

HORROCKS, THE ASTRONOMER.

THE clouds which, during the early part of the seventeenth century, were already gathering in the political atmosphere of England, threatened to extinguish the glimmering light of science that then existed. Many a student in those days who would fain have withdrawn himself from all things calculated to disturb the serenity of his mind, could not have escaped being ruffled by the wars and rumours of wars which then prevailed, and often arrested in his work and discouraged by lack of patronage, would rush into the thick of the storm himself. But we find some who were too deeply absorbed in their learned speculations and researches to heed the gloomy signs of the times or to be cast down by want of sympathy and help.

In the north-west of England we may discover a little band of philosophers, earnest and virtuous, spending their days in the serious pursuit of science, communicating to one another by letter the results of their investigations. There were four of them, and it is said that they were made known to each other by Mr. Christopher Townley, of Carr, Lancashire, the particular friend of Sir Edward Sherburne, the translator of *Manilius*, who, in an Appendix to one of his translations, in which he gives a catalogue of eminent astronomers from the earliest times to his own day, thus speaks of the Lancashire group of students and of their kind patron:—"These four were lights of the first magnitude in the Northern Hemisphere, who were happily brought to the acquaintance of one another by the means of Christopher Townley, of Lancashire, who stuck not for any cost or labour

to promote as well astronomical and other mathematical studies, by a diligent correspondence kept and maintained with the learned professors in those sciences, upon which account he was very dear to all the four, and for which reason, as for the particular respect I owe him, he merits to be named in this catalogue." And who were these "four lights of the Northern Hemisphere?"

William Milbourn, as Sir Edward Sherburne, tells us—aged about forty—was a curate in the remote village of Brancepath, in Durham. He so arranged his pastoral duties as to leave himself some time for his favourite occupation—the study of astronomy; nor did he fail, in spite of imperfect means, to carry his observations to such a degree of exactness as to enable him to discover errors in tables then received as trustworthy. He died during the civil wars, and his papers were destroyed. No trace, therefore, would have remained to us of his work, but for a correspondence he had carried on with William Gascoigne, who was the youthful inheritor of landed property in Yorkshire.

William Gascoigne was happier than his friend, the curate of Brancepath, in possessing the power of money, being thus enabled to carry out many a scheme which otherwise he might have been compelled to relinquish. He devoted himself to the study of astronomy, constructing telescopes with his own hands; but he is especially distinguished as the inventor of the micrometer. Gascoigne perished in the flower of his youth on the battle field, fighting for his king at Marston-moor. His

papers, like those of Milbourn, were destroyed, with the exception of one letter, which contains a description of the micrometer: this is addressed to a youth of his own age, named William Crabtree, residing at Broughton, near Manchester, who although engaged in business pursuits, was so energetic and successful in scientific work, to which he devoted his hours of leisure, that his great friend Horrocks, the astronomer, spoke of him as a person who had "few superiors in mathematical learning."

And now we approach the king of this small company of students, Jeremiah Horrocks, the curate of Hoole, who was, intellectually, if we may so express ourselves, "a head taller than his fellows." Although the importance of his astronomical work was little regarded at the time, his name has since been held in much honour by the greatest of our scientific men, and the beauty of his stainless life, be it remarked, well accords with the sublimity of the celestial study, which was his chosen recreation. It is owing to Jeremiah Horrocks that England may be said to possess an especial share or interest in the rare and important phenomenon which the whole world is now awaiting—the transit of Venus.

Among the valuable collections of Hearne, the antiquary, we come upon the following memorandum:—"Mr. Horrox, a young man, minister of Hoole, a very poor pittance, within four miles of Preston, in Lancashire, was a prodigy for his skill in astronomy, and had he lived, in all probability he would have proved the greatest man in the whole world in his profession. He had a very strange, unaccountable genius, and he is mentioned with great honour by Hevelius upon account of his discovery of Venus in the sun upon a Sunday; but being called away

to his devotions and duty at church, he could not make such observations as otherwise he would have done." This young Englishman was not forgotten when the transit of 1769 was approaching, for in the memorial addressed to the king, and presented by the Royal Society, requesting a grant of money for the necessary expenses of a proper observation of the phenomenon, we find these words:—"As far as appears, from the history of Astronomy, Mr. Jeremiah Horrox, an Englishman, seems to have been the first person since the creation of the world who calculated the passage of that planet (Venus) over the sun's disc, and observed the same at the village of Hoole, fifteen miles northward from Liverpool, on the 24th of November, O.S., in the year 1639." Nor will Horrocks be forgotten in December, 1874, when observing astronomers of many nations will station themselves on sea and land throughout the world, eager to watch what was first seen by an Englishman. Do we not hear his voice calling to us across the gulf of 135 years saying to us, as he said to his contemporaries: "Contemplate, I repeat, this most extraordinary phenomenon . . . the planet Venus drawn from her seclusion, modestly delineating on the sun, without disguise, her real magnitude, whilst her disc, at other times so lovely is here obscured, in melancholy gloom."

And again he says—"It is to be much desired that this remarkable phenomenon should be observed from several different localities." Yet, while we are about to obey the wishes thus expressed, and this on a magnificent scale, such as Horrocks had never dared to desire, comparatively few beyond the scientific world have heard the name of the first observer of the Transit of Venus.

Jeremiah Horrocks was born at

Toxteth Park, Liverpool, in the year 1619, or about that time. Many researches have been made, but in vain, concerning his parentage, which some imagine to have been of very humble origin. For this assumption, it seems to us, there is no trustworthy foundation. Undoubtedly it matters little in one sense, for the importance of his astronomical work, the remarkable character of his genius, and the moral grandeur of his life, suffice to ennoble any family which can claim him as their own, yet there would be a certain satisfaction, be his lineage what it may, in arriving at a solution of the mystery. Horrocks was a name of some note in the sixteenth and seventeenth centuries, it appears again and again on the lists of rectors, vicars, and curates, also occasionally elsewhere. We read of Horrockses "godly, learned, and orthodox;" Horrockses whose voices were "oracles in those days," &c. Moreover we have mentions of the Horrockses of Horrocksford Hall, and Hunter, in his "Life of Oliver Heywood," tells us how his hero mentioned the Horrocks family as one "of note before the wars." There appears some reason for supposing Jeremiah Horrocks to have sprung from this numerous and virtuous race; if so, instead of being of "very humble origin," he was connected with a tolerably good old family, consisting of many highly-educated, and some talented people.

The future astronomer was, from the beginning, it would seem, surrounded by Puritan influences. Concerning his native village, we glean the following particulars from the *Christian Reformer* for June, 1862: "At the time when Toxteth passed to the Molyneuxs, of Sefton, then a Roman Catholic family, there was neither church nor chapel to be found in

the village, and only about twenty dwellings. The population consisted almost entirely of Nonconformists, and Toxteth was called by them 'The Holy Land.' The people were in the habit of meeting for worship in a retired glen, then probably but little known, but now familiar as 'The Dingle.' A relic of these prayer meetings remained in the memory of people living in 1812." In support of the above statements it is to be observed that names still linger at Toxteth which speak plainly of a Puritan origin. There is a farm named "Jericho," the stream of "Jordan," the rocks of "David's Throne," and the cave of "Adam's Battery."

The Toxteth people, shut out as they were from the rest of the world felt the necessity of establishing some educational institution within the reach of their children; for it was difficult to send them to any of the great ecclesiastical schools in the country around. Collecting together therefore their very slender pecuniary resources, they resolved on building a modest school-house in their own village, which, having achieved, they sent for a tutor from the famous theological establishment at Winwick. In the "Autobiography of Adam Martindale" (a Chetham Society publication), Winwick is thus mentioned: "Winwick, the ecclesiastical foundation of Lancashire, was as famous at that time as a scholastic establishment, as it was as a school of theology, the rectors at that time—and indeed for many generations—having as many as five curates, whose labours were extended throughout the neighbouring district. The universities were the only high road to literary distinction, and the school of Winwick, one of their chief feeders from this part of the kingdom. Such as failed from various causes to attain the object of their ambition, became useful

schoolmasters in the country around. The head-master of Winwick, being requested to send his best pupil, selected Richard Mather, who was then only fifteen years of age. He accordingly took up his abode at Toxteth, and, young as he was, appears to have fulfilled his task to the entire satisfaction of all concerned. He taught there for some years, only leaving that he might prosecute his own studies at Oxford University. The inhabitants of Toxteth, in 1618, built a chapel, and invited Richard Mather to be their minister. He accepted this invitation, was ordained by Bishop Morton, of Chester, and so dwelt among them again until 1633, when he, with a Mr. Christopher Horrocks, of Horrocksford, Bolton le Moors, and many others, sailed to New England.

In Cotton Mather's *Magnalia Christi*, we read of the return to Toxteth of the favourite school-master, "not as a teacher, but a preacher," if, however, we take into consideration the scanty educational opportunities likely to be met with in a remarkably small and obscure village, we can scarcely fail to arrive at the conclusion that Mather—probably the only classical scholar there—would find himself entreated to teach where he had taught before; and, if so, the boy Horrocks would be among the pupils, thus early in life receiving valuable instructions from one who had long before his well-known public career distinguished himself at the famous school of Winwick. In 1632, Jeremiah Horrocks bid farewell for a time to the simple home of his childhood, and travelled to Cambridge, partly, as we may suppose, on foot, carrying with him his small possessions. He was destined for the profession of the Church; we see his name entered thus in the books of Emanuel College, where—be it observed—Puritans were wont to assemble:—

"Jeremy Horrox. Born at Toxteth, Lancashire. Sizar. 18 May, 1632."

We may remark that, although the name is constantly spelt with an *x*, the late Professor de Morgan had in his possession a copy of Lansberg's *Tabula Perpetua*, in which Horrocks had himself written—not only a list of books he had by degrees procured, but also his own name, which he has spelt thus—*Horrocks*. Moreover, in a book published lately—*Letters of the Scientific Men of the Seventeenth Century*, we find his friend and fellow-student, Dr. Wallis, who afterwards in conjunction with Dr. Christopher Wren prepared Horrocks's works for publication, writing thus to Collins, the mathematician: "Mr. Horrox, his name is truly spelt Horrockes, not Horrox, which I could wish to be preserved at least in some places in the printed books, though (since he hath been pleased so to put it) it may in *Latin* elsewhere be written with *x*."

It was while at Cambridge that Horrocks first began to study astronomy, and this he was obliged to do without either guidance or companionship, that science being scarcely taught there in those days. On this subject, Dr. Wallis in his autobiography, alluding to his own experiences, says: "I devoted myself also to astronomy and geography as parts of natural philosophy, and to other parts of mathematics; though at that time, they were scarce looked upon with us as academical studies then in fashion. But Horrocks, vanquishing all difficulties, resolves that instead of a master he will use astronomical books, that the tediousness of study shall be overcome by industry, and poverty by patience. "Armed" he says "with these weapons, I shall contend successfully; and, having heard of others acquiring knowledge without greater help, I should blush that

anyone should be able to do more than I, always remembering that word of Virgil's—

“*Totidem nobis animæque manusque.*”

But the indefatigable and courageous youth, although unvanquished by gigantic difficulties, does not cease to regret the want of the “sympathy of companionship in his endeavours.” It is not long, however, that he has to work in solitude, for William Crabtree soon appears on the scene; he writes from Broughton proffering his friendship, having heard of his enthusiasm for astronomy probably from Christopher Townley, Milbourn, or Gascoigne. Thus arose a friendship between these two young students, which proved a source of great happiness to both. Crabtree, in a letter to Gascoigne, speaks of Horrocks as his “second self,” and Horrocks in his treatise, *Venus in Sole visa*, mentions Crabtree as his “most esteemed friend.”

For some unknown reason, Horrocks did not remain at Cambridge long enough to graduate; it has been suggested that he was obliged to hasten his return to Toxteth in order to contribute to the support of his family, and we think it not improbable that he taught there as Richard Mather had done, for which occupation he was well-fitted, having made the most of his opportunities while at college, where he had eagerly studied the best Latin authors, and cultivated to a high degree his natural aptitude for mathematics. Our young collegian during his short sojourn at Cambridge, had the advantage at Emanuel College of the instructions and companionship of some very remarkable men, among whom we may mention the following well-known characters: The celebrated and beloved Dr. Benjamin Whichcote

entered Emanuel College in 1626, becoming a fellow and tutor there in 1633. Among his pupils we find the names of Dr. Wallis, Dr. John Worthington, and others. According to the dates, Jeremiah Horrocks must have been one also, but so little is the fame spread abroad of this “very strange unaccountable genius,” that those who have deemed it worth their trouble to notice some of Whichcote's pupils have left the Lancashire curate in obscurity, whereas as we have seen it well expressed—“his name ought to be known as far over the globe as stars are observed, or ships navigated.” Bishop Burnet, as we may remind our readers, speaks of Dr. Whichcote as “a wise and kind instructor, a man of rare temper, very kind and obliging,” and he says also that “he studied to raise those who conversed with him to noble thoughts.”

Then there was Dr. Anthony Burgess, afterwards of the Westminster Assembly, and subsequently Professor of Divinity at Gresham College, London. Wallis is recollected as one of his pupils, but Horrocks is again overlooked, although he must have been studying in company with Dr. Wallis, at least up to the year 1625, when Burgess was still at Emanuel College.

Lastly, among the tutors we will name Thomas Horton, who entered Emanuel College, 1623, took his B.A. 1626, M.A. 1630, and was then made fellow of that college, taking his B.D. in 1637. He was appointed one of the University preachers. Dr. Wallis was his pupil, and Horrocks we know, must have been so too.

Of his fellow students, we will only notice two. Dr. John Wallis, was one who could not have been overlooked by a keen and observant youth like Horrocks; they must surely have had many an animated conversation on subjects which

deeply interested them both. Wallis was born in 1616, entered Emanuel College the same year as Horrocks. He lived on a long life after the early death of his illustrious fellow-student, and was, as we have already mentioned, requested to edit his posthumous works.

Dr. John Worthington, born 1617-18, says himself in writing to a friend—"He (Horrocks) lived at Toxteth Park, near Liverpool, in Lancashire, was sometime of Emanuel College, Cambridge, admitted the same year that I was." Worthington was a man distinguished for his worth of character, and his learning; letters of his are to be found in the book already quoted—"Letters of the Scientific Men of the Seventeenth Century;" he corresponded with Hartlib, and others on the literary and scientific subjects of the day.

On leaving the University, Horrocks returned in 1635 to Toxteth, where he remained for about three years, during which time he was in constant correspondence with Crabtree on the subject of their astronomical observations; it is indeed to be regretted that the two friends limited themselves strictly to scientific communications, for any incidental hints concerning the every day events of the short life of our hero would have been invaluable; as it is, his history has been so involved in doubt and obscurity, that we possess very little satisfactory information.

It has been doubted whether the two friends ever met personally, but it seems probable from one passage in a letter from Horrocks to Crabtree, dated April 29th, 1637, and published among the *Opera Posthuma*, edited by Dr. Wallis, a very rare work now, that they were together on the evening of March 19th, 1637, when they witnessed in company an occultation of the Pleiades by the moon.

Horrocks had been patiently waiting for an appointment of some kind in the church to which he had dedicated himself. In 1639 he received a curacy at Hoole, near Preston, then in the diocese of Chester, from which we may suppose that he was ordained by Bishop Bridgman. In a letter dated June 1st, 1639, he writes to his friend: "Next week I remove to Hoole, it is a small village, five miles from Preston." Much to the regret of biographers, the enthusiastic astronomer scorns to mention the circumstances of his appointment, or the prospects of his Hoole curacy, and hastens on in the next line to the discussion of his astronomical investigations. It was at one time asserted that Jeremiah Horrocks never entered Holy Orders, for, dying so young as he did, there was not time for him to do so, as some have thought, but it is to be remembered, that although in our times candidates for ordination are not admitted till they have attained the age of twenty-three, in those days the matter was left to the discretion of the bishop, who, it seems considered the youthful candidate on this occasion was fit for the responsibilities he was willing to undertake. John Gadbury, an astrologer, who was contemporary with Horrocks, although he long outlived him, being born in 1627, and dying as is supposed in 1692, compiled an almanack, calculated, as he states in the title-page, from the "'British Tables,' composed first by the Reverend Mr. Horrox, and first published by Jeremy Shakerly." Costard, the astronomical writer, who lived not long after, speaks of him also as a "young clergyman," and we may also remind our readers of Hearne's memorandum, already quoted, which it appears was discovered by Professor Rigaud where Horrocks is spoken of as a hard-working curate "on a very small pittance."

Hoole was a dreary little village in the seventeenth century, but we hear no word of discontent from the hopeful and studious curate, whose whole world of happiness was in his own mind. We know he had a very humble dwelling there, for twice he speaks of the "narrowness," and again of the "smallness" of his apartment, not by way of complaint, but to explain some difficulties caused by this want of space when making astronomical observations.

Many hours he now passed in solitude, earnestly pursuing his astronomical investigations, and forgetting all around him while he gazed at the starry heavens through his much valued telescope obtained in 1638, for an incredibly small sum of money, but with which he tells us he could see the smallest spots on the sun; the young astronomer was happy enough in spite of the dreariness of his new home; feeling that after a day well spent in the most strictly conscientious discharge of his pastoral duties, he might give himself up to the sublime joys of his midnight and celestial studies. "Nothings could be more noble," he said "than to contemplate the manifold wisdom of my Creator, as displayed amidst such glorious works; nothing more delightful than to view them no longer with the gaze of vulgar admiration, but with a desire to know their causes, and to feed upon their beauty by a more careful examination of their mechanisms."

We gather from this expression of calm enjoyment that he had conquered the first difficulties of the study, which he once described in the following touching words:—"There were many hindrances. The abstruse nature of the study, my inexperience, and want of means, dispirited me. I was much pained not to have anyone to whom I could look for guidance, or indeed for the sympathy

of companionship in my endeavours, and I was assailed by the langour and weariness which are inseparable from every great undertaking. What was then to be done? I could not make the pursuit an easy one, much less increase my fortune, and, least of all, imbue others with a love for astronomy; and yet to complain of philosophy on account of its difficulties would be foolish and unworthy. I determined, therefore, that the tediousness of study should be overcome by industry; my poverty (failing a better method) by patience, and that instead of a master I would use astronomical books, &c."

Horrocks, in the early days of his astronomical studies, had been much absorbed in the writings of Lansberg; but was constantly annoyed at finding that his own calculations did not agree with those of the Belgian astronomer. He consulted with Crabtree, and the two friends, after much correspondence on the matter, arrived at the conclusion that Lansberg had been misleading them by his own errors. Great was the indignation of Horrocks at this discovery, and this the energetic youth expresses in no measured language. "Soon after the commencement of my astronomical studies," he writes, "and whilst preparing for practical observations, I computed the Ephemerides of several years, from the continuous tables of Lansberg. Having followed up the task with unceasing perseverance, and having arrived at the point of its completion, the very erroneous calculation of these tables, then detected, convinced me that an astronomer might be engaged upon a better work. Accordingly, I broke off the useless computation, and resolved for the future with my own eyes to observe the position of the stars in the heavens; but lest so many hours spent on Lansberg should be entirely thrown away, I

made use of my Ephemerides in ascertaining the positions of the distant planets, so that I was enabled to predict their conjunctions, their appulses to the fixed stars, and many other extraordinary phenomena. . . I pardon meantime the miserable arrogance of the Belgian astronomer, who has overloaded his useless tables with such unmerited praise, and cease to lament the misapplication of my own time, deeming it a sufficient reward that I was thereby led to consider and foresee the appearance of Venus in the Sun."

And now, feeling that the planet Venus had claimed his especial attention, he writes thus, shortly before his death, proving his extreme youth at the time of his great achievement:—"I, whose youthful days are scarce complete, have chosen for my theme, the Queen of Love, veiled by the shade of Phœbus." Meanwhile, although working enthusiastically at astronomy, he scrupulously attended to the parish over which he was placed, never allowing his beloved pursuit to lead him astray from his appointed duties.

Through the writings of Lansberg he was, in the way of disparagement, introduced to those of Kepler, for which great benefit he again forgives the "boasting Belgian." Of Kepler, whom he calls the "Prince of Astronomers," Horrocks speaks with enthusiastic admiration:—"I venerate," he says, "with the greatest honour and admiration, his sublime and enviably happy genius, and, if necessary, I would defend with my best efforts the Uranian citadel of the noble hero who has so much surpassed his fellows; nor shall anyone, while I live, insult his ashes with impunity." But even Kepler's calculations he would not take on trust, and we find him accordingly putting them also to the test of his own unerring calculations, and engaging in the work of correcting them, "an

undertaking," he remarks, "which could not be displeasing to Kepler himself, as he frankly confessed that these matters were not yet thoroughly explored."

The great Kepler in a small work of his published at Leipsic, entitled *Admonitioncula ad Curiosas rerum Cœlestium* had made an assertion which none dreamed of doubting. He had proclaimed to the astronomical world that Venus would not be seen in the face of the sun more than once during that century: these are his words:—"Venus will pass over the sun's disc in 1631, and not return thither again until 1761."

But Horrocks dares to investigate for himself, and after much deep study and solitary calculation arrives at a result which he thus communicates to his friend, William Crabtree, in a letter dated, Hoole, October 26, 1639. "My reason for writing to you now is to advise you of a remarkable conjunction of the sun and Venus on the 24th of November, when there will be a transit. As such a thing has not happened for many years past, and will not occur again in this century, I earnestly entreat you to watch attentively with your telescope, in order to observe it as well as you can. . . . If this letter should arrive sufficiently early, I beg you will apprise Mr. Foster of the conjunction, as, in doing so, I am sure you would afford him the greatest pleasure. It is possible that in some places the sky may be cloudy; hence it is much to be desired that this remarkable phenomenon should be observed from different localities."

Horrocks wrote also to his younger brother Jonas, begging him to watch at Manchester. In those days when there were so few opportunities of communication it was not possible for him to publish generally his important discovery of a transit to

come. "I hope to be excused," he says, "for not informing other of my friends of the expected phenomenon, but most of them care little for trifles of this kind, preferring rather their hawks and their hounds, to say no worse; and although England is not without votaries of astronomy, with some of whom I am acquainted, I was unable to convey to them the agreeable tidings, having myself had so little notice."

The 24th of November fell on a Sunday. The unassisted curate was compelled more than once, to leave his telescope for the village congregation. These interruptions, especially the second one, must have caused him an anxiety almost unparalleled: he was forced to incur the terrible risk of losing the transit he had predicted in opposition to the universally received opinion, and which would not occur again during that century: But we hear no complaint. He thus tells the story of that important day:—"I watched carefully on the 24th from sunrise to nine o'clock and from a little before ten until noon, and at one in the afternoon, being called away in the intervals, by business of the highest importance which I could not with propriety neglect for these ornamental pursuits.* About fifteen minutes past three in the afternoon, when I was again at liberty to continue my labours, the clouds, as by divine interposition, were entirely dispersed, and I was once more invited to the grateful task of repeating my observations. I then beheld a most agreeable spectacle—the object of my sanguine wishes—a spot of unusual magnitude, and of perfectly circular shape, which had already fully entered upon the

sun's disc on the left, so that the limbs of the sun and Venus precisely coincided, forming an angle of contact. Not doubting that this was really the shadow of the planet, I immediately applied myself, sedulously to observe as long as I could see it on the sun's disc."

William Crabtree had, meantime, carefully watched at Broughton, and although at first despairing of being able to make an observation because the heavens were obscured during the greater part of the day with thick clouds, he had a little before sunset obtained a view of the sun, which suddenly burst forth in all its glory, when he immediately began to observe it, and was gratified by beholding what Horrocks had predicted—Venus upon the sun's disc; but his joy was too great; he became almost insensible;—and here let us listen to the cordial defence of his friend who anxiously shields him from reproach. "Rapt in contemplation," Horrocks writes, "he stood for some time motionless, scarcely trusting his own senses through excess of joy; for we astronomers have, as it were, a womanish disposition, and are overjoyed with trifles and such small matters as scarcely make an impression on others; a susceptibility which those who will may deride with impunity, even in my own presence, and, if it gratify them, I too will join in the merriment. One thing I request: let no severe Cato be seriously offended with our follies; for, to speak poetically, what young man on earth would not, like ourselves, fondly admire Venus in conjunction with the Sun, *pulchritudinem divitiis conjunctam?*" In a little while the clouds again obscured the face of the sun, so that he could observe

* Written originally in Latin, in which language he had composed his treatise, *Venus in Sole visa*, where these memorable words occur:—*Ad majora advocatus quæ ob hæc parerga, negligi non decuit.*

nothing more than that Venus was certainly on the disc at the time. The overwhelming rapture of Crabtree serves to bring out into relief the admirable self-command of Horrocks during the whole of that day of agitation, interruption, and suspense. In speaking of a sketch of the planet as it appeared on the sun's disc taken from memory by Crabtree, as soon as he recovered his senses, Horrocks says he found it to "differ little or nothing from his own observation; nor indeed," he adds, "did he err more than Apelles himself might have done in making so rapid a sketch."

And now, having seen the transit, Horrocks resolved to write a full account of what he had beheld; but his "daily harassing duties" stood much in the way of his beginning this work: these duties were perhaps those connected with teaching; but we can only conjecture, and glean what little we can, out of his own treatise *Venus in Sole visa* from Whatton's translation of which we have so largely quoted.

Not long after this eventful Sunday, Jeremiah Horrocks left Hoole to visit his native village, where he devoted himself for a time, to the composition of his Latin treatise, *Venus in Sole visa*, which he did not live to see in print; but he was to the last full of hopeful plans concerning its publication, and wrote often to Crabtree on the subject, asking his advice and recommendation to a publisher. He wrote on other astronomical subjects, besides the transit of Venus, such as, *A Defence of Kepler; A Disputation on the Fixed Stars; On the Obliquity of the Zodiac; Tycho Brahe, &c.*

He was strikingly serious, earnest and conscientious in all his ways, which in one so young was certainly very remarkable. When about to begin the correction of

Kepler's tables, he pauses before plunging into the difficult task he had taken upon himself, and thus calls to mind his "great taskmaster."—"And may He who is the great and good God of astronomy, and the conservator of all useful arts, bless my unworthy efforts for His mercy's sake, and cause them to redound to the eternal glory of His name, and the advantage of mankind." Again, when resolving not to despair of further success in an astronomical investigation of considerable difficulty, he says: "for I have been blessed by God's grace with such success that I have already somewhat to rejoice over."

This young astronomer saw spiritual truths written, or rather "shadowed out," in the laws of nature. "Shall we think" he writes, "that He who was contented to shadow out these mysteries with the poor blood of bulls and goats, will disdain to have them typified in the more glorious bodies of the stars and motions of the heavens? For my part, I must ever think that God created all other things, as well as man, in his own image, and that the nature of all things is one, as God is one, and therefore an harmonical agreeing of the causes of all things, if demonstrated, were the quintessence of all most truly natural philosophy."

Horrocks had long wished to visit his friend that they might talk over many things together; and as soon as he felt himself at liberty, resting for awhile in his native village, he thought of planning this meeting. On July 18th, 1640, he writes to Crabtree:—"I have just returned to Toxteth. I will shortly answer your letter, either in person, or by writing to you again." On July 30th. "I shall soon be with you; meanwhile, these few words, &c."

It appears that the desired meeting was more difficult to manage

than had at first appeared; for October 3rd, 1640, arrived without their having seen each other, and Horrocks, still at Toxteth, writes, "At last, God willing, I do indeed intend to visit you very soon now, but I am not yet able to fix the day on account of the unsettled state of my affairs; besides, I should prefer finishing my book on Venus seen in the sun's disc, before I come to you."

Crabtree, meantime, rejoicing in the certain hope of seeing his face before long, wrote thus to Gascoigne, speaking of the transit:—"The clouds deprived me of part of the observation; but my friend, Mr. Jeremiah Horrox, living near Preston, observed it clearly from the time of its coming into the sun till the sun's setting; and both our observations agreed, both in the time and diameter, most precisely. If I can, I will bring him along with Mr. Townley and myself to see Yorkshire, and you."

On the 16th of December Horrocks wrote to Crabtree arranging to travel to him on the 4th of January. "I shall be with you," he said, "if nothing unforeseen should occur." We learn from an inscription on the back of the last-mentioned letter that something "unforeseen *did* occur."

There was a silence concerning Horrocks for long after his early and sudden death; but in 1662 some movement was made towards the carrying out of one of the last wishes of his heart—the publication of his works. In that year a copy of the *Venus in Sole visa* came into the hands of Huygens, the Dutch astronomer, who entrusted it to Hevelius, and it was afterwards published in Germany along with a treatise on the "Transit of Mercury," by the last-named astronomer. Eventually, as we have said, Dr. Wallis, at the request of the Royal

Society, published Horrocks' "*Opera Posthuma*," from which we have freely quoted.

It does not lie within the purpose of the present article to enlarge on the value of Horrocks' scientific works, which our readers will find constantly alluded to in many of the writings from which we have gleaned. The name of the youthful astronomer of Lancashire constantly occurs in Professor Rigaud's book, "Letters of the Scientific Men of the Seventeenth Century," where he is often mentioned as that "excellent youth Horrocks." Sir Isaac Newton writes, "I must join with Mr. Gregory in admiring Horrox;" and he tells how he rejoices at the prospect of the publication of Horrocks' writings, speaking of him as "that excellent astronomer Horrox."

In a review of Rigaud's "Historical Essay on the first publication of Newton's '*Principia*,'" these words occur in connection with some astronomical difficulties on which Horrocks successfully tried his strength: "The first to clear up these difficulties by any simple theory was the poor curate of Hoole, who suggested that the moon moved in an ellipse, with a varying eccentricity, and whose apsides were perpetually changing. He explained this theory in letters to Crabtree in September and December, 1638, a view which all subsequent discoveries have contributed to verify and extend." Again—"To Horrox's other investigations, we shall have to refer in the sequel. They are all stamped with the clear indications of a genius of the highest order."

It seems that Newton held Horrocks in the very highest estimation, although on one occasion, as Flamsteed remarks, he has inadvertently ascribed to Halley much of what was due to Horrocks.

Newton thus mentions our hero* (as we read in p. 85 of Whatton's "Memoir"): "There are many inequalities in the moon's motion not yet noticed by astronomers. They are all deducible from our principles, and are known to have a real existence in the heavens. This may be seen in the hypothesis of Horrox, which is the most ingenious, and, if I do not deceive myself,

the most accurate of all"—"in *Horroccii Hypothesi illâ ingemosis-simâ et in fallor omnium accuratissimi ordine licet.*"

In conclusion, we will call to mind the words of the late Professor de Morgan, who said, "No monument is needed for the name of Horrox; for wherever Newton's '*Principia*' is known, there is his name known also." M. G. M.

THE CHRONOLOGY OF THE BIBLE.†

NOTWITHSTANDING the bounding and full-blooded scientific vigour of modern times, when the much that has been realized only serves to raise hopes for the indefinitely more which is to crown the investigations of the future, it is not without significance to remark upon the growing and spreading interest in the past. The death of all anterior or ancestral ages becomes a vivifying influence to the men of the present, whose daily life partakes so much of the historic and fondly retrospective. Omens of what is about to happen are taken from the fulfilled auguries of bygone times; and from completed cycles are fashioned prophetically the models to which those at present in progress, or hereafter to be initiated, will adapt themselves. The *ambages*, no less than the highways of antiquity, are being explored with unprecedented and unflagging ardour; and if one royally-disposed

explorer does nothing less than exhume a city from successive layers of superimposed *débris*, another will not be wanting who will shout *Eureka* as he deposits in his wallet a specimen of the palæolithic period, or of the age of bronze, or as he appropriates a carious tooth that once had the honour of belonging to one of the three hundred heroes of Thermopylæ.

Even now the cultivated world is agitated by an event which some of the more ardent scholars have not scrupled to call the "resurrection of Troy;" and Dr. Schliemann's book on "Trojan Antiquities" is recognized as being about to mark an era in archæology, philology, and general history. The Mound of Hissarlik has already yielded, it is said, to the shrewd questionings of Dr. Schliemann, answers not less interesting certainly than echoed through the world from those of

* In his separate work, "*De Mundi Systemate.*"

† "The Chronology of the Bible, connected with contemporaneous Events in the History of Babylonians, Assyrians, and Egyptians, by Ernest de Bunsen. With a Preface by A. H. Sayce, M. A., Fellow and Tutor of Queen's College, Oxford. London: Longmans, Green, & Co., 1874."