and this at least mental torture remains a blot which nothing can excuse in regard to a man who was not to be reproached for any serious heresy, but at

the worst only for simple disobedience. That he represented truth and his judges error, is not to be added in the balance.

From the particulars that have been ascertained it may be assumed as tolerably certain that Galileo in clear knowledge of his position and in the conviction that he had no forbearance to hope for, either from the Pope or from the Jesuits, did and conceded all that the Inquisition demanded of him. Professor M. Cantor has further called attention to the fact that the verdict which sentenced Galileo to a solemn abjuration of the Copernican theory, and to a still disputed punishment by imprisonment, seems not to have been unanimously held, for of ten cardinals who are represented at the head of the verdict as judges, only seven signed it. According to this, doubts seem to have sprung up within the ecclesiastical court itself, in regard to the method of procedure and the verdict passed.

The formula of abjuration, which probably followed immediately after the announcement of the sentence, contains, after the acknowledgment of the justice of the sentence passed upon him, the solemn promise wrung from him in face of torture: ". . . with an upright heart and unfeigned sincerity I abjure, execrate, and express my abhorrence of the above-mentioned errors and heresies (namely, that the sun, and not the earth, is the motionless center of the universe), and swear that in future I will never by word or writing assert or maintain anything whatever on account of which I might incur similar suspicion."

That he at the same time added to himself, "It moves just the same," and remained faithful to this belief to the end of his life, may, as has already been mentioned, be safely assumed.

He was released two days later from prison, and assigned as residence, under constant ecclesiastical oversight, the Villa Medici in Rome. Later, when his health was sufficiently restored for him to begin the journey, he was sent to Siena. At the end of the year he was allowed to return to his Villa Arcetri near Florence, while residence in Florence remained forbidden till his death. These measures, which made surveillance of Galileo easy and his seclusion much more strict, and from which the Pope, in spite of all the intercession of influential men, was not to be dissuaded, had the undesired result of giving rise to all kinds of stories; for example, that he had already suffered the pains of torture; and with the blindness resulting several years later the rumor was connected that both his eyes had been put out by the hand of the executioner in the prisons of the Inquisition! Pope Urban continued his hatred

and persecution even after Galileo's death, which occurred on the 8th of January, 1642, and this may be regarded as further proof that he believed the innuendos of the Jesuits. After the penitent sinner had been refused burial by the Church, the erection of a monument, for which arrangements had been made by friends and pupils, was discontinued by the special wish of the Pope, "because it is not fitting to honor by a monument a heretic sentenced by the Holy See to do penance, and who died before the expiration of his sentence."

The Church had won a great victory, for she had forced a weak old man seventy years of age, by all the engines of power at her command, to disown his convictions. There was naturally great rejoicing over it, and in the next fifty years there was poured out over the unbelieving a genuine flood of triumphant refutations of the Copernican system. Certain astronomers, protected and guided by the "star of the wise," found favor before the papal see. They belonged to the most faithful sons of the Church, and Prof. Scipione Chiaromonti of Pisa raged furiously against Copernicus, Tycho Brahe, Kepler, Galileo and all who opposed Aristotle and Ptolemy. He was most loyally aided by the Paris professor of mathematics and astrology Jean Baptiste Morin, who had already in 1631 launched against Copernicus a work on the *Solutio famosi problematis de telluris motu vel quiete*, and afterwards, in 1634 and 1642, had published various polemic treatises against him and Tycho Brahe. He got into a quarrel over them with his old friend, the celebrated philosopher Gassendi, who in a letter had declared himself for Copernicus. Against him he hurled first the polemic treatise *Alae terrae fractae* (1643) in which he believed that he had effectually broken the wings of the earth, and afterward the prophecy, read in the stars, that Gassendi should become fatally ill in the midsummer of 1650. When, however, the earth as well as Gassendi pursued its way unharmed, he drew upon himself from a friend of Gassendi the *Anatomy of a Ridiculous Mouse* (*Anatomia muris ridiculi*, Paris, 1651) to which he replied by his coarse epistle *Of the Three Impostors* (1654).

The Jesuit Riccoli had tried again in his *New Almagest* (1653) to restore and set going Ptolemy's complicated world-machinery with all its spheres and epicycles. But he no longer dared to decide for it absolutely, and wrote to Gassendi: "I know nothing essential to bring against the Copernican system, but I advise you not to express yourself for it openly and too decidedly." In secret he seems to have been an adherent of Copernicus, to whom he de-

licated one of the largest craters on his map of the moon. In his book, however, he brings forward only forty-nine arguments for



TOMB OF GALILEO IN FIRENZE. From a photograph.

and seventy-seven against Copernicus, among them naturally as the weightiest the decision of the court of Inquisition. But it is hardly worth while to examine more closely the last conclusions of

ancient but tenacious Aristotelianism, since through the discoveries of Kepler and Newton the true system of the universe soon became for the intelligent world an absolute fact, far removed from all uncertainty and supposition. The advice of Nikolaus Möller of Kiel, in his work *De indubio solis motu immotaque telluris quiete* (1724) or of Pastor Gottfried Kohlreiff in his *Babylonian's View of Heaven* (1744) to reject in the lump as suggestions of Satan the discoveries of Copernicus, Kepler, Des Cartes, and Newton, found only a very limited public.

The Roman Curia in the year 1835, in a new edition of the Index, struck out the works of Copernicus, Kepler, Galileo, and other earth-movers, after having previously made several exceptions. It thereby acknowledged that it had not earlier been inspired by the Holy Ghost, and that it no longer regards the belief in the central position of the earth as a preliminary condition of salvation. The Church now rejoices over the fact that her high dignitaries, inquisitors, censors, and other oppressors of reason have no successors who need to be ashamed of the deeds of their ancestors, and that Father Secchi actually ventured to make in St. Peter's (1851) the experiment of Foucault with the pendulum, that visibly wrote with its point upon the marble floor the words: "It moves just the same!"

Naturally there rises in spite of all this even in modern times now here, now there, some self-sufficient crank who will not admit the movement of the earth, like Karl Schöpffer with his lectures and pamphlets, *The Earth Stands Fast* (Berlin, 1854), *The Bible Does Not Lie* (Nordhausen, 1854), or Superintendent A. Frank in Sangershausen and Pastor Knak in Berlin who consider it a shame to be inferior in faith to the author of the Book of Joshua. Yet the tale was far less discrediting to the latter, and in general to any one not possessing our means of convincing himself of the vanity and impossibility of the Indian dreams of sun-capture and moon-charm, than it would be to a child of our day who can easily assure himself by a slight mental effort of the inadmissibility and absurdity of such notions. To what ignominy those expose themselves who wish such stories taught as truths to-day in the school, Tyndall has so well explained in one of his lectures that I can do no better than to give his words.¹

"The concerns of a universe regarded from this point of view were much more commensurate with man and his concerns than those of the universe which science now reveals to us; and hence

¹*Fragments of Science*, fifth edition, p. 404.

that to suit man's purposes, or that in compliance with his prayers, changes should occur in the order of the universe, was more easy of belief in the ancient world than it can be now. In the very magnitude which it assigns to natural phenomena, science has augmented the distance between them and man, and increased the popular belief in their orderly progression. . . . Let us take as an illustration the miracle by which the victory of Joshua over the Amorites was rendered complete. In this case the sun is reported to have stood still for 'a whole day' upon Gibeon, and the moon in the valley of Ajalon. An Englishman of average education at the present day would naturally demand a greater amount of evidence to prove that this occurrence took place, than would have satisfied an Israelite in the age succeeding that of Joshua. For, to the one, the miracle probably consisted of the stoppage of a fiery ball less than a yard in diameter, while to the other it would be the stoppage of an orb fourteen hundred thousand times the earth in size. And even accepting the interpretation that Joshua dealt with what was apparent merely, but that what really occurred was the suspension of the earth's rotation, I think the right to exercise a greater reserve in accepting the miracle, and to demand stronger evidence in support of it than that which would have satisfied an ancient Israelite, or than that which would now satisfy the archaic editor of the *Dublin Review*, will still be conceded to a man of science.

"There is a scientific as well as a historic imagination; and when, by the exercise of the former, the stoppage of the earth's rotation is clearly realised, the event assumes proportions so vast, in comparison with the result to be obtained by it, that belief reels under the reflexion. The energy here involved is equal to that of six trillions of horses working for the whole of the time employed by Joshua in the destruction of his foes. The amount of power thus expended would be sufficient to supply every individual of an army a thousand times the strength of that of Joshua, with a thousand times the fighting power of each of Joshua's soldiers, not for the few hours necessary to the extinction of a handful of Amorites, but for millions of years. All this wonder is silently passed over by the sacred historian, confessedly because he knew nothing about it. Whether, therefore, we consider the miracle as purely evidential, or as a practical means of vengeance, the same lavish squandering of energy stares us in the face. If evidential, the energy was wasted, because the Israelites knew nothing of its amount; if simply destructive, then the ratio of the quantity lost to that employed, may be inferred from the foregoing figures."