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The Woes of Galileo.

By MARY BRADFORD WHITING.

“ In Santa Croce’s holy precincts lie
 Ashes which make it holier, dust which is
 Even in itself an immortality,
 Though there were nothing save the past and this,
 The particle of those sublimities
 Which have relapsed to chaos—here repose
 Angelo’s, Alfieri’s bones, and his
 The starry Galileo with his woes ;
 Here Macchiavelli’s earth returned to whence it rose.”

THERE are some among those who visit the tomb of Galileo in the Church of Santa Croce—the Westminster Abbey of Florence—who have blamed Byron for making his woes his distinguishing mark, instead of the splendid abilities and the marvellous achievements that are recorded upon it. Yet to those who have made a study of his life, and who have journeyed in reverent pilgrimage from his birthplace at Pisa to his lecture-room at Padua, and from Padua to his observatory at Arcetri, it is difficult not to feel that he was one set apart by fate—

“ A soul by nature pitched too high,
 By suffering plunged too low,”

for the struggle between truth and error, which characterized the whole of his career, though it could not stifle the truths that he discovered, yet retarded their dissemination and rendered miserable the life of their discoverer.

The circumstances of his life are so well known that they need only be lightly touched upon here. He was born on February 18, 1564, in a small house in the city of Pisa, near the famous gardens of the Palazzo Scotto. The house still stands and is visited by tourists, but it is not specially interesting in itself, and it is in the Duomo that the spirit of Galileo still seems to hover, where the vibrations of the great bronze lamp first roused his mathematical perceptions, and where from the Leaning Tower he made some of his first experiments.

Vincenzo Galileo, his father, was descended from a noble Florentine family, but being himself very poor, he made his living by teaching music and mathematics in Pisa, and was so disgusted with his scanty returns that he determined that his son should pursue neither study, but should devote himself to the more lucrative profession of medicine. As far as his means allowed, he had the boy well educated, sending him first to the monastery school of Vallombrosa and afterwards to the University of Pisa. But Galileo took no interest in medicine; his mind dwelt continually on the subjects that had been forbidden to him, and happening one day to overhear a lesson in geometry given to the pages of the Grand Ducal Court, he entreated his father with such vehemence that he at last obtained leave to throw over his medical course and devote himself to mathematics.

The next few years were the brightest of his life, for while his father lived he was free from family cares, and now that he had attained his heart's desire he was able to immerse himself in his beloved studies. His progress was so rapid that in 1588, when he was only twenty-four, he was appointed Mathematical Instructor in the University, and students flocked from all sides to hear his lectures.

But, unfortunately for Galileo, he lived in an age of Court tyrants, and having imprudently criticized a machine invented by Giovanni dei Medici for dredging the harbour at Leghorn, he was deprived of his post. In 1591 his father died, and he became head of an extravagant and ungrateful family of brothers and sisters, whose demands upon him hampered the whole of the rest of his life. In the next year he was elected to the post of Professor of Mathematics in the University of Padua, and it was here that he reached his greatest success as far as his worldly fortunes were concerned. No visitor to Padua leaves the city without seeing the great hall in the Palazzo della Ragione, which is said to be the largest lecture-room in Europe, and is capable of seating two thousand persons. In this splendid building, with its vaulted roof and frescoed

walls, Galileo held his classes, and the story goes that it was not only crowded, but that students were turned away from its doors. It was in Padua that he made his first telescope, an instrument which was modelled on the invention of a Dutch optician, but which he so improved that he was able to apply it to the observation of the heavens, a new method which not only resulted in such discoveries as that of the satellites of Jupiter, the rings of Saturn, and the stars of the Milky Way, but which eventually revolutionized the whole of astronomical science.

That a man possessed of such a genius as this should have been subjected to opposition and bitter persecution seems to us in the present day a fact so outrageous that it fills us with amazement, no less than with indignation. But before judging Galileo's judges, we must endeavour to put ourselves into their place, and to consider the matter from their point of view. When we remember that fifty years after Galileo made his discoveries such a master mind as Milton's—a mind, moreover, which had been brought into actual contact with that of the great astronomer—still clung to the Ptolemaic system, it can hardly surprise us that the first publication of the discoveries raised a storm of fury. Here and there in "Paradise Lost" we find traces of the influence of the doctrines of Copernicus, but if we would make a map of the scenes in which the action takes place we must take the earth for the centre of the universe, and show that the souls of its occupants on their journey to heaven

" Pass the planets seven and pass the fixt,
And that crystalline sphere whose balance weighs
The trepidation talk'd, and that first moved.

Book III.

The system of Ptolemy exactly fitted in with the religious belief of the age: The earth was the most important part of the universe, and its inhabitants were the crown of creation and the unique objects of the Almighty care and protection; the sun and moon were made to give it light, the atmosphere was made to provide it with air, the seas to wash its shores.

The statements of the Scriptures were considered to bear out this belief in every particular, and it is not difficult to understand that with the words before them—"He hath made the round world so fast that it cannot be moved"—good men were filled with horror when they heard the audacious doctrine that the world was not fast at all, but that it revolved round the sun, and that, far from being the centre of the universe, it was not even so important as Jupiter, since Jupiter had four satellites to revolve round him, while the earth was obliged to content herself with one.

It is easy for us at the present day to sneer at these men and speak of them as blind bigots; but is it not possible that some of those to whom Galileo's discoveries are common-places, and therefore indisputable, have taken up quite as unscientific an attitude towards the discoveries of their contemporaries?

Some surprise has been felt at the fact that while Galileo was signalled out for persecution, Copernicus, the first propounder of the new astronomical system, was left unmolested. His great work—"De Revolutionibus Orbium Cœlestium"—in which he states that the sun is the centre of the universe round which the earth and the other planets revolved, was actually dedicated to Pope Paul III.; but the year of its publication (1545) was also the year of Copernicus's death, and though the book was brought to him on his death-bed, he did no more than just recognize it, nor was he ever conscious of the fact that his friend, Andreas Osiander, had written an introduction to it. This introduction it was that saved his reputation with the Church, for Osiander guarded his position by saying that the new theory need not be considered possible, nor even probable, since it was no more than a theory, and had been merely suggested by Copernicus as a facilitation of astronomical studies. This explanation satisfied the authorities, and the startling statement slept on quietly and undisturbed for the next sixty years, when Galileo's application of the telescope to the study of the heavens brought such sudden and marvellous

proofs to bear upon it that it could no longer be ignored. The discovery of the moons of Jupiter in 1610 was the turning-point in the matter. If they were really there, revolving round the planet, the Ptolemaic system could not stand. The best thing to be done, therefore, was to deny their existence, and the objectors in consequence refused to look at them through the telescope, declaring it to be an impious invention.

A letter written by Galileo to his friend Kepler in the August of this year shows the despair with which he regarded their attitude :

“What is to be done? Shall we side with Democritus or Heraclitus? I think, my Kepler, we will laugh at the extraordinary stupidity of the multitude. What do you say to the leading philosophers of the faculty here, to whom I have offered a thousand times of my own accord to show my studies, but who, with the lazy obstinacy of a serpent that has eaten his fill, have never consented to look at planets, nor moons, nor telescope. Verily, just as serpents close their ears, so do these men close their eyes to the light of truth. These are great matters, yet they do not occasion me any surprise. People of this sort think that philosophy is a kind of book like the ‘Æneid’ or the ‘Odyssey,’ and that the truth is to be sought, not in the universe, not in nature, but (I use their own words) by comparing texts! How you would laugh if you heard what things the first philosopher of the faculty at Pisa brought against me in the presence of the Grand Duke, for he tried, now with logical arguments, now with magical adjurations, to tear down and argue the new planets out of heaven!”

But worse was to follow. In September, 1610, Galileo left Padua and entered the service of the Grand Duke of Tuscany, taking up his residence in Florence. He had no sooner arrived than he made public his two new discoveries—firstly, that Venus and Mercury revolve round the sun, and not round the earth, as had previously been believed; and, secondly, that by observation of the spots on the sun it was possible to prove

that it revolved on its own axis. Far from recognizing the danger of this proceeding, Galileo was anxious to convince the authorities of the truth of his discoveries, and in the spring of 1611 he obtained permission to go to Rome, taking his telescope and other instruments with him.

His courage seemed at the time to find its reward, for he was not only patiently listened to, but was loaded with praises and flattery; all the while, however, a plot was being formed against him. Later on in the year the storm broke, and from that time until the end of his life he was harassed by perpetual persecution. To trace every step in the proceedings would be to fill many volumes, but the point at issue was that the authorities wished him to confess that his doctrines were contrary to Scripture, and therefore could not be true; while he, on his side, refused to admit that they were contrary to Scripture, since the astronomical statements in the Bible were not intended to be taken literally—"The Holy Spirit intends to teach us how to go to Heaven, not how the heavens go."

He makes his position very clear in a long letter written in 1613 to his friend, Father Castelli, the Professor of Mathematics at Pisa:

"I am inclined to think that the authority of Holy Scripture is intended to convince men of those truths which are necessary to their salvation, and which, being far above man's understanding, cannot be made credible by any learning, or any other means than revelation by the Holy Spirit. But that the same God who has endowed us with senses, reason, and understanding does not permit us to use them, and desires to acquaint us in any other way with such knowledge as we are in a position to acquire for ourselves by means of those faculties, that, it seems to me, I am not bound to believe, especially concerning those sciences about which the Holy Scriptures only contain small fragments and varying conclusions: this is precisely the case with astronomy, of which there is so little that the planets are not even all enumerated."

This letter was made public, and it was in answer to it that Father Caccini, a Dominican monk, was engaged to preach against Galileo in Santa Maria Novella in the Advent of 1614, when he based his discourse on the text: "Viri Galilei, quid statis aspicientes in cœlum?"

If Galileo would have ceased to uphold the Copernican system, the authorities would have been willing to sink their opposition; but this he would not do, and the natural consequence followed. Believing that it was their duty to prevent the dissemination of false doctrine, they warned him that if he would not obey he should be imprisoned; and, submitting to this threat, he lived for seven years in his villa near Florence without publishing anything. At the end of that time a gleam of hope came to him, for, at the death of Gregory XV. in 1623, Cardinal Barbarini, who had always treated Galileo with marked consideration, became Pope under the title of Urban VIII., and, hoping to have the decree rescinded, he went to Rome to present his petition. The Pope received him kindly, and made him many handsome presents, and though he would not promise to rescind the decree, Galileo was tempted to believe that it would no longer be enforced, so that after his return to Florence he set himself to the composition of his great work, "Dialogues on the Two Principal Systems of the World: the Ptolemaic and the Copernican."

It is clear that Galileo intended to obey the Papal prohibition in the letter, whatever he may have done in the spirit, for he is careful to speak of the doctrine of Copernicus as an "hypothesis," and to add the word "possibly" when he ventures on any daring statement; but such precautions as these were no more than a child's barrier of sand against the inflowing ocean; and when, after innumerable difficulties and delays, the book was at last published in 1632, Galileo found that, in spite of the fact that he had obtained permission to print it, a mandate from Rome forbade its sale, on the ground that he "had transgressed orders in deviating from the hypothetical treatment by decidedly maintaining that the earth moves and the sun is

stationary," and that he must therefore be brought before the Inquisition.

The unfortunate astronomer was now nearly seventy years old; he suffered from severe physical ailments, and his sight was failing. But though his friends and his physicians entreated for him, there was no redress, and in the January of 1633 he set out on his journey.

Much has been written about his trial in Rome, but the best authorities unite in declaring that, though he was examined under threat of torture, no torture was actually administered; the fact, however, remains that he was compelled by moral, if not by physical, force to sign a recantation and submit to punishment. In the midst of the assembly of Cardinals, humbly kneeling upon his knees, he was made to confess his fault as follows:

"After an injunction had been judicially intimated to me by the Holy Office to the effect that I must altogether abandon the false opinion that the sun is the centre of the world and immovable, and that the earth is not the centre of the world and moves, and that I must not hold, defend, or teach in any way whatsoever, verbally or in writing, the said doctrine, and after it had been notified to me that the said doctrine was contrary to Holy Scripture, I wrote and printed a book in which I discuss this doctrine already condemned, and adduce arguments of great cogency in its favour, without presenting any solution of these, and for this cause I have been pronounced by the Holy Office to be vehemently suspected of heresy—that is to say, of having held and believed that the sun is the centre of the world and immovable, and that the earth is not the centre and moves."

The often-repeated story that, on rising from his knees, the old man stamped his foot on the ground and exclaimed "E pur si muove!" ("And yet it moves!") has been repudiated by the critics; and in this they are doubtless right, for if Galileo had made such a declaration he would certainly have been consigned

to the dungeons of the Inquisition, whereas he was allowed to return to his own house at Florence.

Whether he was justified in making his recantation is a more difficult question, and one which we, at this day, are perhaps not qualified to decide; his woes, at any rate, were heavy enough to satisfy even those who are loudest in his condemnation. His bodily ills were great. His beloved daughter, the very light of his eyes, died at the early age of thirty-three; his relations were both rapacious and ungrateful; his friends, though faithful, were watched by the Inquisition, nor was he allowed to go to their houses. His villa at Arcetri was, in fact, a prison. It was here that Milton visited him, and it was here that he made those observations of the moon which are alluded to in "Paradise Lost"—

"whose orb
Thro' optic glass the Tuscan artist views
At evening from the top of Fiesole,
Or in Valdarno, to descry new lands,
Rivers, or mountains in her spotty globe."

His health was now so bad that he begged to be allowed to move into Florence that he might be near his physicians, and this boon was at last granted on condition that he spoke to no one of his opinions. In a letter dated March 10, 1638, the Inquisitor Fanano writes to Cardinal Barbarini in Rome: "I have ordered him not to go out into the city under pain of imprisonment and excommunication, and have forbidden him to discourse with anyone on his condemned opinion of the earth's motion. He is now seventy-four years of age, and brought so low by his blindness and other complaints that we may easily believe his promise not to transgress this command."

But, in spite of his bitter persecution, Galileo never lost his reverence for religion; the little Church of San Giorgio is only about twenty yards distant from the house that he occupied in the Costa San Giorgio, and he was careful to ask for permission to attend it, as a letter from the Vicar of the Holy Office, granting him leave to be present at the Easter services in

1638, attests. One other consolation was not denied him, and that was the knowledge that his discoveries were making their way in spite of all attempts to stifle them, for his condemned book was not only printed in Holland in the Latin tongue, but translations soon appeared in Italian and English. All through the closing years of his life he continued his studies, although his blindness had now become complete ; but his woes were soon to end, and on January 8, 1642, he passed away at the age of seventy-eight. Even after his death the authorities continued to persecute him, for his remains were not allowed to be buried in consecrated ground ; but in 1737, when a member of the Florentine family of Corsini reigned as Pope under the title of Clement XII., permission was given to remove them into the Church of Santa Croce. His books, however, still remained on the Index, nor was it, incredible as it may seem, until August, 1820, that a decree was passed permitting the faithful to renounce their adherence to the Ptolemaic system.

“ E pur si muove ! ” The words may not have been uttered by Galileo of the motion of the earth, but they are eternally true of the advance of knowledge. In the same year that the Tuscan astronomer died, Newton was born in England—Newton who, by his discovery of the law of gravitation, perfected the theories which were started by Copernicus and carried on by Galileo.

The woes of Galileo are over, yet, as we dwell upon them, it is impossible not to ask ourselves why such blind and cruel injustice should be permitted in the world. The problem is one to try the faith of men ; but is it not the law of life that new truths, intellectual as well as spiritual, must always be crucified ? Nor need we fear that the crucifixion of new truths will be their destruction, for it is invariably followed by their resurrection, and in the power of that resurrection they enable the minds and souls of men to ascend to heights as yet undreamed of and unknown.

