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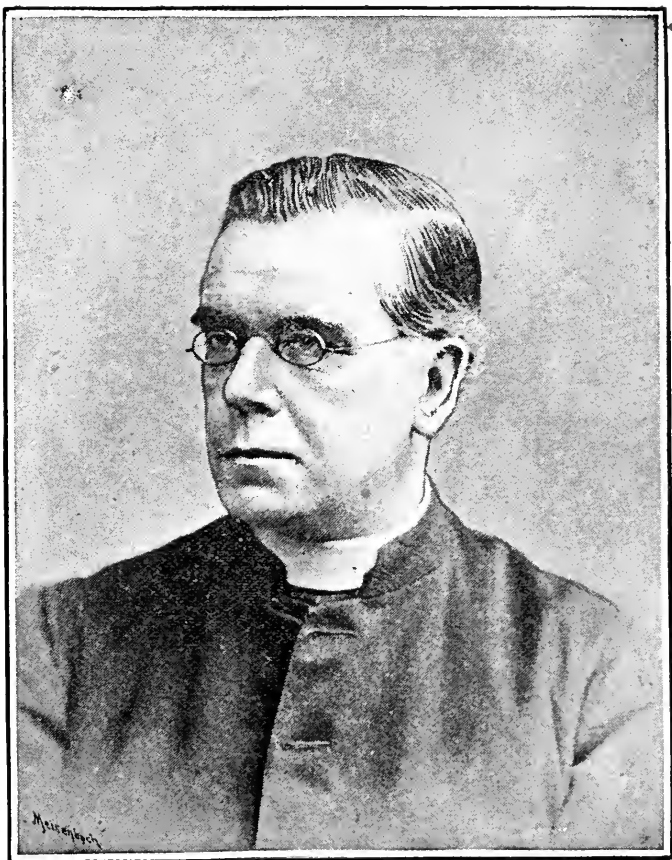


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THE ASTRONOMICAL



FATHER PERRY.

Frontispiece.

DEEMEN

FATHER PERRY,

THE JESUIT ASTRONOMER.

Div. II

BY

A. L. CORTIE, S.J.



LONDON:
THE CATHOLIC TRUTH SOCIETY,
21, WESTMINSTER BRIDGE ROAD, S.E.

1890.



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PREFACE.

IT is often said that the Catholic Church is hostile to the progress of scientific thought. Few charges are more false. The Church has ever been the nurse and mother of true science, and her children have held the foremost place in the ranks of scientific investigators. To take, as an example, electricity, the recent developments of which are so marvellous. What do we find? That its nomenclature is derived from Catholic sources—Galvani, Volta, Ampère, Coulomb, Gramme, and Planté are surely a group worthy of admiration. The great French school of chemists, too, from Lavoisier, its founder, to Chevreul, one of its most brilliant modern exponents, has been almost entirely Catholic. Dulong, Petit, Dumas, Becquerel, were all children of the Church. Nor must we omit to mention the names of Cuvier and Buffon, the zoologists, Malpighi the biologist, Jussieu the botanist, Fresnel, whose labours on

light are classical, nor those known to the veriest tyro in natural philosophy, Descartes, Cauchy, Torricelli, Mariotte, Regnault, Melloni, and Malus. But it is in the science of astronomy that Catholics have perhaps most of all distinguished themselves. To take priests alone. Have we not Copernicus, the founder of the modern system, who dedicated his great book to the then reigning Pontiff, Paul III. ; and the learned Gassendi, who first observed the transit of a planet across the sun's disc ; and Piazzzi, the Theatine monk, the discoverer of the first asteroid ; and a great band of distinguished Jesuit Fathers? And Galileo, too, in spite of his waywardness in persisting in authoritatively interpreting Scripture, which brought upon him the condemnation of the Holy Office, was a devout Catholic, and a personal friend of Cardinal Barberini, afterwards Pope Urban VIII. Nor must we pass over in silence among Catholic laymen the names of Leverrier and Tempel. And our present Holy Father, Pope Leo XIII., who has ever shown himself the generous patron of science, has but recently commanded the erection of a complete observatory at the Vatican, of which the Barnabite Father Denza is to be the director, while the late Pontiff, Pope Pius IX., gave generous aid to both Respighi and Secchi.

In all the physical sciences the Society of Jesus has had many distinguished men, but more especially in astronomy. It is related of St. Ignatius that he was wont at night to watch the starry firmament, in order that his heart might be inflamed with the love of God, from the consideration of the wonders of His works. His children seem to have caught something of this trait in the character of their holy Founder, and to have learned from him a love of astronomy. Thus before the Suppression we have the names of Clavius, Scheiner, Riccioli, Grimaldi, Mayer, Hell, Boscovitch, and the missionaries Schall and Verbiest, prominent among their contemporaries, while the foundation of the observatories of Vienna, Mannheim, Tyrnau, Prague, Gratz, Wilna, Milan, Florence, Parma, Venice, Brescia, Rome, Palermo, Lisbon, Marseilles, Avignon, Lyons, and Peking, bear witness to the activity of the Society of Jesus in this branch of science.

In the restored Society the same zeal for astronomy prevails, as is attested by the existing observatories of Rome, Louvain, Kalocsa, Zi-kawei, Manilla, Cuba, Antaninarivo, Washington (Georgetown), Puebla, Calcutta, and Stonyhurst; and by such well known names as De Vico and

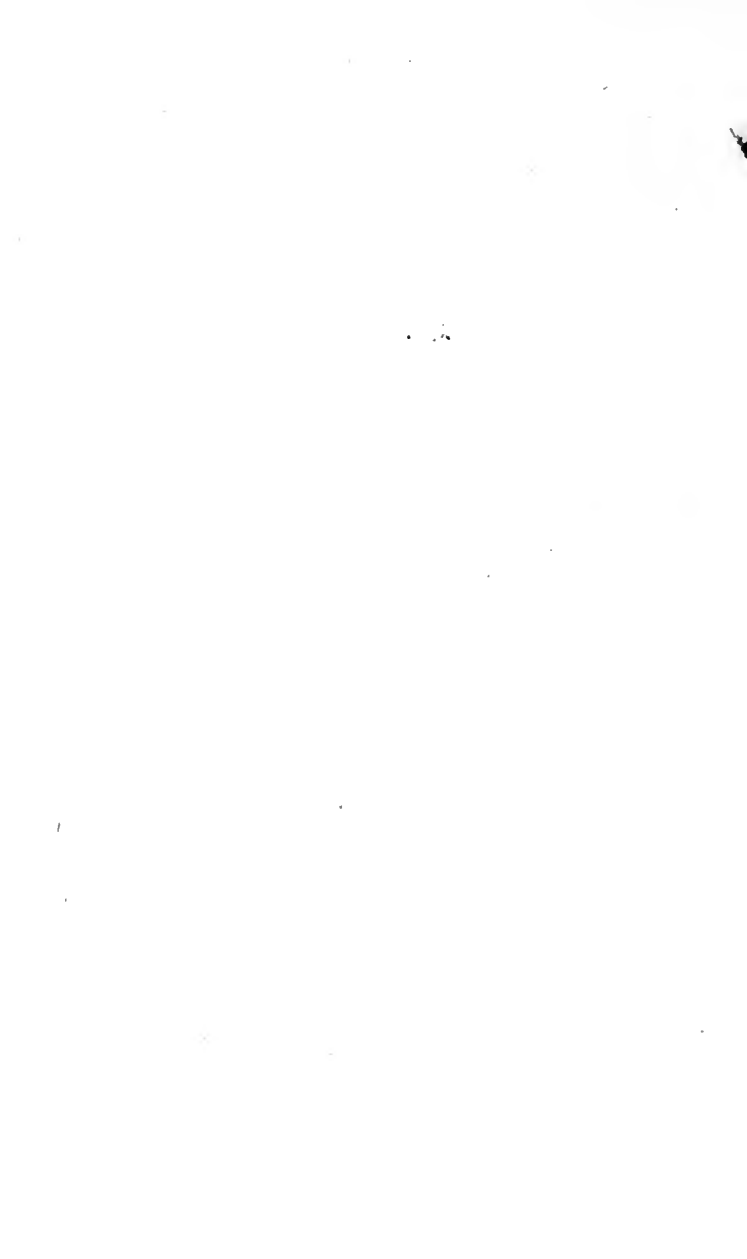
Secchi;¹ to whom we must add, in deep sorrow at his loss, the name of Father Perry. The blow has fallen heavily upon the Society of Jesus and the Catholic Church in England. In the fulness of his strength he went to observe the late solar eclipse, and we were all looking forward to his speedy return, and expecting many more years of honourable toil from him, when the hand of death snatched him from us, and God called him home. But his death was glorious, for he died a victim to his sense of duty, and to his zeal for his science. Truly he may lay claim to the title of 'martyr of science,' and a part of the story of the eclipse of December 22, 1889, will be the account of how Father Perry was carried from a sick-bed to take his last observation.

A. L. C.

*St. Beuno's College, North Wales.
Lady Day, 1890.*

¹ The name of this famous astronomer has an interesting association with Stonyhurst. The revolutionary events of 1847 drove him, then a student of theology, from Rome to Stonyhurst. One day Father Weld, himself a student at the College, showed the instruments at the Observatory to the young Italian. He was immensely interested, and from that time took up the study of astronomy, making his first observations with the four-inch refractor now standing in the College gardens. This story has been told me by one who was then at the College and who knew Secchi well.

My best thanks are due to the proprietors of the *Illustrated London News* for permission to use the electrotype from which the Portrait of Father Perry is printed, to Mr. Turner and Mr. Common for permission to copy the negative of the Solar Corona of December 22, 1889, and to Father Sidgreaves, the Director of the Stonyhurst Observatory, his assistants, and other friends, for much kind help, without which the bringing out of this little work in its present form would have been impossible.



FATHER PERRY.

CHAPTER I.

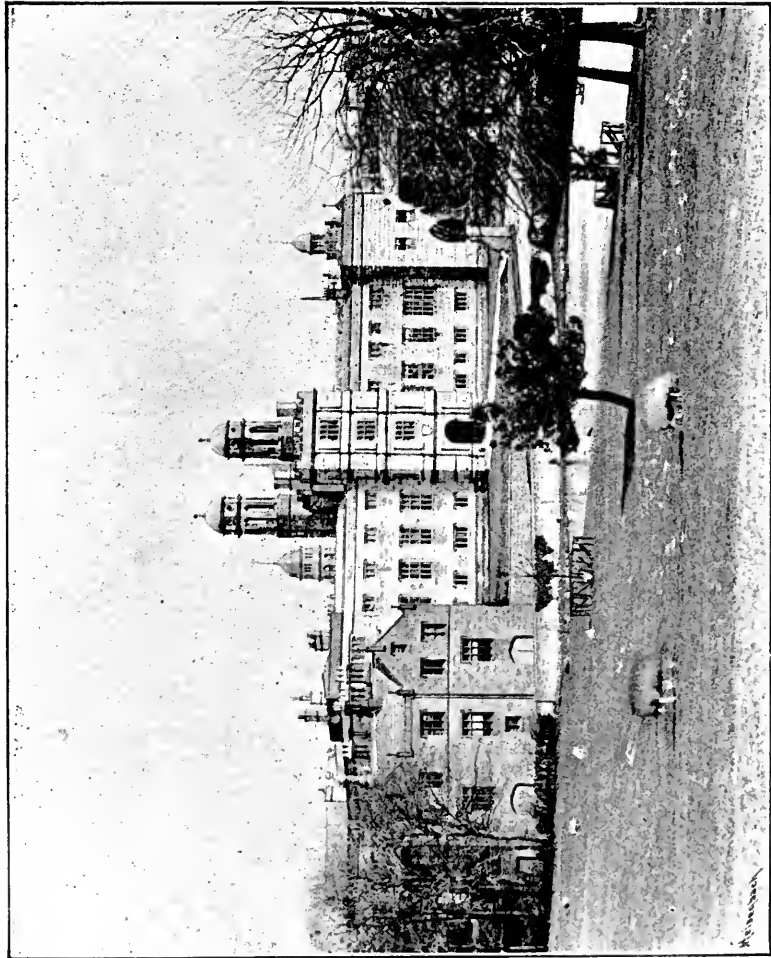
HIS LIFE AND VIRTUES.

STEPHEN JOSEPH PERRY was born at London on August 26, 1833, and was baptized at his father's residence. His family is well known in connection with the invention and the manufacture of the steel pen. His early life, by the testimony of those who knew him best, was most innocent, and it was his great joy to serve Mass in his parish church at St. John's Wood. When in his eighth year he had the misfortune of losing his mother, and on the morning of her death he was taken to her bed-side to receive her last blessing. In his tenth year he was sent to school at Gifford Hall, where he remained for a year and a half. Thence he passed to the Benedictine College at Douay, a name famous in the annals of the persecution of the Catholics in the time of Elizabeth and the early Stuarts. His college career lasted seven years, and it was here that he first displayed his remarkable talent for mathematics.

Feeling the call to the sacred office of the

priesthood, he left Douay for the English College at Rome, to enter upon the study of philosophy. But before leaving he paid a visit to his sister, then a novice at the Convent of Notre Dame at Northampton. She gave him the Life of St. Ignatius to read, and it is generally believed that the reading of this book first put into his mind the idea of becoming a religious. While studying in Rome he received the advice to offer himself to the Society of Jesus on his return to England. He was accepted, and joined the Novitiate, which was then established at Hodder House, near Stonyhurst, on November 14, 1853. In the succeeding year the novices were removed to Beaumont Lodge, near Windsor, now transformed into the well known College of St. Stanislaus. The next three years were devoted to the study of rhetoric, classics, mathematics, and philosophy, the first being spent at St. Acheul, near Amiens, and the last two at the house of philosophical studies of the English Province of the Society of Jesus at St. Mary's Hall, Stonyhurst. During his studies Father Perry had displayed a great aptitude for mathematics, so that his Superiors determined to allow him to follow the natural bent of his mind, and to devote himself wholly to science. At this time, too, the Observatory at Stonyhurst, which had been founded in 1838, had begun, under the directorship of Father Weld, to establish a reputation for itself as a meteorological and magnetic station. It was with a view of Father Perry's ultimately succeeding to the charge of this estab-





STONYHURST COLLEGE. ELIZABETHAN FRONT.

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W. H. Wood

lishment that he was sent to attend the lectures of De Morgan, in London, in 1858, and those of Bertrand, Liouville, Delaunay, Cauchy, and Serret, in Paris, during the following year. During this time he offered himself for the London Matriculation Examination, in those halcyon days when honours were given in special subjects, taking the sixth place in the mathematical list.

In the autumn of 1860, Father Perry was recalled from Paris to profess physics and mathematics at Stonyhurst, and to take charge of the Observatory. These duties he fulfilled for two years, and a third year was spent in teaching the class of Elements at the College. At the age of thirty, he was sent to St. Beuno's College, North Wales, to study theology preparatory to his ordination as a priest. Here he distinguished himself as a thorough and solid student. In fact one of his professors wrote to a former pupil, then in Rome, in enthusiastic terms of his aptitude for this branch of learning, and there seems little doubt that he would have made a first-rate professor of theology, had not his Superiors destined him for other pursuits. He received the sacred unction of the priesthood on September 23, 1866. On the completion of the third year of probation, which the Society of Jesus exacts from all her priests, and which Father Perry spent at Laon, in France, he resumed his original duties at Stonyhurst, where, with the exception of journeys undertaken in the cause of science, he remained until the last fatal expedition. On February 2, 1871, Father Perry

finally bound himself irrevocably to the Society he loved so much, by the solemn vows of the religious state.

There are two aspects of Father Perry's character which present themselves for our consideration, his religious character, and in the second place his scientific character. For it must ever be borne in mind that he was first and foremost a religious and a priest, a true child of the Society of Jesus, and that all his science was directed to furthering its glorious end, the greater glory of God. To none did he yield in his enthusiasm and his self-sacrificing devotion to astronomy ; but his astronomy was based upon his religion. We would then wish to present to our readers in the first instance a sketch of him as the religious and the priest, as he appeared to the eyes of those who knew him best. We shall endeavour to give the simple unvarnished tale of the life which he led at Stonyhurst, that we may receive edification therefrom and learn a lesson for ourselves.

Four virtues there were which shone pre-eminently in Father Perry's character, and these were his love of prayer, his deep humility, his simplicity, and his great kindness to all. And first with regard to his spirit of prayer. In spite of his manifold duties in the College, and of the breaking up of any regular order of the day, which astronomical observations necessarily entail, he was most exact in giving the full time to prayer which his Rule demanded of him. For he had laid well to heart the truth of the maxim which he was wont to

repeat, that "Time spent in prayer is never time lost." Hence he never omitted his daily meditation even when busiest, and his examinations of conscience were made with scrupulous exactitude. It has frequently happened to the writer to have been working at night with Father Perry, and should a quarter of an hour intervene between two observations he would immediately seize the opportunity of making his night examination of conscience. The points for the morning meditation he had already made, since for several years he had the duty of explaining these to the lay-brothers of the College. His posture at prayer was most reverent. Sometimes it has happened to the assistants of the Observatory to call at his room during prayer-time for a key or what-not, and at such times he was invariably found kneeling at his *prie-dieu*. Another witness thus writes in the January number of the *Demerara Catholic Calendar*: "It was noticed, that when here, he recited his daily Office, which takes more than an hour, sitting on the very edge of his chair, for fear he should grow drowsy if he took up an easier position; and to any one who knows how enervating the tropics are to an Englishman who has just come into them, this will be no ordinary proof of his reverent exactness and self-denial." His manner too at Holy Mass and in the administration of the sacraments, was most devout, and yet without any ostentation or display. To an old Douay friend who once asked him whether he did not find that his science dried up his piety, he answered with a look of holy

joy upon his face : " Oh, not astronomy." Who at Stonyhurst will not recall his familiar figure as he made his way from his room to the refectory with his beads in his hands, reverently raising his biretta as he passed the statues of our Lady and the saints on the way? In this connection we cannot refrain from quoting the words of a Protestant writer in a recent number of the *English Mechanic*.¹ " No more single-hearted, earnest servant of science than he was, ever existed. . . . He was a very religious man, but utterly and absolutely without any cant or pretension. It always seemed to me that Stephen Perry lived to give the lie to the conception of that *monstrum horrendum*, the typical Jesuit of the *Rock* and the *Record*. Surely no man was ever less of a schemer or conspirator than he was."

Father Perry seized with avidity all occasions which presented themselves for the exercise of his priestly functions, which did not interfere with the work which obedience had given him. In fact he once told the writer that he had asked to be taken from the charge of the Observatory, and to be sent on a mission. For at least twenty years he was confessor to the community and boys at Stonyhurst, and among the latter from the very first he was most popular, from the great kindliness of his manner in the tribunal of Penance and the affectionate interest he took in each one of his penitents. In the pulpit, though he preached at the College but rarely, he was most earnest and fervent in

¹ " A Fellow of the Royal Astronomical Society," in the *English Mechanic* for January 24, 1890.

manner. In the expedition to Carriacou in 1886 for the eclipse of the sun, his sermons drew not only Catholics, but Protestants and Dissenters to hear him, who were much affected by his burning exhortations. "Father Perry," says *Nature*, "was much admired as a preacher. His sermons were marked by the earnestness which formed so distinguished a feature of his character." In the last expedition he arrived at his destination on December 7th, and the very next day found him preaching to the convicts in French, and the last sermon of his life was delivered before the same audience on the following Sunday. He also preached a sermon at the burial of the master-at-arms of the *Comus*, a Catholic named Shea, who had been killed by a fall from a rock, and he performed the duties of "extraordinary" confessor to the nuns. Nor was Cayenne the only place where prisoners received his spiritual ministrations, for he was very fond of relating how he had once supplied the place of the chaplain at one of the large English prisons. Another incident which gave him great consolation happened during the expedition to Nos Vey, Madagascar, to observe the Transit of Venus in 1882. This was, that he was able to give the last sacraments to the servant of a French trader, who otherwise would have died hundreds of miles away from a Catholic priest. Lastly, in connection with his duties as a priest, we must mention that he took great pleasure in giving the annual retreat, when he could spare the time, to the Children of Mary of the congregation at Stonyhurst,

and occasionally performed a like office in other places.

We must next consider him as the humble religious. His whole manner was, in the first place, most modest and unassuming, nor did he ever give the slightest sign of being puffed up with his scientific attainments. On all public occasions at Stonyhurst, he never put himself forward in a prominent position, and at plays and entertainments he was generally to be found in a back seat. He had the same habit among his scientific brethren, and it has frequently happened that at public meetings he had to be fetched from the body of the hall, to take his proper place on the platform. But the surest test of humility, is the readiness with which one accepts lowly offices at the call of obedience. As has been related before, after two years' directorship of the Observatory, Father Perry was set to teach the lowest class in the College. His conduct on this occasion was most admirable, and he entered upon his new duties with the greatest zeal. As he told the writer, this was to him one of the happiest years of his life. It may be permitted to give another personal reminiscence. On one occasion, when he was busy in his room, getting his things together, preparatory to setting off for a public lecture, he requested that some verses, which he selected from a chapter of Thomas à Kempis, might be read to him, and these were verses which inculcated the necessity of humility.

Father Perry was quite child-like in his simplicity. It was but the outer manifestation of the

great purity of his soul. He used to narrate his successes to us without the slightest boasting or affectation, and yet with that freshness and zest which is rather the characteristic of the fortunate schoolboy than of the honoured man of science. He keenly enjoyed, too, the company of the boys at Stonyhurst, and was very much loved by them in return. They frequently, during the cricket season, invited him to join them in their matches, and Father Perry, who was very fond of cricket, rarely refused. Every year, too, he was wont to get together an eleven of the professors and masters, and solemnly challenge the little boys at Hodder to a match. On these occasions he was as earnest in arranging his field and sending in his reverend batsmen, as if he had been conducting the most important scientific expedition. Such a power he had of giving his whole mind to whatever business he took in hand. On his return from the Transit of Venus expedition of 1874, the first thing that he had to narrate was that he had played a cricket match at Ceylon, against an eleven of the island, his eleven being made up from the officers and crew of *H.M.S. Volage*, and that he himself had made the top score.

It was this charming simplicity of manner, which rendered him so popular among his scientific brethren. After the total solar eclipse of 1886, the observers, when the anxious strain of the few moments of totality was over, vented their pent-up feelings in a good game of leap-frog. A friendly caricaturist, as Mr. Turner tells us, has represented Father Perry in the act of leaping, a libel "as

regards the literal facts, but still a venial libel, for not the most active leaper of us enjoyed the game more obviously than he."

He was also kindness itself. His religious brethren, the boys at Stonyhurst, his scientific friends, and all who came in contact with him, could not resist a sort of magnetic influence which drew their hearts towards him. Who that ever met him will not recall his hearty shake of the hands, and the beaming smile with which he accompanied his greeting? "To all who came in contact with him in connection with his scientific work, he endeared himself by his genial and retiring manner, retiring on all occasions, save when some sacrifice was demanded for the science he loved so well, and for which he laid down his life." Such is the testimony of *Nature*, a leading scientific journal. He was always ready to sacrifice himself to help others. The letters he received from perfect strangers, asking for information and advice in astronomical matters, were frequent, and to all he vouchsafed an immediate answer. Several came from workmen who had attended his lectures, and who wrote to him to clear up some difficulty which had occurred to them. And in the cause of science, who was so ready to sacrifice himself as Father Perry? On one occasion, when lecturing at the Public Free Library, in Liverpool, on the planet Venus, he told his audience that he was ready to lay down his life in the cause of astronomy. And that his words were no empty boast, is proved by what he endured from sea-sickness, to which he was a

martyr, in the many voyages which he took on behalf of the Government, or the learned societies, and finally, by his death in the performance of his duty, in the last expedition. As the writer in the *English Mechanic*, before quoted, says: "He was one who never thought or attempted to spare himself when there was any work to be done. I know from personal observation what a martyr he was to sea-sickness, and the life of utter misery he spent on board ship, and yet he was ever ready to proceed to the ends of the earth when any important observation was to be made." "Father Perry has been one of the most consistent and cheerful of sufferers in the cause of science," is the testimony of another pen, in the January number of the *Observatory*. On this the *Standard* of January 6th remarks, that "astronomers the world over will endorse the words of Mr. Turner, for the unassuming, kind-hearted devotee of astronomy, who now rests in a foreign land, will be mourned by astronomers of all nations." And the *Manchester Guardian* of the same date speaks of "not only his splendid services to science, but the steadfast piety of his life, and his noble devotion to duty."

When on board ship he greatly endeared himself both to the officers and to the sailors. Thus, on leaving the *Volage*, one of the stokers presented him with a poem which he had himself composed, as a mark of his esteem and regard. And what more touching incident can be recorded than that of the sailor of the *Comus*, who, when Father Perry was dead, came to his companion to say that he

had been deputed by the men of the lower deck to tell him "how much cut up they were about it." That this kindness was fully recognized in scientific circles, is evidenced by the tone of the notices which have appeared of him in the public press, which have been almost affectionate in their appreciation of his character. Nor in the whole of his public or private career can he be said to have made a single enemy, a striking testimony of his sterling worth.

Another instance of his kindness must not be passed over without its due meed of praise: amidst his multifarious occupations he found time to pay a daily visit to the College infirmary, to cheer with his conversation an old and infirm Father, who dearly prized his company.

And yet we should be giving but a false impression of Father Perry's character, did we leave it to be inferred that all these virtues were the effect of a natural gentleness of disposition. Quite the contrary, for it was by the way of self-conquest that he reached the high point of religious perfection to which he attained. Naturally, he was of a vivacious and hasty temperament, traits which are often to be found in a character so zealous and energetic as his was. But he was fully conscious of this defect. One day at the Observatory, when about to begin his examination of conscience, he said, with a pleasant smile, to the writer, "Well, have I been hasty with any one?" Bright, full of energy and spirit, and heart and soul in every work which he had in hand, his impetuosity was but the natural

warmth which accompanied so strenuous a character. The following incident will show how grace in him could overcome nature. On one occasion, when giving a public lecture, the demonstrator at the lantern completely failed for some time to throw the necessary pictures on the screen. It was noted, with great edification to themselves by some Catholics in the hall, that Father Perry did not give the slightest sign of impatience at the unfortunate mishap.¹

Such a life has done much to break down the barriers of bigotry and misunderstanding which separated us from our Protestant fellow-countrymen. As M. Lefebvre, a Professor of the Catholic University of Louvain, and President of the Brussels Scientific Society, expressed himself on the occasion of a lecture of Father Perry's on the Transit of Venus in 1874, "I know not whether we ought more to admire these men who, called to the strictest and highest of all vocations, the care of souls, devote themselves as if out of their superabundance, with an incomparable disinterestedness and energy to the culture of science, or that great Protestant England, which laying aside prejudices to which Catholic countries blush not to offer sacrifice, names Jesuits as the organizers of these great astronomical undertakings."

¹ Since writing the above I have been informed of an exactly similar case which happened to Father Perry at H—, in a letter from the curate of the town. "He himself was suffering from a very bad cold, so that circumstances were all against him, but he kept his composure to the very end, and said a few words of thanks to the exhibitor."

CHAPTER II.

FATHER PERRY AS A LECTURER. METEOROLOGICAL AND MAGNETIC WORK.

A TRULY holy man cannot fail to be a hard-working man. *Laborare est orare*, or work undertaken for God, is equivalent to prayer. We have seen how Father Perry could live. We must now give a brief account, necessarily a mere summary, of the many works which he carried out for the greater glory of God. When in 1868, on the completion of his Tertianship, Father Perry took permanent charge of the Observatory at Stonyhurst, he had passed no less than nineteen and a half years in the labour of preparation. Of these the first eight and a half had been spent in the schools of Gifford Hall and Douay, five more had been passed at Rome, St. Acheul, and Stonyhurst in the higher courses of literature, mathematics, and philosophy, two more had been devoted to a special training under first-class professors at London and Paris in mathematics, and finally he had received the full course of four years' study of theology at St. Beuno's College. Moreover, he had acquired considerable experience in astronomical work during the two years when he had directed

the Stonyhurst Observatory prior to his ordination, and he had been successful in that most difficult of all tasks, the teaching of a class of small boys. Therefore, although trained as a specialist, he could in nowise be termed a man of only one branch of learning. His literary attainments were by no means of a low order, and he was a sound philosopher and theologian, as well as an accomplished mathematician.

Father Perry's duties at Stonyhurst were two-fold, for besides being Director of the Observatory, he lectured for more than twenty years in the higher class of mathematics at St. Mary's Hall, and of late years had the whole charge of the mathematical studies of the boys at the College. In the schoolroom he was a model lecturer, his chief characteristics being his clearness and his extreme neatness in all his demonstrations at the board. He very rarely referred to his notes, in which he had his course of lectures most admirably summarized. The secret of his great success was to be found in the thoroughness with which he prepared his lectures. Although he had given the same course for twenty years, yet he made it a practice of never going to the lecture-room without an hour's immediate preparation. As the assistants at the Observatory well knew, that hour was a sacred time during which he was not to be disturbed. Again, immediately after returning from his lecture, he drew up a summary of what he had just delivered for reference on future occasions. A clean page was always left in his note-books

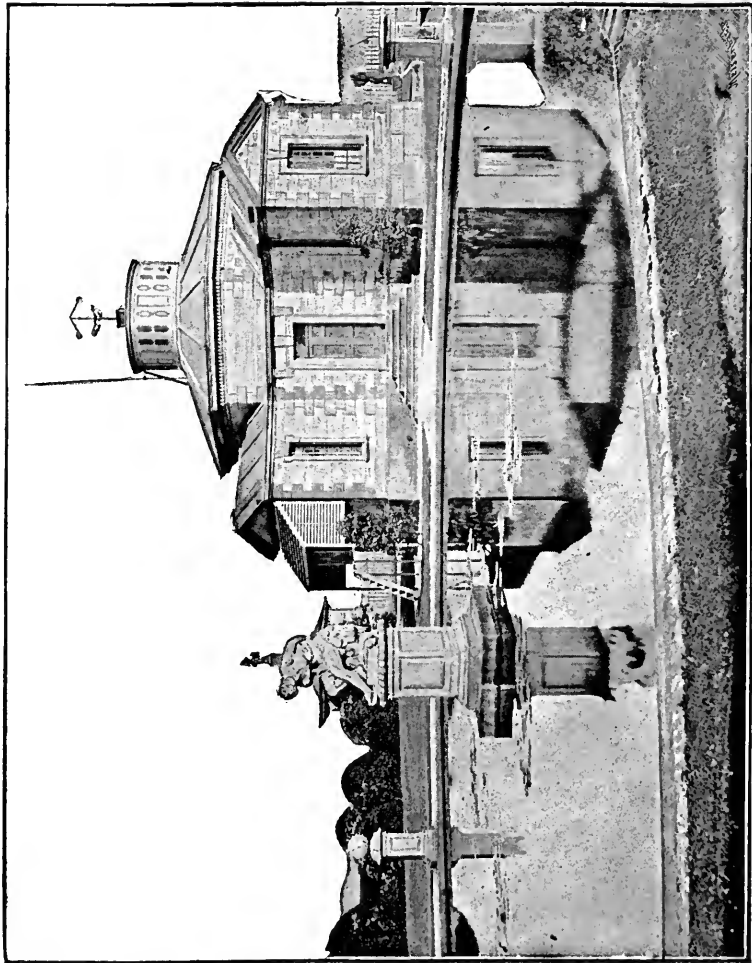
opposite these synopses, on which he noted any new result or fresh method which might appear. By this means he prevented his methods or his matter from becoming antiquated. A striking instance of his painstaking and orderly manner is to be found in the care with which he corrected the boys' papers, when prefect of the lower mathematics at the College. Every paper, even to those of the smallest and most backward boys, was most thoroughly examined, marks were given for each sum, and these were entered in ruled columns in note-books opposite the boy's name. It once happened that the master of one of the lower arithmetical schools went to Father Perry about one of his boy's papers, thinking that he deserved more marks than he had received. What was his astonishment to find that Father Perry immediately referred to his note-books, stated the number of marks given for each single question that had been answered, gave him a list of the chief mistakes that had been made, and sent him away fully satisfied with his fairness, and greatly edified at his wonderful exactness. We have dwelt somewhat at length upon this point, for it always seemed to us that the man who could turn from writing papers for the learned Societies on terrestrial magnetism and solar physics, to correcting the multiplication and division sums of little boys with such evident zeal and pleasure, must have been a very good and humble man.

As a public lecturer on astronomical subjects Father Perry stood in the very first rank, and his

loss will be greatly deplored by the audiences he was wont to address at Liverpool, Preston, and other large towns, principally in Lancashire and Yorkshire. On these occasions he never used a single note, and would talk at times for over an hour with extraordinary facility, pouring out names, facts, and dates in connection with his favourite science, which denoted most accurate and careful reading. Here, again, his orderliness is to be admired. All his photographic slides, for he always lectured with the aid of a lantern, were most carefully ticketed, numbered, and catalogued by his own hand, while little notes in the catalogue give the source from which the slide was taken, and the chief facts about the subject therein depicted. He even entered so far into details as to gum a piece of paper on each slide preparatory to a lecture, which was intended to serve as a guide to the operator at the lantern and to save him trouble. The operator had only to place the thumb of the right hand on this paper to preclude the possibility of the picture being upside down on the screen. But that he was not dependent on his pictures was evidenced on several occasions, when some misfortune happened to the lantern. At such times he continued speaking and kept his audience interested, without being at all disconcerted. His great popularity as a public lecturer arose from his simple and most pleasing manner, while it was rare indeed that his audience failed to catch some spark of his enthusiasm for astronomy. In the autumn of 1884 he delivered at Liverpool twelve free

lectures on the solar system under the auspices of the Corporation, in connection with their free library and reading-room. Each lecture after the first was preceded by a class and preliminary discussion, a syllabus of the lecture in the form of a programme with three questions appended was to be obtained in the hall, and a final examination was held, when prizes and certificates were awarded. The average attendance at these lectures was over one thousand persons, some three hundred of these being present at the preliminary school, while sixty sent in answers to the weekly papers and entered for the final examination. As specimens of the questions set we take the following at haphazard: "Draw a figure in explanation of the phases of the moon." "Do all the planets exhibit phases?" "Does the spectroscope teach us anything regarding the motions of the stars or the rotation of any heavenly body?" It must be remembered that the bulk of the audience consisted of artisans and working men, and the fact that many of them were able at the end of the course to answer these and similar questions, is a striking testimony to the pains which he took with them. But it made no difference to Father Perry whether he lectured to the cultured audience at the Royal Institution, to the working men of Lancashire, or to the small boys at Hodder, there was always the same careful and painstaking preparation. Among his chief lectures may be mentioned those at the Royal Institution on the Transit of Venus and the Solar Surface; those





THE METEOROLOGICAL OBSERVATORY, STONYHURST.

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before the Société Scientifique of Brussels and the Catholic Scientific Congress at Paris in April, 1888, for he lectured equally well in French as in English; those delivered at Dublin on receiving his degree of D.Sc., *honoris causa*; at Cambridge after the Transit of Venus; at Montreal, which he visited in connection with the British Association in 1884; at South Kensington in connection with the exhibition of scientific apparatus; and at Manchester on the coming of age of the Scientific Students' Association, when both the Catholic and the Protestant Bishop, the late Dr. Fraser, were to be found on the platform. Among other towns where he lectured were Wigan, at which place the audience numbered over three thousand, Lancaster, Preston, Burnley, Glasgow, Blackpool, Skipton, Oldham, Bolton, Chester, Southampton, and Birmingham, while he generally lectured on board the vessels which conveyed him on his many astronomical expeditions, and at some of the towns where he landed, such as Bombay, the Cape, Barbados, and Georgetown, Demerara.

We now pass on to Father Perry's labours in connection with the Stonyhurst Observatory, and we propose to consider his work in each of the three branches of scientific research which are there carried on. These are meteorology, terrestrial magnetism, and astronomy. The Observatory, which had been founded in 1838, was primarily intended as a meteorological station, and the readings of the usual instruments have been continuously recorded ever since that date. In 1860,

Father Perry, not yet a priest, succeeded Father Weld in the direction of the establishment. In that year was issued the first annual report in the form of a neat little volume, in which were tabulated the mean results of the readings of the thermometers, barometers, rain-gauge, and wind-gauge. But it was in 1866, when Father Perry was a theological student at St. Beuno's, the Observatory being meanwhile under the charge of Father W. Sidgreaves, the present Director, that a great addition was made to the work of the Observatory by reason of its choice by the Board of Trade as one of the seven principal stations for meteorology in the British Isles. Accordingly a complete set of self-recording instruments, comprising a thermograph, a barograph, an anemometer, and a rain-gauge, was supplied by the Board, and since their erection the results have been regularly sent to the Meteorological Office, the Registrar-General, the French Meteorological Society, and other public bodies. A sunshine recorder has been since added. We may mention one very useful application which has been made of the Stonyhurst series of observations by Messrs. Scott and Galloway, in two papers which they published in 1872 and 1873, on the connection which exists between the indications of the self-registering instruments at Stonyhurst and explosions in the coal-mines of England. From these papers it clearly appears that of five hundred and fifty fatal escapes of gas which occurred during the years 1868, 1869, and 1870, fifty-five per cent. were indicated by the

barograph, and twenty-nine per cent. by the thermograph. During Father Perry's directorship the meteorological work was greatly extended. His recent reports contain, besides the ordinary tables of meteorological phenomena, observations of the directions of the upper clouds, undertaken for, and in connection with, the Observatory at Upsala, agricultural notes and observations of crops, observations on trees and shrubs and on flowering plants, notes on auroræ, the upper glows, and other occasional phenomena. Nor must we forget to mention, that in 1879 Father Perry prepared for the Meteorological Office a Blue-book on the climate of Kerguelen, containing his own observations, those of the officers of H.M.S. *Challenger*, and those of Sir J. Ross's expedition in 1840 to the southern seas in the *Erebus* and *Terror*.

It was not till the year 1858 that any magnetic observations were taken at Stonyhurst, when it was chosen by Sir E. Sabine,¹ one of the pioneers of the science of terrestrial magnetism, as one of his stations in the magnetic survey of England which he was then making. Father Weld, who was at that time the Director of the Observatory, determined to take up this branch of physics, and purchased a complete set of instruments for the observation of the absolute value of the magnetic elements. But it was not until 1863 that the regular series of monthly determinations of the declination, the in-

¹ Among the distinguished men of science to whom the Observatory at Stonyhurst was greatly indebted in the beginning of its career, must be especially mentioned the names of the late Sir E. Sabine and Mr. James Glaisher.

clination, and the horizontal force, was commenced under Father Sidgreaves. Needless to say that these observations have been continued ever since. This branch, too, of the Observatory's work was greatly developed by the generosity of a public body, for with the aid of a grant from the Royal Society, a complete set of self-recording magnetographs was purchased in 1866, and erected in a specially-constructed subterranean chamber. This installation is a most perfect one. An annual account of all magnetic storms was drawn up by Father Perry, and published in the report before mentioned. From these it appears that auroral displays are generally, if not always, accompanied by perturbation in all the magnetic elements. Again, such storms have been much less frequent during years of minimum sun-spots, and correspondingly pronounced at maximum sun-spot epochs. The greatest magnetic storm ever recorded at Stonyhurst coincided with the apparition of the magnificent sun-spot of November, 1882, and many of our readers will recall the unusual auroral displays which were to be seen all over Europe and America in that month. As is evident, the reduction of the magnetic photographic curves taken by such a set of self-recording instruments, demands immense labour and great time, before any final results can be attained. The curves have to be measured for every hourly reading, and hourly, daily, monthly, and yearly means have thence to be calculated. Up to the present time these measures have been taken, and the means deduced down to the end of

the year 1879 for the declination, and the horizontal force, a work entailing the tabulating of more than one hundred thousand hourly measures. For this most necessary preliminary work, the Observatory owes a great debt of gratitude to the indefatigable industry of the late Father Joseph Hawett.

Some of the results published by Father Perry as an appendix in the annual reports of the years 1879 and 1880 are not without a general interest. Thus it appears that the normal daily curve described by the magnetic needle is very regular in its nature, having but one inflection, the westerly maximum occurring between 1 p.m. and 2 p.m., and the minimum between 7 a.m. and 8 a.m., the needle during the night remaining almost immovable. This daily curve varies slowly from year to year, the annual variation evidently following a well-defined law. There is also a monthly variation which is worthy of notice. Thus it appears that during the month of March there is a rapid descent of the needle towards its minimum position, between 7 a.m. and 8 a.m., the same thing occurring till the month of August. In September, however, and the winter months, the needle, from 9 o'clock in the evening to the corresponding hour next morning, points nearly always a little north of its mean position. Again, the amplitude of its daily oscillation is at a maximum during the month of April, a fact which seems to bring some confirmation to the opinion of Quetelet, concerning the connection which exists between vegetative

and magnetic force. A half-yearly inequality is also very apparent, if the mean curve for the winter months be compared with that deduced from the summer readings.

Besides these routine observations at standard magnetic observatories, another most important work is the determination of the absolute values of the magnetic elements at different points on the earth's surface. Such determinations, taken at many stations over a whole district or country, constitute a magnetic survey. By this means the construction of magnetic maps is rendered possible, on which are marked the lines of equal declination, equal inclination, equal horizontal force, and equal total force. Hence, too, the positions of the magnetic poles can be deduced, areas of maximum or minimum force can be found, and the magnetic equator and meridians can be traced. Some of Father Perry's very best scientific work was accomplished by the making of such magnetic surveys. The first, that of the west of France, was undertaken in 1868, in conjunction with Father W. Sidgreaves, the stations at which observations were taken being Paris, Laval, Brest, Vannes, Angers, Poitiers, Bordeaux, Abbadia, Loyola, Bayonne, Pau, Toulouse, Périgueux, Bourges, Paris, and Amiens. The following year a similar work was accomplished by the same two observers for the east of France, the order in which the stations were selected being Paris, Rheims, Metz, Strasbourg, Issenheim, Dôle, Dijon, Lyons, Avignon, Marseilles, Montpellier, Grenoble, N.-D. de Myans,

Mongré, Saint-Etienne, Clermont, Moulins, Paris, Douay, and Boulogne. The results of these two surveys were published in the *Philosophical Transactions of the Royal Society* for 1870 and 1872, and in the *Proceedings*¹ for 1871. A magnetic survey of Belgium was likewise undertaken in the summer of 1871, when the magnetic elements were determined at twenty stations. During this expedition Father Perry was accompanied by his assistant, Mr. W. Carlisle. One interesting result is worthy of mention. The magnetic maps of Lamont had already indicated the existence of some abnormal disturbing cause, and Father Perry found that in the south of the country where coal-mines abound there was a great increase in the horizontal force accompanied by a decrease in the inclination, while in the north-east the contrary was the case, an increase in the inclination and a decrease in the horizontal force being apparent. Hence it appears that the source of the disturbance is due to the coal measures which stretch across the south-eastern part of the land. Also he was enabled to point out a local source of disturbance in the vicinity of the Royal Observatory at Brussels. The results of this third survey were likewise published in the *Philosophical Transactions* for 1873. Father Perry determined the magnetic elements at yet other stations during the expedition to Kerguelen in 1874 for the Transit of Venus, the observations being taken at the Cape, Kerguelen, Bombay, Aden, Port Said, Malta, Palermo, Rome,

¹ Vol. xx.

Naples, Florence, and Moncalieri. Similar observations were taken at Nos Vey, Madagascar, in 1882. It was principally in recognition of such work that Father Perry was elected a Fellow of the Royal Society in 1874. Other papers from his pen on the same branch of physics are: "Results of Seven Years' Observations of the Dip and Horizontal Force, at Stonyhurst College Observatory, from April, 1863, to March, 1870;"¹ "Note on a Simultaneous Disturbance of the Barometer and of the Magnetic Needle;"² "Magnetic Observations made at Stonyhurst College Observatory from April, 1870, to March, 1876;"³ and in conjunction with the late Professor Balfour Stewart, "Preliminary Results of a Comparison of certain simultaneous Fluctuations of the Declination at Kew and at Stonyhurst during the Years 1883 and 1884."⁴ Comparisons were also made between the magnetic curves at Stonyhurst and at Florence by Father Perry and Signor Donati, with those of Zi-Ka-Wei, in China, in conjunction with Father Descheverens, while Father Ferrari, of the Gregorian University at Rome, has published some interesting details relative to magnetic storms observed at Stonyhurst, Vienna, and Rome.

¹ *Phil. Trans. R.S.* vol. 161, 1871. ² *Proc. R.S.* 1876, No. 172.

³ *Proc. R.S.* 1876, No. 175. ⁴ *Proc. R.S.* 1885, No. 241.

CHAPTER III.

ASTRONOMICAL WORK.

IF Father Perry was fortunate in coming into the possession of such a complete meteorological and magnetic equipment as that of the Stonyhurst Observatory, when he was appointed Director in 1868, he was no less fortunate in the acquisition of a fine equatorial of eight inches aperture, which allowed him to greatly develop the astronomical portion of his work. This instrument, purchased in 1867, originally belonged to Mr. Peters, and possesses finely-divided circles, and most perfect clock-work attached to it. The makers were Troughton and Simms, and it is very solidly mounted in a chamber with a revolving dome in the College gardens. The other instruments were an excellent four-inch refractor equatorially mounted by Jones, a Cassegrain reflector of nine and a half inches aperture on an altazimuth stand, a seven-inch Newtonian reflector, the gift of Sir J. Radcliffe; two transit instruments, two sidereal clocks, and a chronometer by Frodsham. During his directorship Father Perry has added a five-inch refractor by Alvan Clark, originally the property of the Rev. Prebendary Webb, the

instrument with which he made the observations contained in that book so dear to amateurs, *Celestial Objects for Common Telescopes*; and a very perfect theodolite.

But it is chiefly in instruments connected with the study of solar physics that the Observatory has been enriched during the late Director's term of office. For it was Father Perry's great endeavour to make the Stonyhurst Observatory as efficient as possible in this department. These instruments include two direct-vision spectroscopes, one by Browning and the other by Hilger, a pocket-spectroscope by Browning, a large spectroscope by Troughton and Simms fitted with four compound prisms by Hofmann, a very fine automatic spectroscope by Browning containing six prisms of 60° , supplemented by a Christie-Hilger half-prism, and—the gem of the Observatory—a magnificent photographic grating-spectrometer by Hilger.

We must now give a brief summary of the principal work which has been effected by Father Perry and his assistants with this fine installation. Father Perry was by no means a dilettante, but as in his teaching and lecturing, so in his observing, he was most thorough and painstaking, almost, if we may use the term, plodding. If he made up his mind to take up any particular class of observation, he was most pertinacious in its pursuit, and the result is that his work is not scattered over very many fields, but that he has accumulated a great number of observations, and

done solid and enduring work in a few well-defined lines. These include a long series of observations of the phenomena of Jupiter's satellites, and of occultations of stars by the moon, published in the *Monthly Notices of the Royal Astronomical Society*,¹ as also the determinations of the position of comets, from that of Winnecke in 1869, down to those of 1889. An annual watch has also been kept for meteorites,² chiefly those of the November stream. Papers on the eclipses of the moon, observed at Stonyhurst, have also appeared in the *Monthly Notices of the Royal Astronomical Society*,³ as also on the new star in Andromeda.⁴ Besides this, Father Perry has also published papers in the same journal on subjects connected with the Transit of Venus,⁵ the several eclipses of the sun which he observed,⁶ on the supposed planet Vulcan,⁷ and on various astronomical instruments.⁸

But it is by his labours in the domain of solar physics that he has chiefly distinguished himself as an astronomer, and of these we propose to speak a little more in detail. The routine work which he inaugurated at Stonyhurst in this

¹ Loc. cit. vols. 33, 34, 38, 39, 40, 41, 44, 45, 46, 49.

² *Monthly Not. R.A.S.* vols. 33, 40; *Cronica Cientifica* (Barcelona), 1880.

³ Loc. cit. vols. 37, 45; *The Observatory*, vol. 11 (1888).

⁴ Loc. cit. vol. 46.

⁵ Loc. cit. vols. 36, 37.

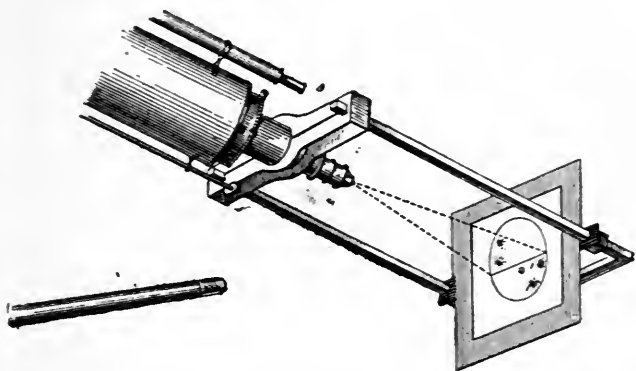
⁶ Loc. cit. vols. 31, 42, 48.

⁷ Loc. cit. vol. 37.

⁸ Loc. cit. vols. 33, 37, 44. Articles from Father Perry's pen are also to be found in *The Month*, *Na ure*, *Tablet*, *Observatory*, *Copernicus*, *British Journal of Photography*, *Astronomical Register*, *Annales de la Société Scientifique de Bruxelles*, &c.

department includes the daily drawing of the sun when possible, the measurement of the depth of the hydrogen envelope which surrounds our luminary, the observation of the heights, positions, and directions of the flames which at times arise out of this envelope, and if opportunity permits, the recording of the spectra of such sun-spots as are to be seen on the disc. A long programme, and one most faithfully and consistently adhered to during the last ten years. Father Perry's aim was, as he tells us in the lecture delivered before the Royal Institution in May, 1889, "not to undertake any work that would be a mere repetition of what was being done better elsewhere." Hence he preferred to secure drawings rather than photographs of the solar surface, that the camera might be supplemented by the pencil. The result has proved the wisdom of his choice, and the drawings, the work of his assistant, Mr. W. M'Keon, have been received with marked favour and approbation by both astronomers and artists, when exhibited at the soirées of the Royal Society, and at the meetings of the Royal Astronomical Society. They are made by means of the direct projection of the image of the sun on to a drawing-board, which is carried by a light frame attached to the equatorial, as shown in the annexed engraving. The scale is ten and a half inches to the solar diameter, drawings of a much larger size being made of any spots which present features of interest. The number made in a year averages

about two hundred and forty.¹ By this method the details of the solar surface can be studied or sketched at pleasure; and moreover, by proper adjustment of the drawing-board, and by the aid of a series of discs the actual positions of the spots can be readily calculated. "The clock-work



SKETCH-BOARD ATTACHED TO THE TELESCOPE USED FOR SOLAR WORK AT THE STONYHURST OBSERVATORY.

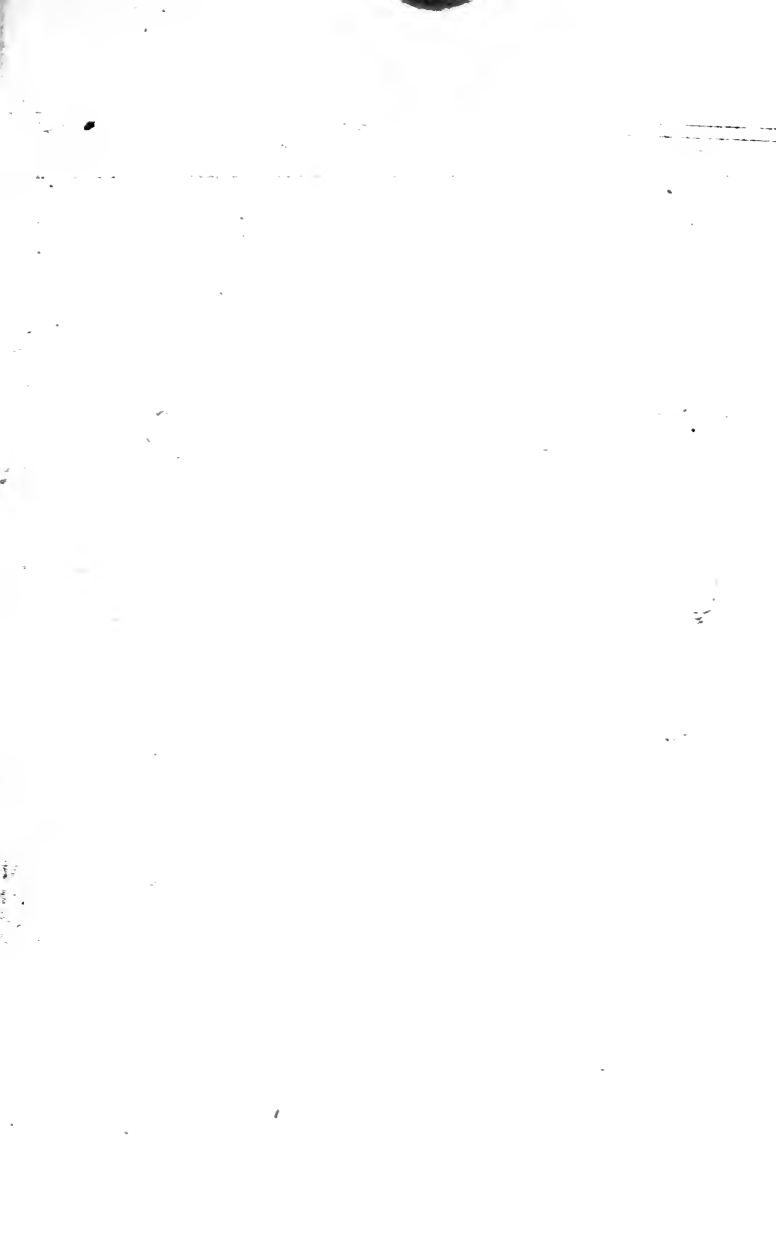
of the equatorial keeps the image fixed in position on the paper, whilst an accurate outline is traced of the umbra and penumbra of every spot visible on the disk. . . . The details are then filled in as quickly as the nature of the sky permits, each portion of the drawing being over and over again brought into coincidence with the projected image,

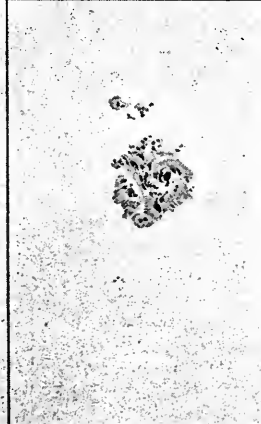
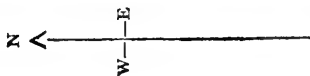
¹ Curves and tables exhibiting the daily amount of sun-spot area for the years 1887, 1888, were published in the Report for those years. Curves for the rest of the cycle are being prepared.

in order to detect and remove the slightest difference between them. By this means the final picture gives the advantage of all the best moments of seeing that occur during the progress of the observation, and not merely the result at one single instant, which may be far from the best for definition even on the finest day.”¹ Father Perry discussed and compared the Greenwich photographs and the Stonyhurst drawings in an interesting paper printed in the *Memoirs of the Royal Astronomical Society* (vol. 49), in which he shows how great a degree of correctness can be attained by the latter. With regard to the delineation of those brighter patches on the solar disk called faculæ, the advantage would seem to be decidedly on the side of the drawings. The mean daily spot area is, however, greater on the photographs.

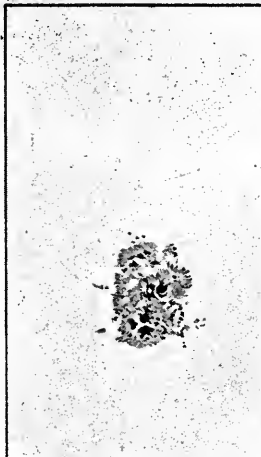
The accompanying engraving is a copy of the drawings of the two largest sun-spots as yet observed at Stonyhurst. They both occurred in 1882, which seems from several indications to have been the year of maximum solar activity of the present cycle. Father Perry himself placed the date of the maximum at 1882·6, and predicted the beginning of the present year for the minimum. The large spot seen in April was observed from the 12th to the 25th of that month, and from the 10th to the 22nd of May. Its area on the 20th of April was about $2,319\frac{1}{4}$ millions of square miles. Two enlarged drawings of this spot are

¹ From the lecture before the Royal Institution on May 24, 1889.





April 18th, 10^h 40^m a.m. G.M.T.

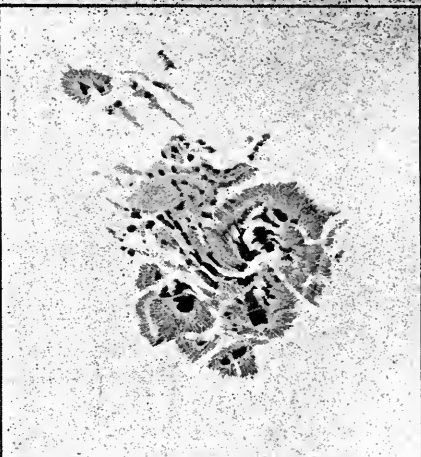


November 17th, 0^h 45^m p.m. G.M.T.

ENLARGED.



April 16th, 1^h 10^m p.m. G.M.T.



April 18th, 4^h 52^m p.m. G.M.T.

also given, and a mere cursory glance at these will show what great changes took place in the structure of the spot in the two days which intervened between the sketches. A more careful examination brings out many other points, which space compels us to leave to the study of our readers. We would, however, call attention to the rotatory motion of the spot in the direction of the hands of a watch as we look at the sun, and in the opposite direction as we look at the picture; and also to the splitting up of the spot in its progress. The largest spot of the whole cycle was that which attained its greatest area in November of the same year. This, the finest spot seen on the sun since 1870, was followed on the Stonyhurst drawings from its birth as a few black dots in October, through its maximum in November, and finally in December. It was this spot which was accompanied by the intense magnetic storms and the beautiful displays of the Aurora Borealis alluded to in the preceding chapter. Its area on the 17th of November was about $2,761\frac{1}{2}$ millions of square miles. These pictures, which have been photographically reproduced from the original drawings, will suffice to show what can be effected by means of the pencil.

When the drawings on any day have been finished, the image of the sun is most carefully scrutinized for some time, and any peculiarities noted. At times such scrutiny is assisted by direct observations by means of a Hilger solar eye-piece.

A great amount of material has, therefore, been accumulated, which Father Perry only lived to partially discuss. In fact it had always been his intention to collect and compare all his magnetic and solar data in one volume, and just before starting on his last fatal expedition, he had given instructions to his assistant to prepare charts on which all the spots might be plotted, in order to facilitate their study. His main object was to throw light upon the theories of the mode of the formation of spots, and, if possible, to find the clue to the connection between terrestrial magnetism and solar activity. To quote from the interesting obituary notice of Father Perry which appeared in the *Monthly Notices of the Royal Astronomical Society*:¹ "This work was intended to be exhaustive of the material he had accumulated, which he considered might be sufficient to throw important light on the subject of the proper motions in spots, on the connection between spots and faculæ, the recurrence of spots in the same heliocentric position, and many other questions of solar physics. The remarkable observations of veiled spots which Father Perry brought before the Society in January, 1888, indicate that the method of projection adopted is capable of furnishing results of considerable interest and value. It is a serious loss to astronomy that his untimely end has prevented so hopeful an investigation from being conducted under the auspices of the author and originator of the work."

¹ Vol. 50, n. 4.

Papers on the solar surface have been published from time to time in the *Monthly Notices of the Royal Astronomical Society*,¹ in the *Astronomical Register*, (Nov. 1884, and Feb. 1886), in the *Proceedings of the Liverpool Astronomical Society*, (Session 1883, 1884), and in other scientific periodicals, while two most important lectures on the same subject were delivered, the one in 1884, at the meeting of the American Association at Philadelphia, and the other, already referred to, in May, 1889, at the Royal Institution in London. Space will not permit us to give anything like an adequate discussion of these papers, we must, therefore, be content with the bare enumeration of a few interesting points. With regard to faculæ,² Father Perry has established the fact that they do not precede the birth of a spot, but are most numerous and widespread when it disappears. Again, he has stated with regard to the distribution of faculæ, that it is much more general than that of the spots, many being visible even near the sun's poles. Nor would it appear that the view that faculæ lag behind a sun-spot receives any confirmation from the Stonyhurst drawings.

Besides he has arranged in three classes, and established many points relative to those faint markings to be seen on the solar disc to which Trouvelot gave the name of "veiled spots," and which were independently discovered at Stony-

¹ Loc. cit. vols. 48, 49.

² From the Latin *facula*, "a little torch;" the name given to patches of brilliant white matter on the solar surface.

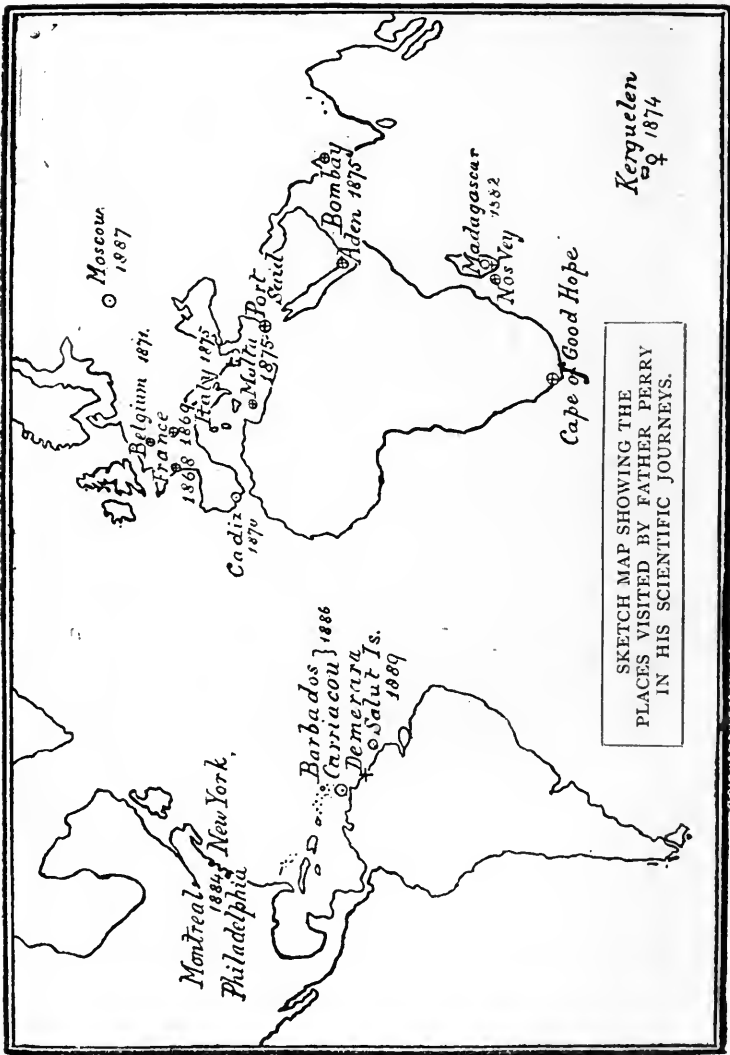
hurst. They have been watched with persistent patience for several years. These evanescent spots would seem to be intimately connected with, and to explain the genesis of, those remarkable blurred patches which appear in Janssen's magnificent photographs of the solar surface. With regard to the chromosphere, or incandescent envelope of hydrogen which surrounds the sun, and to the solar prominences, valuable results have been published in the *Observatory*, the mean depth of the former being established as about four thousand miles. The greatest prominence observed at Stonyhurst, was seen on October 30, 1883, and reached a height of 132,000 miles.

Father Perry's last paper on sun-spots, read at the November meeting of the Royal Astronomical Society,¹ a few days before his departure to Salut, was on the recent appearance of spots in high southern latitudes, one of them having the extraordinary high latitude of 40° S. This small spot, he conceived, marked the beginning of a new solar cycle.

Were we asked to point out the chief characteristic of Father Perry's scientific work, we should unhesitatingly say that it was his thoroughness and patient accuracy. Even his enthusiasm yielded the palm to this quality. For he possessed, what some have defined to be the principal mark of true genius, the faculty of taking immense pains. He was as a rule an enemy to theorizing, for he

¹ Loc. cit. vol. 59, n. 1.

believed that observations were easily distorted into a false meaning, if one possessed a mind already biassed by a theory. Hence we find him insisting so much on methodic routine work, and on no consideration whatsoever would he permit any disturbance to be made in the order of the duties which he had undertaken at Stonyhurst. Accordingly, any result which he has published on astronomical subjects can be implicitly trusted, as deduced as a general rule from not a few, but from a long series of observations. Such is eminently the case with his papers on solar physics. Finally, to quote from a most kindly notice by the chief assistant at Greenwich in the February number of the *Observatory*, "he was always eager to gird on his armour in the sacred name of science: the discomforts and anxieties, nay, the real dangers of the crusade never daunted him for a moment; and we can claim for him all the laurels due to the soldier who pays for victory with his life, and dies bravely, cheerfully, nobly, at the moment of success. *Requiescat in pace!*"



SKETCH MAP SHOWING THE
 PLACES VISITED BY FATHER PERRY
 IN HIS SCIENTIFIC JOURNEYS.

CHAPTER IV.

SCIENTIFIC VOYAGES.

ONE would have imagined that all this work would have been more than amply sufficient to satisfy the zeal of any astronomer however ardent and enthusiastic. Especially, too, when we remember that Father Perry served for several years on the Council of the Royal Astronomical Society, and on the Solar Physics Committee, being a regular attendant at the meetings. And yet he found time to take part in several important astronomical expeditions, in fact it has been stated by those who ought to know best, that he was a member of more scientific expeditions than any living astronomer.

All these journeys which he undertook on behalf of the Government or the learned societies, were in connection with problems concerning the great central luminary of our system. The most fundamental of these, is the exact determination of the

EXPLANATION OF THE SIGNS USED IN THE SKETCH MAP.

Transit of Venus (sign ♀). Kerguelen 1874, Madagascar 1882.

Total Solar Eclipse (sign ☉). Cadiz 1870, Carriacou 1886, Moscow 1887, Salut Isles 1889.

Magnetic surveys (sign ⊕). France (West) 16 stations 1868, France (East) 20 stations 1869, Belgium, 20 stations 1871. Also the Cape, Kerguelen, Bombay, Aden, Port Said, Malta, Palermo, Rome, Naples, Florence, Moncalieri, 1875, and Nos Vey, 1882.

Canada and United States, 1884. British Association, and American Association.

primary unit in astronomical measurement, the distance of the earth from the sun, and to this the Transit of Venus expeditions of 1874 and 1882 were directed. Other problems of a different order concern the physical constitution of the sun, and the nature of the glorious atmosphere which surrounds him, the full beauty and extent of which is only to be viewed at times of total eclipse. Father Perry was sent to observe no less than four of such eclipses, namely those of the years 1870, 1886, 1887, and 1889. Careful and painstaking in preparation, accurate and skilled in observation, zealous, nay enthusiastic, in the love of his science, he was early recognized as a most fit subject to lead such expeditions. What a remarkable sign of the times, and what a contrast between the days of Elizabeth, and those of our gracious Sovereign Victoria!¹ For the Jesuits

¹ Father Perry was not the first Jesuit who took part in an expedition for the observation of the Transit of Venus. A similar honour was paid to the celebrated Father Hell, who at the instance of Christian VII. of Denmark, went in 1769 to Wardhaus, in Lapland, and wintered in latitude $70^{\circ} 23' N.$ Father Hell was born at Schemnitz in Hungary in 1720, and died at Vienna in 1792. He was for thirty-six years director of the Observatory at Vienna, and published many important astronomical works. His observations of the Transit of Venus were most accurate and successful, but had been for many years discredited by astronomers, owing to aspersions which had been thrown upon his character and honesty as an observer. However, he has recently been most triumphantly acquitted, owing to the researches of Professor Newcomb, who has with great pains examined the original documents, which show not the slightest traces of having been tampered with. See Professor Newcomb's paper, *Monthly Notices R.A.S.* 1883, vol. 43, p. 371. The Royal Society of London also invited their foreign member, the celebrated Father Boscovitch, to observe the transit at a station in California. The troubles which at that time afflicted the Society of Jesus prevented his acceptance of the post.

the Blessed Campion, Southwell, and their companions, nothing better was prepared than the rack and the gibbet, while to Father Perry, a Jesuit as they were, living under the same rule, and bound by the same vows, his countrymen entrusted the conduct of several important scientific missions.

We propose to first pass in review the most interesting points in connection with the Transit of Venus expeditions, and then to epitomize those which concern the solar eclipses which Father Perry observed. The first Transit of Venus of this century occurred on December 8, 1874, and Father Perry was appointed by Sir G. B. Airy, at that time astronomer royal, to take command of the expedition to Kerguelen, or Desolation Island, in the South Pacific. Father Perry has himself published a remarkably interesting pamphlet detailing the chief events of his voyage and stay on the Island of Desolation.¹ He thus speaks of the island: "Its excellent geographical position gave it special claims, situated as it is at the spot best suited as a south station for the application of Halley's method of total duration, and as an east station for retarded ingress to pair with Honolulu in Delisle's method, and at the same time being nearly as good for the direct as for the indirect mode of attack. And then the desolate situation, almost three thousand miles away from any

¹ *Notes on a Voyage to Kerguelen Island to observe the Transit of Venus, December 8, 1874.* By the Rev. S. J. Perry, F.R.S. Reprinted from *The Month*. London: Henry S. King and Co., 1876.

habitable spot ; the dreary aspect of an island of rock and lake and bog, without man or beast or tree to break the monotony of its loneliness ; and most of all, the fearful approach through mist and storm, with waves the greatest in the world, and winds blowing a gale five days out of every seven—all tended to create a sympathy for those who had the honour of being entrusted with this important post."

Accompanied by Father Walter Sidgreaves, his companion in both Transit of Venus expeditions, Father Perry left England on May 23, 1874, and the Cape in H.M.S. *Volage*, under the command of Captain Fairfax on September 18th, the telescopes, observing huts, and heavy luggage being stowed on board H.M.S. *Supply*, under the command of Captain Inglis. When almost within sight of Kerguelen, the two vessels encountered a severe and protracted storm. "The waves were enormous, and we could not but enjoy the grandeur of the spectacle in spite of the very great inconvenience, not to say suffering, to which we were exposed. Four days and nights the mighty waves had been washing over the *Volage*, with consequences which were at times rather more than comic, though luckily no man was washed overboard during these terrific gales." At last, on the 8th of October the vessels reached Royal Sound, and cast anchor in Island Harbour. An American party had already occupied Molloy Point, the spot chosen by H.M.S. *Challenger*, as the most suitable for an observatory, and it



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LAKES TO THE SOUTH OF OBSERVATORY BAY, KERGUELEN ISLAND.

PHOTOGRAPHED BY FATHER PERRY.



therefore became necessary to select another site for the primary English station. After several short sea-trips, and consultation being held with sealing captains, a position was secured, where there was a plentiful supply of water, a good horizon, and a firm rock foundation for the instruments. Two subsidiary stations were also subsequently occupied by the officers of the war-ships. These were as widely separated as circumstances would permit. Otherwise a single cloud might have rendered all observation impossible on the eventful day. As we shall see, the result justified Father Perry's forethought. A party of German astronomers had also pitched their tents in a cemetery about half a day's sail from the English station. The time before the 8th of December was fully occupied in the erection of the instruments, and in the necessary preliminary observations. The setting up of a thoroughly equipped astronomical, meteorological, and magnetic observatory, is by no means a light undertaking; the trouble and labour entailed were immensely increased in a climate in which the mean temperature even during the summer months is about 40° Fahr, and which is so misty and rainy as that of the Isle of Desolation. In this connection the following incident is worthy of record. It happened that the spider lines of the transit instrument at one of the subsidiary stations were broken by an accident. To procure fresh ones it became necessary to pay a visit to the principal observatory. Accordingly, two officers set out to walk the

distance, but six miles as the crow flies. Three inlets of the sea, however, separated the two stations, and it was necessary to walk round these. Starting about mid-day the two officers were overtaken by nightfall after passing the first inlet only, so rough were the hills, and so boggy the intersecting valley which they had to cross. "In the absence of daylight it would have been too dangerous, and almost impossible, to advance, so they sat down side by side, cold and hungry, with the prospect of still harder work on the morrow. Having scarcely any food, and thinking it hopeless to attempt to walk round all the inlets, they determined at daybreak to swim across the water. The temperature was scarcely above freezing-point, but there was little choice left. Fortunately, the water was not deep at the point where they made their first attempt, and they were able to wade safely across. But the second trial was more serious, as they had to swim nearly a quarter of a mile, and to pull themselves through the kelp, wherever this strong sea-weed made all attempt at swimming abortive. Both had strength enough to gain the shore, and afterwards reach our dwelling, though they arrived completely exhausted from cold, fatigue, and hunger."

At last the eventful day arrived, and with it came a hazy filmy sky which interfered somewhat with observations, and at one time a dense cloud which caused Father Perry to lose the first internal contact of the planet with the sun's limb, although this important observation was secured by three

other observers at the two subsidiary stations, which in his prudence he had caused to be erected. However, he himself secured good observations of both second internal and external contact, the sky having cleared somewhat by that time. Besides contacts, thirteen photographs of Venus on the sun were obtained, an equal number of micrometric measures of the distance between the limbs, and also a few measures of the diameter of the planet. In all enough material was secured for the application of the methods of both Halley and Delisle to the solution of the problem of the sun's distance.

When the work of the 8th of December was over it was thought, "that it only remained to dismount the instruments, pull down the observatories, and return with all despatch to more genial climes." But not so; for Sir G. B. Airy had given instructions that "the utmost attention must be given to the determination of absolute longitude, which will probably be fundamental for those seas." How Father Perry carried out this part of the programme will be seen by the following extract, although the taking of the necessary observations lengthened the stay on the island to a total duration of five months. "One hundred double observations of lunar altitude or azimuth, and thirty transits over the meridian, were the number required, and our first two lunations had only given us about five transits and a proportionate number of azimuths. The prospect was not encouraging, and there was no excitement now to carry us through the work. But the line of

duty was clearly marked out, and if it might not be possible to obtain all the observations, we ought at least to stay as long as prudence would permit. Calculations were made on both sides, the question of provisions was weighed against that of lunar observations, and the balance struck was that observations might be continued until the end of February, even though it were necessary to put all on half rations. More could scarcely be expected, and we settled down to our twelve weeks' work with the pleasant prospect of a home journey of many thousand miles upon a scant allowance of even the necessaries of life. To be a martyr for science is all very well in contemplation, but all may not find it quite so agreeable in the practice. We must not deny that there was a little grumbling, 'tis an Englishman's birth-right, but the work was done, and we hope thoroughly."

Nor can we refrain from quoting the following passage which clearly brings out the character of the man, and his exactness in carrying out the task entrusted to him. "For our own part, we were determined that no consideration should make us flinch where the astronomical interests of the expedition were at stake."

During this long banishment on the desert isle, the crews of the vessels amused themselves with boat-racing, football, paper-chases, and other athletic sports, while the officers took to shooting ducks, which were abundant about Royal Sound, and when the birds had been driven away, to stalking

the sheep which had been brought for food for the expedition, but which on their being landed, had scampered off to the hills, and becoming perfectly unapproachable and wild, served only for purposes of sport.

On the 27th of February at 5.30 a.m., the moon passed the meridian, the last observation necessary to complete the task was secured, and by eight o'clock both war-vessels had weighed anchor, and on a beautiful morning, were merrily steaming out to sea. But the troubles of the observers were not yet over, for almost immediately they encountered a far worse storm than that which had greeted them on their arrival. This time it was a cyclone which had overtaken them. We cannot do better than quote Father Perry's own description: "For nine-and-forty hours our Captain and First Lieutenant are unceasingly at the post of danger; no sleep, and scarcely any food. Another of our boats has been torn from its davits, and has to be cut adrift. The green waves pour freely over the hammock-nettings, carrying seamen bodily over the guns on deck. The men are unable to hold on at the wheel, and one, more vigorous than his mates, is twice carried round without relaxing his grasp. It is almost needless to say that we were flooded everywhere, the wind blowing a hurricane, and the ship rolling at times more than 45°. Each time that the side of the vessel went completely under water, there was a momentary doubt, in some minds at least, whether she could right herself, but the noble ship behaved gallantly

and proved herself thoroughly seaworthy. From calculations made on board afterwards we passed within twenty-two miles of the centre of the cyclone, yet we lost no lives, and our chapter of accidents included only eight slightly wounded." After touching at Ceylon, Bombay, Aden, and Port Said, the *Volage* at length reached Malta, where Fathers Perry and Sidgreaves bade adieu to the Captain, officers, and crew of the vessel, of whose great kindness Father Perry always spoke in enthusiastic terms. From this island they took the overland route home. On the way they were privileged at Rome to be received in audience by the late Holy Father Pope Pius the Ninth.

As was to be expected Father Perry was again selected to lead another expedition in 1882 to Nos Vey, Madagascar, to observe the second Transit of Venus of this century. One who was present at the soirée of the Royal Society in the spring of 1881, still recalls the unfeigned joy with which Mr. Stone of the Radcliffe Observatory, Oxford, and the President of the Commission for the Expeditions to observe the Transit of 1882, received his acceptance of the post. This expedition has been described by his companion Father Walter Sidgreaves, in an article in *The Month* for April, 1883, entitled, "The last Scientific Voyage of H.M.S. *Fawn*." After a pleasant passage to Cape Town, the observers left Simon's Bay on the 4th of October, in the above named man-of-war, under the command of Captain Aldrich, and after a wait of five days at Durban,

in the strictest quarantine, for small-pox raged at the Cape, in order to time and rate the chronometers by the aid of the telegraph wire between Durban and the Cape Observatory, arrived at their destination on the afternoon of the 22nd of October. Nos Vey, the station chosen for the observatory, is a small island lying on the south-west coast of Madagascar, about two miles from the mainland, consisting of sand and coral, three-quarters of a mile long, and a quarter of a mile broad. On this spot several trading companies have erected their establishments, and it is the centre for barter with the wild Sakalaves of the neighbouring coast. A Norwegian missionary, Mr. Rosvig, was at that time also stationed at Tullear, a native village on the mainland. The arrival of the war-vessel seems to have been very opportune, for two traders had been most cruelly murdered only a month before by the savage natives, which rendered the position of the other servants of the companies most critical. Under these circumstances, Captain Aldrich deemed it advisable to provide the observers with a guard of blue-jackets. However, whether frightened by the proximity of the ships, or whether warned by the King's sons, the irresponsible and cruel rulers of these poor savages, the village on the island near the observers' dwellings was one night quietly broken up, and the whole of the inhabitants decamped to the mainland. They, however, still continued to pay visits to the island for fishing and trading purposes, while several others were in the

employ of the traders, so that the astronomers had ample opportunity for studying their character. Father Sidgreaves thus records his impressions of them: "The natives as a class have always appeared to us a merry, peaceful, indolent, in-offensive race. And we have been led to believe that all that is dangerous in them is due to their princes (the King's sons), and there are eight of them, who trade upon the universal superstitious awe in which they are held by their father's subjects. It is believed all over the coast that some terrible calamity would befall any one who should raise his hand against any one of these; and so there is no law to restrain their rapacity. The visit of a King's son is like a plague. It works destruction all round. Whatever he wants he takes, and he does not hesitate to reduce to poverty any one who happens to be the owner of a large number of oxen, if it suits him to want them. During our stay one of the better-to-do-men of the neighbourhood was thus stripped of his property. The example spreads contagion, and for the time survival of the fittest is the undoubted law."

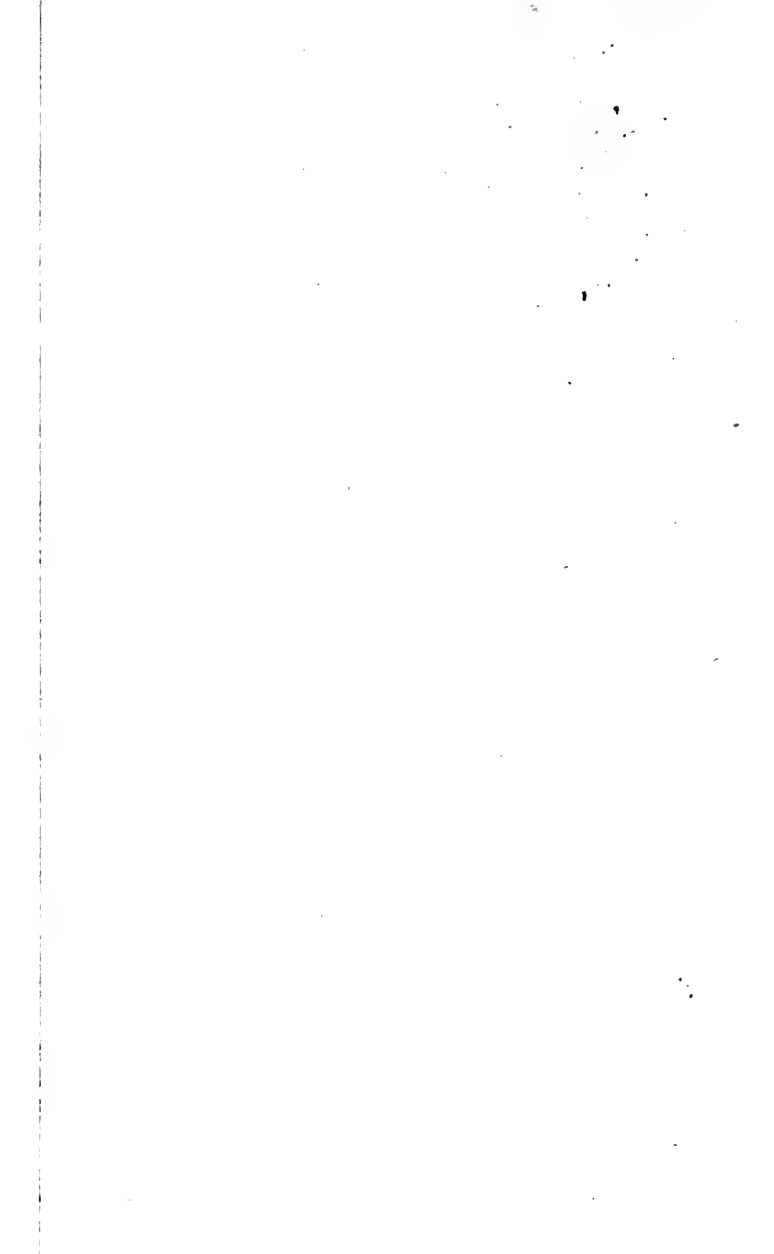
During the six weeks which were spent upon the island preparatory to the transit of the planet—which the sailors, as they watched her in the evening twilight, declared would never "fetch-up" in time—the officers of the *Fawn* employed themselves in making a very thorough survey of the neighbouring coast. The astronomical work was rapidly pushed forward, the observers not having to



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A GROUP OF SAKALAVES, NATIVES OF THE S.-W. OF MADAGASCAR.

PHOTOGRAPHED BY FATHER PERRY.



contend against a climate as severe as that of Kerguelen. In fact, although the mean temperature during the day was between 80° and 90° Fahr., yet they were hardly ever without a cool sea-breeze. The longitude of the station was accurately determined by chronometer runs, and in addition, to secure perfect certainty in this important point, the occultations of all stars by the moon during the first half of the lunation were observed. Nothing disturbed the monotony of the routine work, except a fire which had been caused in the dried-up grass by a sailor inadvertently dropping some burning material from his pipe. This threatened at one time to be very serious, and had the wind been in the S.W., it seems hardly possible that the observatories could have escaped. However, by clearing wide paths between the observatories and the fire, the danger was at last happily averted. The afternoon of the 6th of December was luckily very fine, and the ingress of the planet on the sun's disc, the observation which the astronomers had travelled so far to secure, was most successfully observed by both Father Perry and Father Sidgreaves with two six-inch equatorials, and by Captain Aldrich with the four-inch equatorial belonging to the Stonyhurst Observatory. On the 9th of December the observers left Nos Vey for Durban, the chronometers being again timed for the return measure of the distance between the two meridians. It only remains to state that the solar parallax deduced by Mr. Stone from all the British observations in 1882 is $8.823''$, corres-

ponding to a mean distance of the earth from the sun of 92,890,000 miles, with a possible error of 150,000 miles. We have entered somewhat into detail in our description of these two expeditions, because, in the first place, the next Transit of Venus will not occur till the beginning of the twenty-second century, and secondly, because it is a method of determining the sun's distance from the earth, which, although in the hands of good observers, it has yielded most excellent results, yet has already been superseded by more exact astronomical and physical methods; as for instance, that based upon the accurate determination of the velocity of light, the measure of which quantity modern scientific instruments have rendered attainable. Under these circumstances it is unlikely that another expedition will ever be despatched for a similar observation from these shores.

Of the four expeditions in which Father Perry took part for observing a total eclipse of the sun, that of 1887, for which he went to Russia with Dr. Copeland, the two astronomers being the guests of Professor Bredichin at Pogost, was altogether fruitless on account of a thick curtain of clouds which intercepted the solar corona from view, and the last journey when he met his death in harness is specially treated of in the next chapter.

There remain the two eclipses of 1870 and 1886. It is doubtful whether the advent of any total solar eclipse has excited a keener interest among astronomers than that of the year 1870. The recent triumphs of photography in the hands

of De la Rue and Secchi in 1860, and of Tennant in 1868, the no less marvellous spectroscopic victories achieved by Janssen in the same year, and by Young and Harkness in 1869, had opened quite a new field for speculation and research. Then, too, Spain and the north-west coast of Africa which were crossed by the line of totality, were within easy distance for at least astronomers of the European nations. Accordingly, the points of vantage were occupied by the leading solar physicists and observers of the world; including men of such wide reputation in this branch of science as Huggins, Janssen—who escaped from Paris, then besieged by the Prussians, in a balloon in order to observe the eclipse—Lockyer, Young, Secchi, and Vogel. England alone sent out a band of over fifty observers, a strong party came from the United States, while Austria, Germany, Italy, and Spain were each worthily represented. It speaks highly for Father Perry's reputation, that he was chosen, even at this comparatively early stage in his career, to take charge of one of the four parties into which the English observers were divided. His own observations on this occasion were but partially successful, owing to the presence of light filmy clouds which covered the sun, so that the light was not sufficiently powerful for the dispersion of the spectroscope which he used attached to the Stonyhurst Cassegrain reflector. Nevertheless, he estimated the greatest breadth of the corona from the sun's limb as about seven-eighths of a solar diameter, the greatest extensions

being over the prominences. He also recorded the occurrence of four gaps in the inner corona, and estimated its light-giving power as seen through the thin layer of cloud as about one-eighth of that of a bright moon. Some very valuable observations on the bright lines in the prominences, corona, and even on the lunar surface, were made by one of his party, Captain Maclear, R.N., who used the Stonyhurst four-inch refractor, and the Browning spectroscope, an instrument of less dispersive power than the one used by Father Perry.

The observation of the spectrum of the solar corona was again the object of Father Perry's journey to Carriacou, one of the Windward Islands, in 1886. The party of British observers included, besides Father Perry, Mr. Lockyer, F.R.S., Dr. Schuster, F.R.S., Dr. Thorpe, F.R.S., Capt. Darwin, R.E., Messrs. Turner and Maunder of the Royal Observatory, Greenwich, and an assistant, Mr. Lawrance, while the expedition was joined by Professor Tacchini, of the Roman College Observatory¹ at Southampton. On arriving at Barbados Father Perry was met by Bishop Butler, of Demerara, a former pupil of his at Stonyhurst, and whose guest he became after the labours of the

¹ The Roman College Observatory is built on one of the pilasters of the intended dome of the Church of St. Ignatius. This site was chosen as long ago as 1750 by the famous Boscovitch, but the idea was only realized by Secchi in 1849. Secchi's body rests in the church, beneath the observatory, the scene of his many labours. On his death, the Italian Government appropriated the private property of the Society of Jesus, although when his brethren had been expelled from Rome in the troubles of 1871, he did the Government the kindness to remain in charge of the observatory by their own special request. Otherwise he would probably have come to Stonyhurst.

eclipse were over. Father Perry, with Mr. Maunder, found berths on H.M.S. *Bullfrog*, under the command of Captain Masterman. They arrived at their destination on the eve of the Assumption, and were most cordially welcomed by Mr. Roche the magistrate, and by the venerable Canon Petretto, a worthy priest who has devoted his life to the salvation of the souls of this abandoned spot of the Lord's vineyard, and who received the visit of a brother-priest with a delight impossible to express in words. The feast of our Lady was most worthily celebrated by a procession and Solemn Benediction, and Father Perry occupied the pulpit both morning and evening. The observatory was finally placed in close proximity to the dwelling of Mr. P. Drummond, who had very generously placed his house at the service of the astronomers. Father Perry's instrument was the five-inch Stonyhurst refractor, to which was attached a grating spectrocope lent by the authorities at South Kensington. His object was two-fold: first to search for the bands of carbon during totality, which in the eclipse of 1883 Professor Tacchini had believed that he had glimpsed in the spectrum of the corona, and secondly to examine the order of the appearance and disappearance of the bright lines in the inner corona just before and after totality. This latter observation was to be a test observation of the truth of Mr. Lockyer's theory concerning the seat of the selective absorption which causes the dark lines in the normal solar spectrum. The question still not satisfactorily

solved is this: Are the dark lines to be attributed to the combined selective absorption of concentric gaseous layers surrounding the sun similar to the successive coats of an onion, or is such absorption caused by the action of one layer contiguous to the photosphere or bright surface of the sun, and hence called the "reversing layer?" The first hypothesis is supported by Mr. Lockyer, the second was held by Secchi, and the observations of Young in 1870, when immediately before totality he saw the dark lines flash out bright or reversed, lends weight to the second view. On Mr. Lockyer's hypothesis, it is evident that there ought to be a difference observed in the lengths of the bright lines seen in the inner corona immediately before and after totality, the hottest belonging to the lower layers being short and bright, the lines corresponding to the cooler outer layers being longer and less bright. Again, the short lines would come into view first, and disappear last, and the rest in order of their length and intensity. In spite of Father Perry's instrument being without clockwork, an almost necessary adjunct for such delicate observations, the lack in this instance being kindly supplied by Lieut. Helby, who placed the slit of the spectroscope as far as possible in the required positions, and in spite of a drenching rain shortly before and after totality, Father Perry was enabled to see at one minute before totality the well-known coronal line 1474K, which was immediately followed by the appearance of some fifteen lines which seemed

to be of various lengths. During totality, he searched for the carbon bands, with a negative result, as did also Professor Tacchini at his station. If then the carbon bands are a part of the coronal spectrum, they were not visible in 1886. As the end of totality approached, Lieut. Helby placed the slit radial to the point of reappearance of the photosphere; and twenty seconds before the bright edge of the sun peeped out, Father Perry reports that he saw about fifty lines flash into view in the limited part of the spectrum under observation. "This lasted only a very short time, and after totality no lines were seen, as the rising wind interfered considerably with the steadiness of the telescope, and in a few minutes we were again deluged with rain." The different lengths of the bright lines seen would therefore seem to lend some countenance to Mr. Lockyer's hypothesis, but is it not possible that the flash just after totality was an indication of the "reversing" layer? However, in 1882, Mr. Lockyer himself in Egypt took some observations which distinctly corroborate his hypothesis, and the observations of Mr. Turner in the eclipse under review tell, though less emphatically, in the same direction. Thus this interesting question at present rests. Two days after the eclipse, Father Perry paid a farewell visit to Canon Petretto, who received him with the ringing of the church bells, which summoned all his parishioners to the church, where Father Perry was forced by the worthy man to mount the pulpit, and give them a final discourse.

CHAPTER V.

LAST JOURNEY.

WE now come to the story of the last scientific expedition of Father Perry. Besides Father Perry and his assistant, Brother Rooney, the Royal Astronomical Society despatched a second expedition, under the charge of Mr. Taylor, to St. Paul de Loanda, on the west coast of Africa. The equipment of both parties was identical, consisting of a four-inch photographic refractor with Capt. Abney's lenses, and a reflector made by Mr. Common, of Ealing, of twenty inches aperture and only forty-five inches focal length. This instrument was designed to photograph the fainter portions of the corona, only the roots having hitherto been impressed on the photographic plate. Observers in former eclipses have traced the outer corona, especially at times of minimum sun-spots, as a vast equatorial extension to some seven or eight solar diameters from the limb. The first problem, then, to be attacked was to ascertain if such appearance was merely subjective, or due to optical illusion. If it could be photographed it was objective. The next object was to find out, if possible, whether the corona changed

in form during the two and a half hours which elapsed between totality at Father Perry's and at Mr. Taylor's station. This part of the programme was a failure, owing to clouds having prevented Mr. Taylor from seeing anything at all of the eclipsed sun. Each plate to be used was, moreover, prepared by Capt. Abney with light-intensity squares, by comparison with which the light-giving power of each portion of the corona could be gauged. It is only necessary to add that, considering the dampness of the climate of Salut, Father Perry's photographs were very successful, owing to the great care he took in the focussing of his instrument, and to a most providential clearing of that particular patch of the sky in which the sun was, for the few minutes necessary for the observation. But in the moment of triumph the great astronomer was already stricken with a fatal disease. Very rarely, if ever, in the history of science, has such a noble example of self-sacrifice been witnessed as that of this good Catholic priest.

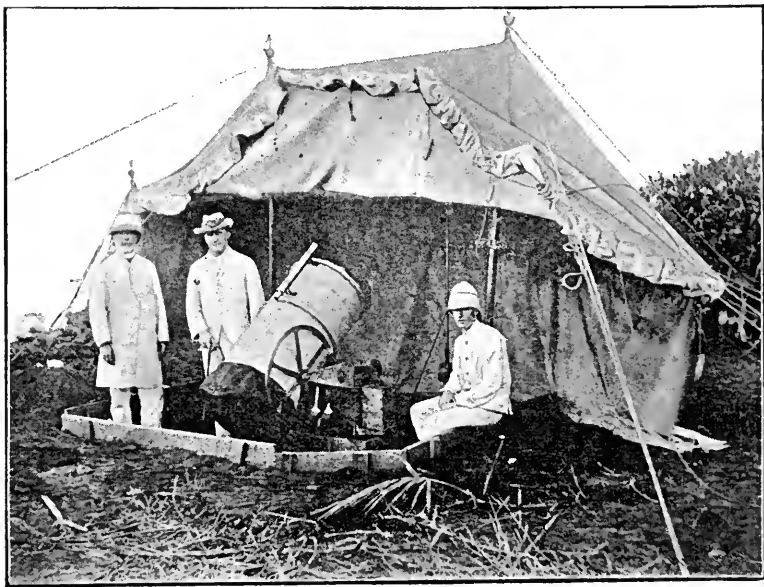
Father Perry, with his companion Brother Rooney, left Southampton on board the R.M.S. *Tagus* on the 14th of November, and arrived, after an excellent passage with but one bad night, at Barbados at six o'clock on the morning of the 26th of November. There he was met by Father Strickland, S.J., and landed to say Mass. At nine o'clock he received a visit from Captain Atkinson and Commander Grey, of H.M.S.S. *Comus* and *Forward*, which were at anchor in the roadstead,

awaiting his arrival. The instruments were at once transferred to the *Forward*, and it was arranged that Brother Rooney should proceed to the Salut Islands to select a site for the observatory, while the *Forward* should take soundings and secure a safe anchorage for her sister-vessel. Accordingly the *Forward* left Barbados on the 28th of November at 11 a.m., and after a rough passage arrived at the Isles. Father Perry wrote to Mr. Turner, of the Royal Observatory, Greenwich, from Barbados. He says, "All are most kind and anxious to assist in every way," and a correspondent of the *Manchester Guardian* of the 6th of January thus writes :

The greatest possible praise is due to Captain Atkinson and his officers and men for the hearty, earnest manner in which they threw themselves into the spirit of the expedition. Captain and officers were constantly inquiring if there was anything they could do to make the astronomers more comfortable and render the expedition a real success. Lieutenant Thierens and his men deserve great credit for the able and cheerful manner in which they carried out each task that was entrusted to them. During Father Perry's illness on board the *Comus* everything that it was possible to do for him was done.

It is a most pleasant duty to add that in Father Perry's numerous expeditions he always met with the greatest kindness from the officers and men of Her Majesty's navy, of whom he was wont to speak in the most enthusiastic terms. To proceed with the story. On the arrival of the *Forward* at the Isles, Brother Rooney selected a site for the observatory on the Royal Island, where the prison





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THE "CORONAGRAPH" AT SALUT, WITH FATHER PERRY,
CAPTAIN ATKINSON, AND LIEUTENANT THIERENS.

for the convicts, the hospital, and the chapel were situated. Four rooms were prepared for the observers in the hospital, and everything was done on behalf of the French Commandant, who had received instructions to this effect from his Government, to further the success of the expedition. The Iles du Salut are situated off the coast of French Guiana, about twenty-two miles from Cayenne, and twelve miles from the mainland. They are used by the French Government as a penal settlement for their convicts. Three islands constitute the group, Royal Island, on which the commandant and chief officials reside, St. Joseph, where political prisoners are detained, and the Devil, to which the poor lepers are relegated. On Royal Island there are two large hospitals, one for the military and the other for the convicts, these latter numbering seven hundred, one hundred and fifty being Frenchmen, and the rest Arabs and Chinese. They are guarded during the day by forty warders, who are armed with loaded revolvers, and at night by sixty soldiers. On Father Perry being informed that any one found out at night was immediately shot, he expressed the wish, with that merry twinkle in his eye so well known to his friends, "that they would wait a minute while he was on the island."

Our next extract is from the letter of Father Strickland,¹ which gives a very good idea of the

¹ For the complete letter of Father Strickland, and the diary of Brother Rooney, we must refer our readers to the *Tablet* of the 25th of January, and the 1st of February, 1890.

unhealthy climate of the island, and the sufferings which Father Perry endured.

The *Comus* man-of-war, Captain Atkinson, left Barbados on the 2nd of December with the Rev. Father Perry on board for his expedition to the Isles de Salut, near Cayenne. They arrived on the 7th. During the voyage the weather was very rough, and the *Comus* rolls heavily in bad weather. Father Perry suffered very badly from sea-sickness, and was much done up on his arrival, but, without allowing himself any rest, landed the same evening to view the site and introduce himself to the authorities. . . .

He took up his quarters in the hospital. He was much pleased with his rooms, which were very good, but the sanitary arrangements of the whole island were as bad as possible, and when rain came on about the 18th the effluvium on the island was almost insupportable to those not used to it. It was only on the 20th that Captain Atkinson and his officers became aware that Father Perry was in bad health, for he made light of all his personal wants for fear of giving trouble to others. In fact it was this very spirit of saving trouble to others which made him persevere in declining Captain Atkinson's urgent and repeated request that he would live on board the *Comus* and land each morning for his work. Had he done so, in all probability his life would not have been sacrificed to his over-anxious desire to do everything for the best for the success of the work confided to him. . . .

The observatory which had been erected for the occasion was half a mile from the hospital, and the intervening ground was very rough, being a steep descent and ascent, and the distance was gone over on foot four times each day in fair weather or foul. Lieutenant Thierens, second officer of the *Comus*, who was specially appointed to assist Father Perry and his men, always slept on board the *Comus*, and landed in the morning for work, and this small precaution of sleeping in the fresh air of the sea seems to have preserved the men

from all serious illness, though nearly all were less well than usual.¹

The following is Father Perry's own description of the island and his life there, as told in a letter to his sister :

At present I am living partly on board, and partly at the Military Hospital. I have had a slight fever, and am taking quinine and sulphur baths; but hope to be quite well for the work next week. On Sunday, the feast of the Immaculate Conception, I preached to the Catholic convicts. A convict serves Mass each morning at 6 a.m., and all our surroundings are convicts and warders. Every evening the Arabs may be seen in every part of the island prostrating in worship, but I have not as yet learnt where the Chinamen pray. The vice in the islands is fearful. Dogs are everywhere, and revolvers in the hands of all the warders. Two convicts were executed last week, and two or three others are already sentenced. This morning one poor fellow, who had died in hospital, was given to the sharks, which swarm in these waters. Our station consists of three islands: Royal Island, on which are the worst criminals; St. Joseph's, where the prisoners are condemned for life, but not to perpetual hard labour; and The Devil, where the poor lepers are kept. Food is sent to these twice a week, and the doctors visit them occasionally. They are all in the last stage of misery, and I see them crawling about as best they can. The captain, officers, and men of H.M.S. *Comus* are all kindness, and the officials on shore are doing everything possible for us. The French Government sent orders that we were to be treated with all kindness, and the Governor of Cayenne has sent the most pressing invitations to Captain Atkinson and myself. Ask all the good nuns to pray for your affectionate brother, S. J. PERRY.

¹ It is only right to state that the Royal Astronomical Society are in no way responsible for having sent Father Perry to such a hot bed of pestilence. The original station chosen was Cayenne. He himself requested that the change might be made, as the sun would be a little higher at Salut at the time of the eclipse.

The instruments having been placed in position, the work of rehearsal for the great day immediately began. This, and the providential observation of the eclipse itself, is best told in the words of the *Manchester Guardian* :

The first general rehearsal took place at 4.30 p.m. on the 16th; there was a second on the 17th at the same hour. In the evening Father Perry gave a lecture on board H.M.S. *Comus*, during which he took the opportunity of giving further useful instruction to those who were to assist at the instruments.¹ There were four assistants at each instrument—three officers to take down the times given by the observers, and one first-class petty officer to hand plates, &c.

The weather was splendid up to the 18th, when several very heavy showers of rain fell. On the 19th, at 6 p.m., there was a full rehearsal in twilight, which was very successful. Rain commenced to fall at 9 p.m. and continued to fall in torrents all night. At 9 p.m. on the 20th the stars shone out most brilliantly, and Father Perry decided to remain in the observatory all night to take trial photographs. Several were taken, and the sky clouding at 2.30 a.m., Lieutenant Thierens and his men returned to the *Comus* at 3 a.m. Father Perry was of opinion that it might clear up again, and he wanted to get a few more photographs if possible; and as he wished to sight the position of the sun at its rising, he lay down in his hammock, under one of the bell tents, instead of going to his quarters at the hospital. Mr. Rooney did not like the idea of sleeping there, so he walked about the camp. It is thought that Father Perry got a chill on this occasion, for the dew falls very heavily during the night on the Salut Isles.² At 5.45 a.m. Father Perry got up and prepared

¹ He had already given the men a similar lecture.

² Father Perry had been warned that it was dangerous to be out at night, but he merely remarked, "What is the good of telling us that, when it is essential for our work to be out at night?"

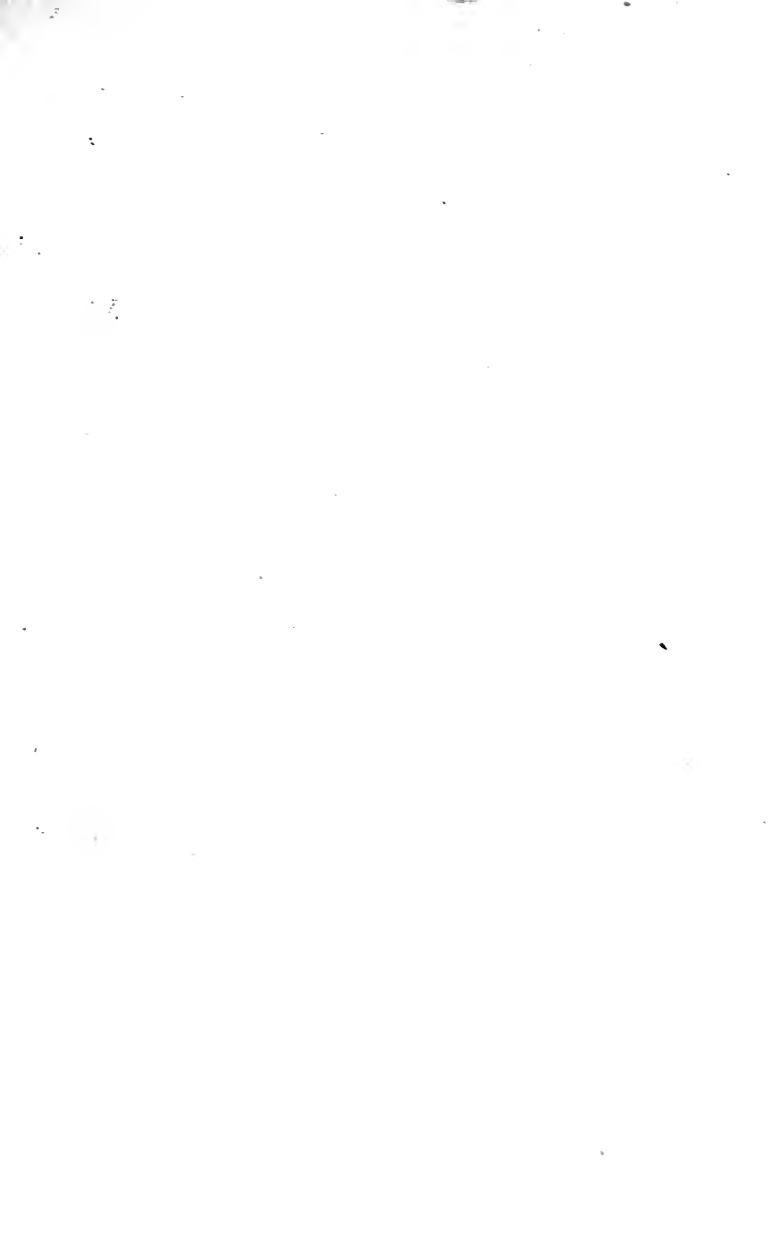
to take the sun's position. Then followed a full rehearsal at 7.30, when every part of the programme for the morrow was most rigidly carried out. Two sentinels were placed on guard, with strict instructions that no one was to be allowed to enter the camp during the rehearsal, and all went as smoothly as possible—not a word being uttered except by those appointed to count the time. Father Perry was very much pleased with this rehearsal. The rehearsal over, the astronomers returned to their quarters to take some rest. At 3 p.m. they were again at the observatory, and a photograph of the sun was taken with the 20 in. mirror. The remainder of the evening was spent in making little adjustments and getting everything into good order for the great event of the morrow.

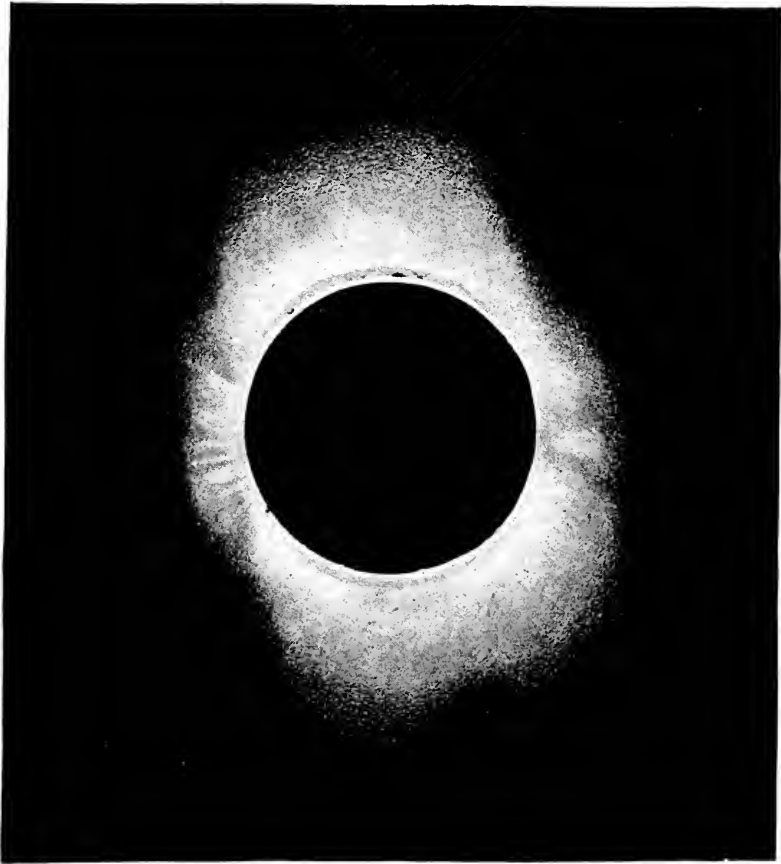
The night grew very dark, and heavy rain fell. At 3.30 a.m. on Sunday morning, the 22nd, Mr. Rooney, hearing Father Perry moaning, entered his room, and found him in great pain. He gave him a dose of some medicine which they had brought with them, and this seemed to give a little relief. At 4.45 Mr. Rooney started for the observatory, to get everything ready and put the plates into the slides. Before he left Father Perry asked him to send a blue-jacket to assist him down the rough road to the observatory. At 6 a.m. Lieutenant Thierens and his men arrived. The officer was informed of Father Perry's illness and request, so a man was sent off at once. The sun rose in a clear sky, but at seven o'clock all looked very black, and at 7.20 a heavy shower of rain fell for about three or four minutes. After this the sky began to brighten up. At this time Father Perry arrived at the observatory, looking very unwell and leaning on the blue-jacket. As soon as he entered the camp he asked Mr. Rooney if all was ready, and, having been told that all was quite ready, he walked round to see that every man was at his post. The sky was now much brighter, with a large patch of blue near the sun. A few minutes later the sun appeared, it being then a little more than half-eclipsed, and about seven or eight minutes before totality

commenced. The sun was well out into the blue patch, and as soon as totality commenced the signal was given, and the plates were all successfully exposed according to the programme drawn up by the Solar Eclipse Committee of the Royal Astronomical Society. Captain Atkinson, of the *Comus*, also observed with a small telescope. The corona stood out magnificently, and was very much like the American one of January 1, 1889.

Totality lasted one hundred and twenty-nine seconds. When the observations were finished Father Perry walked over to Mr. Rooney and asked if all had gone right at his instruments, and on being told that everything was most satisfactory, he remarked, "This is the most successful observation of the kind that I have ever had anything to do with." He then asked Captain Atkinson to get three cheers for the successful observation, and three hearty cheers were given. He said, "I cannot cheer," but he waved his helmet. From the moment he entered the camp until the observations were all over he seemed quite himself, and all hoped that he was not so ill as was feared; but it was with great difficulty that Mr. Rooney got him up the steep hill back to his quarters. Frequently on the way he spoke of the providential manner in which the sky cleared and enabled them to so successfully photograph that for which they had travelled so far. He considered the toils and fatigue well repaid by the magnificent sight they had just beheld. When they reached the hospital he was quite exhausted, and the resident doctor was asked to see him. He said he was very feverish and very much fatigued. The doctor told him to remain in bed, and gave him some medicine in the afternoon. Father Perry told the marines to get all his things packed up, and he wished a message to be sent to Captain Atkinson, to ask that a boat might be sent for him at five o'clock that evening, and a man to help him down.

By the kind permission of Mr. Turner and Mr. Common, we have been enabled to reproduce





THE SOLAR CORONA OF DEC. 22, 1889.
PHOTOGRAPHED BY FATHER PERRY.

To face page 70.

for our readers the accompanying copy of the solar corona as photographed by Father Perry. The original drawing from the negatives was made by Miss Violet Common. As will be seen, the equatorial extension has been photographed for about the distance of a solar diameter from the limb, while the polar rifts are well marked. That at the north pole is filled with delicate rays of light. The general form of the corona resembles very much that of January 1, 1889, and is similar in outline to those of the years 1867 and 1878, years of minimum solar activity, as was the year 1889. This type of solar corona, then, which has been likened in form to a "rather flat, empty cotton-bobbin," seems to be characteristic of such epochs. There is one feature, however, of the present corona which serves to distinguish it, and that is the trend of the lower edge of the eastern extension away from the south pole. It is also separated by a very well defined rift from the feathery structure which surrounds the pole.

It will also be observed that the general mass of the corona on the E. side is much broader than that on the W., as was also the case in Schuster's photographs of the 1875 eclipse, while in 1878 the western mass was the broadest. In 1883, Janssen photographed the corona to a distance of almost two solar diameters, more than twice as far as appears in Father Perry's photograph. It seems very probable that the mirror was dewed, owing to the dampness of the Salut climate, and hence its failure to photograph more of the coronal exten-

sion. Mr. Rooney remarks that it was almost impossible to keep things dry. The photographs taken by the Lick observers, Mr. Burnham and Mr. Schæberle, at Cayenne, have also suffered from the same cause, although they were developed immediately after exposure. It will moreover be noticed that the inner corona and the bright prominences have been reversed in the negative, and so appear black in the positive picture, showing that the exposure which was sufficient to photograph the fainter details was far too great for the more luminous inner portions. From a casual examination of the plates taken with the refractor, Captain Abney would estimate the brightness of the corona close to the limb as two hundred times that of the corona half a diameter away.

In all six photographs have been secured by Mr. Rooney with the refractor, and twelve by Father Perry with the reflector. Owing to Captain Abney's care, it is likely that important results will be deduced as to the light intensity in different portions of the corona, which will make this eclipse very valuable. Some plates also exposed by Father Perry at the end of totality, which are now in the hands of Dr. Huggins, will, it is hoped, help to solve the problem as to the feasibility of observing the solar corona in ordinary daylight.

CHAPTER VI.

HIS DEATH.

WE must now let Brother Rooney tell the affecting story of Father Perry's last days on earth, taking up the thread of the narrative from the last quotation. We would only add one pathetic circumstance from Father Strickland's letter, which is that shortly before his death Father Perry began to wander, and "thinking himself again engaged in the supreme moment of the scientific mission which had so long filled his thoughts, began to give his orders as during the short minutes of the eclipse."

All was done as arranged, and as usual he steered the boat which brought him to the ship; but when he got on board he could scarcely walk. Though he looked very weak, we all thought a good night's rest would do him good.

On the Monday morning he told the Quartermaster he wanted to see me before I went ashore. I went to his cabin about 6 a.m., and he told me he had had a dreadful night—up every hour and no sleep. He then gave me instructions what to do. When I returned to the ship at 8.30, I was told he was suffering from acute dysentery. I went to him after breakfast and told him the sky was cloudy and we could get no observations. He told me to dismount and pack up my instrument,

but to leave his standing till to-morrow. He gradually grew worse, and at lunch time it was considered best to dismount his instrument too, get everything packed and on board, and sail on the Tuesday morning. He agreed to this and by six o'clock everything was safe on board. But the doctor told me then that the patient was very much worse, and that if he did not improve during the night he would be in very great danger. This doctor, Dr. McSwiny, was a Catholic, brought up at Clongowes Wood College. Father Perry had so bad a night that the order to sail in the morning was cancelled, and the doctor agreed it would be best to send for the Abbé from the island, and get Father Perry the last sacraments. As I was starting for him, we saw him putting off. We told him the state of the case when he arrived, and he heard Father Perry's confession, and arranged with him to come at four o'clock and give him the last sacraments. After the Abbé had gone, Father Perry sent for me and told me what had been arranged. He was not at all upset by the serious news, but directed me quite quietly to put everything tidy in the cabin and arrange as well as I could for the Presence of the Blessed Sacrament, and to wash his hands and feet out of reverence to the holy oils. When all was tidy and arranged, he asked me to be on the look out so as to let him know when the Abbé was coming. The boat bringing him put off punctually at four, the Commandant and two nuns accompanying the priest. The nuns brought two baskets of things and we soon arranged a nice little altar in the cabin. Father Perry had his crucifix and beads in his hands, and he explained to the Abbé that the former was specially indulgenced for the hour of death. So after giving the absolution the Abbé blessed him with it. Father Perry answered all the prayers with great fervour and exactness. He received Holy Viaticum with very great devotion, and then remained for some time in silent prayer. He made his profession of faith in French, and thanked God that he was dying in the Society of Jesus. He begged pardon of all present for any faults by which he might have disedified them, and the doctor in particular for any impa-

tience during his sickness. He asked my pardon specially for any unkindness to me during the years I had worked under him, and told me to ask the community at Stonyhurst to forgive his many faults. The doctor was anxious to prevent any further excitement, and cleared the cabin. It had been arranged that the two doctors and I should share the night nursing between us, taking four hours each. Soon after the Abbé had left, the two doctors belonging to the island came on board, but they judged it better not to disturb the sick man, but only had a consultation with the two doctors of the ship. Fortunately, Dr. McSwiny could talk French fluently. The Governor of Cayenne signalled that he was very anxious to know how Father Perry was, and the nuns in the hospital were praying for him in their chapel.

Father Perry was worse again at night, and the doctors took the two first watches with him, as they did not like leaving him. I went on shore for Mass at eight in the morning, Christmas Day. It was a very quiet Christmas for all on board. There was a piano in the ward-room, but it was never touched during Father Perry's illness, and the men had to go right forward for any little amusement they could get up. Dr. McSwiny told me he was going to give Father Perry some medicine at 8 p.m., and if he could only keep it on his stomach he might get the upper hand of the attack. When I went for my watch at 4 a.m., Father Perry told me he was better, that he had passed the crisis at midnight, and that, thank God, he was now out of danger. He dozed a little, but never got a real sleep; still I had a good account for the doctor when he came to relieve me at 8 a.m. He said, "Thank God, but let us hope it is not merely a lull before the storm, as I have often known in such cases." It had been arranged overnight that if Father Perry were no worse, it would be best to sail at 9 a.m. on Thursday morning, putting the sick man in a cot, that he might not feel the rolling of the ship. Father Perry was quite satisfied with this arrangement. The Abbé and the Commandant came to see him before the ship sailed, but the doctor allowed only the Abbé to see

him. All on board were very glad to get away from the Salut Islands: four men were down with dysentery, and others were ailing slightly. So the start, and the news that had gone round the ship that Father Perry was out of danger, put every one in great spirits. I went to Father Perry when we started, and found him very comfortable. He said he did not feel the motion of the ship at all. He remained much the same all day, and we began to be very hopeful. The doctor had changed my watch, putting me from twelve to four, so I went to bed at 9.30. When I woke up I found it was six o'clock. I was very startled, and, fearing the worst, hurried off to Father Perry's cabin. He was not dead, as I had feared, but he had had a very bad night, and the doctors had not ventured to leave him; so they divided the night between them, and did not call me. When I went in at one o'clock, Father Perry was wandering a little; but he got calmer soon, and told me to get writing materials, that he might write out the telegram for Greenwich, giving the results of our work. He tried to write, but could not form the figures. He then dictated them to me, and when I had written the telegram out in ink, he was satisfied, and told me to send it off as soon as we reached Demerara.

When Dr. McSwiny came in again, he told me Father Perry was certainly getting worse, and he feared all hope was gone. I suggested we had better tell him, but he said we would watch closely for a time first and see whether there was any change. I had made a promise in the little chapel on the island that if Father Perry recovered I would ask the Rector on my return to Stonyhurst to have a service of thanksgiving; and now all my hopes were that he might live till we reached Demerara. Dr. Axford, the second doctor, came to relieve me at 10 a.m., but I resolved I would not leave Father Perry while in this very critical state. The doctor gave him some champagne, but he would not take much, saying he wished to keep his head quite clear. At one o'clock I thought I noticed a change, and I called Dr. McSwiny. He said Father Perry was dying. He was

still unwilling to tell him, but I resolved to do so, thinking it my duty. I took Father Perry's hand and asked him if he knew me. He looked at me and said, "Yes, of course." I said to him, "You are much worse to-day; the doctor gives us no hope. I fear you are dying." He turned round, very calm and self-possessed, and told me to say the prayers for the dying. I had a *Catholic's Manual* in the cabin, and I read the prayers from it. He answered them very fervently, and when they were finished he asked me to say some more. I then said the Litany for a Happy Death, and the Litany of our Lady, the Act of Consecration to the Sacred Heart, and the Stonyhurst Act of Consecration. He then asked me to say the Brothers' Act of Consecration to St. Alphonsus. A little later, at 2.15, I asked him if he would like to renew his vows. He was delighted, and said, "Yes, yes, thanks." I put the crucifix in his hands, and helped him by saying the words before him, which he repeated after me. He did this with great devotion, and when we reached the words, "ever to lead my life therein," he was much affected, and said how happy he was to die a professed member of the Society.

The doctor made an injection into his arm to try and keep him alive a little longer, as the Captain said that were he to die there he would have to bury him at sea. I prayed very earnestly to the Sacred Heart and our Lady that he might at least live long enough to be buried ashore, among our Fathers in Demerara. He kept repeating the holy names of Jesus and Mary, adding that of St. Ignatius. I may say that he repeated them hundreds of times during his sickness. After this he became very quiet and the doctor prepared to repeat the injection, but he noticed it, and said, "No; no more injections, let me die making acts of love of God." I put the crucifix in his hands again, and he asked me (it was now about 3 p.m.) to repeat the prayers for the dying. This time, too, he answered in a clear, steady voice. After the prayers he held up his crucifix, and made an offering of all his sufferings and of his life at the foot of the Cross, resigning himself entirely to the holy will of

God ; and he made his profession of faith again. I asked him if there was anything he would like me to do for him, any message he would like to send to Stonyhurst or elsewhere. He answered, "In this supreme moment one should think only of one-self." He exhorted the doctor and myself to love God with our whole hearts, saying we could not love Him as we should, but we must have a great desire to love and serve Him. He remained very quiet for some time after this, making acts of love, sometimes in English, sometimes in French. At about 3.15 he looked up and asked whether there would be any difficulty in landing his body for burial. The doctor said there would not. Father Perry replied, "You do your part now and then Brother Rooney will take charge of everything and look after the funeral arrangements." I assured him I would do so. He seemed very pleased and gave me his blessing. I replaced the crucifix in his hand and he kissed it very tenderly, as in fact he always did. At times during his illness I thought he would break it, he pressed it so hard to his lips. He put it to his lips several times and repeated the Holy Name, blessing himself with his crucifix.

At 3.35 he became unconscious. I put the crucifix to his lips several times, but he did not notice it. The doctor said he was making a hard fight, and that we could only pray and wait the end. At 4.15 the doctor said he could scarcely feel his pulse or the beat of his heart. I began the prayers for the dying again. When we had got about half-way through Father Perry turned his head on one side. I got up to raise it. He was dead. Thus he passed away in our arms at 4.20. We knelt down and said the prayers for a soul departed, and we then informed the Captain, and asked him if he would take the body to Demerara. I breathed a fervent act of thanksgiving when he said he would. We laid the body out in white vestments : he looked perfectly peaceful and quite himself. The body was carried by six marines to the bridge till the coffin was ready, in the cot in which he had died, covered with a Union Jack. At 10 p.m. the coffin was ready, and he was laid in it,

his face quite calm and white, as if he was asleep. The coffin was left on the bridge. Father Perry died about seventy miles from Demerara, lat. 6°56' N., long. 56°50' W. At 3.30 on Saturday morning we anchored two miles outside the lightship, which is itself twelve miles from Georgetown. The water being shallow the *Comus* could get no nearer. Captain Atkinson sent a boat to the lightship to inform them of Father Perry's death, which they were to signal to the shore, and warn them to make arrangements for the funeral.

Fortunately Lord Gormanston, the Governor, with Bishop Butler, had met Father Perry at Barbados, and wishing him to lecture at Georgetown had promised to send a steamer out as soon as the *Comus* was signalled. This arrangement was specially fortunate, as, owing to a mist coming on, the lightship could not signal Father Perry's death to the shore. The steamer arrived at 9.30, and came as close as it could. There were on board Lord Gormanston's private secretary and the Harbour Master, sent by the Governor to escort Father Perry. At ten the Captain ordered all hands on deck, and the same six marines who had carried the body before lowered it into the boat amid the solemn tolling of the ship's bell. Father Perry had been a great favourite, and all seemed to feel his death very much. On the evening on which he died, one of the blue-jackets came to me to say he was deputed by the other men on the lower deck to say how cut up they all were. At 10.30 we steamed to Georgetown, and the *Comus*, with her flag half-mast high, started for Barbados. On reaching land we found the Governor and Father Scoles waiting to receive Father Perry, still ignorant of the sad reality. They had not noticed the flag half-mast high, and when they saw something was wrong they still thought Father Perry was only ill. There was still some difficulty in arranging the funeral, owing to objections raised by the officer of health; but it was finally settled that the body should be taken to the Cathedral, as soon as the grave had been prepared, and after a short service there be carried at once to the cemetery. The Bishop received the body

at the Cathedral at two, accompanied by all the clergy. At 2.30 the *cortège* started. The body was carried to the hearse by six policemen, who walked by it to the grave. The hearse was followed by the Bishop's carriage, with the Bishop, Father Scoles, and myself; three other Fathers followed; then the Governor and his secretary.

Many others followed on foot, and next Mr. Chatterton and friends. The prayers at the grave were said by the Bishop, the body of Father Perry was lowered into the grave at 4 p.m. Thus did the good religious and great astronomer meet his end, devoting himself to the last to the work which he had taken up as the best way for him to work for God's greater glory.

We make no apology for the length of quotations, for though our readers may have perused some of these details already, we are sure that they will not be sorry to re-read them. To omit the story of his death would have been impossible in the sketch of a life that ended so gloriously. The lesson to be learnt is obvious. As Father Bernard Vaughan has so well said in his panegyric of Father Perry preached at the Church of the Holy Name, Manchester, on February 16, 1890: "The death-bed scene of that humble, simple-hearted Jesuit, in command of a Government expedition undertaken in the interests of science, is a scene from which men might learn that faith and science were not yet divorced, and in which they might see that as the telescope brings within the field of view the unseen glory of the skies, so faith brought within the spiritual ken of the Jesuit astronomer the unseen glory of Heaven. In the nineteenth century, a Jesuit priest laid out in sacred vestments, covered with

the English flag, on the bridge of an English frigate, and mourned by English blue-jackets, who in losing the priest felt they had lost a true friend, who did not therein read a sign of the times in which they lived?"

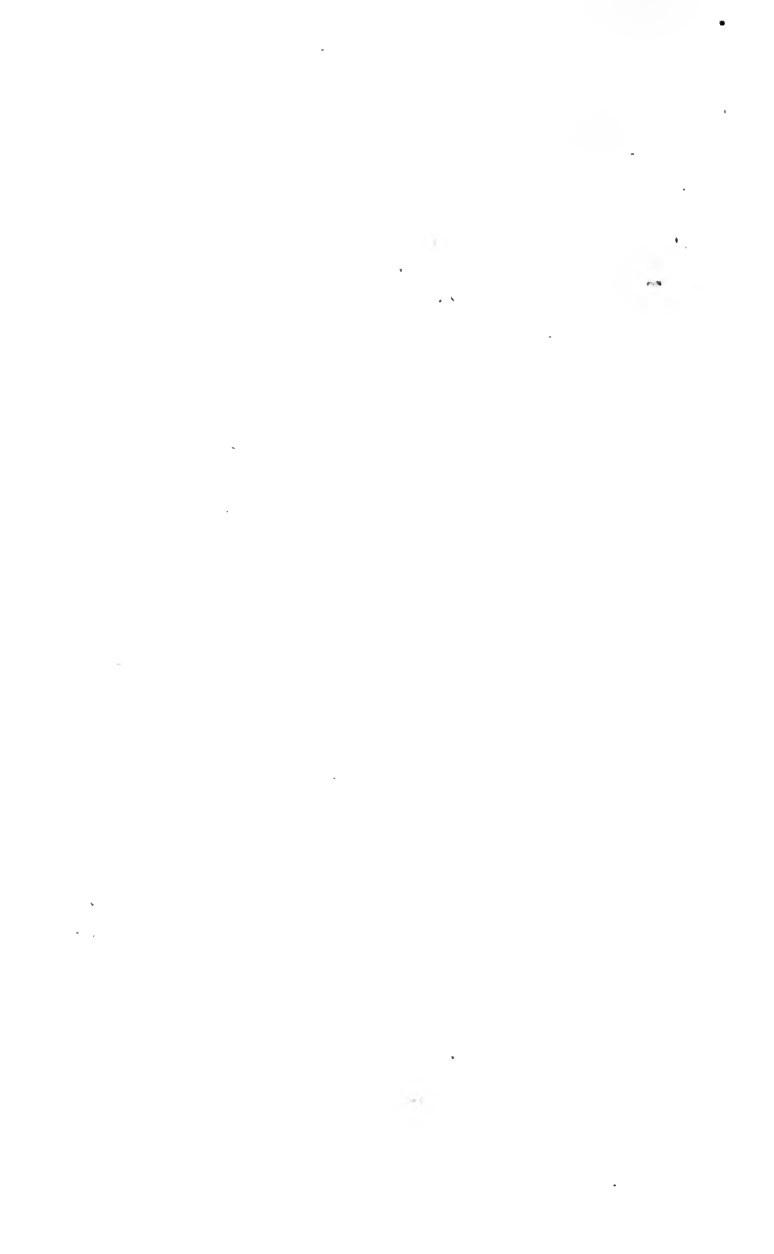
Although it has been denied to Father Perry that his remains should rest beneath the shadow of the walls of that College which in life he loved so dearly, yet never will the fragrance of his memory pass therefrom, for his name is held in benediction, because of the bright example of holy living and holy dying which he has set before its inmates. The Solemn Dirge and Requiem for the repose of his soul was sung on February 1, 1890, and the lessons to be learnt from the holy life of their late Father and friend were set before the boys in a manner calculated to move their hearts by the preacher of the panegyric, Father Charnley.

With regard to Father Perry's honours, he was, in 1874, elected a Fellow of the Royal Society, and shortly before his last expedition was placed on its Council. He was a Fellow (April 9, 1869,) and Member of the Council of the Royal Astronomical Society, and in December last had been proposed by the Council as a Vice-President for the ensuing year. He also at the time of his death held the post of President of the Liverpool Astronomical Society. He was a Fellow of the Royal Meteorological Society, and a member of the Physical Society of London. With regard to foreign societies, he was an associate of the Pope's academy of the Nuovo

Lincei, the oldest established scientific society in Europe, and one which has reckoned the immortal Galileo among its members, as also of the Société Scientifique of Brussels, and the Société Géographique of Antwerp. In 1886 he received the honorary degree of D.Sc. from the Royal University of Ireland. For several years preceding his death he served on the Committee of Solar Physics appointed by the Lords of the Committee of Council on Education, as also on the Committee for Comparing and Reducing Magnetic Observations, appointed by the British Association for the Advancement of Science, of which body he was a life-member, and a frequent attendant at their yearly meetings. He also attended at Paris, in 1887 and in 1889, the meetings of the Astrophotographic Congress, for the photographic chart of the heavens. From the *Monthly Notices of the Royal Astronomical Society* (vol. 50, n. 4) we extract the following resolution of the Council, which was passed unanimously, at their meeting of January 10, 1890, and recorded in their minutes: "The Council, having heard with the deepest regret of the death of the Rev. S. J. Perry while on the Society's expedition to observe the Total Eclipse at the Salut Isles, desire to put on record their sense of the great loss which astronomy has suffered by the death of so enthusiastic and capable an observer, and to offer to his relations and to his colleagues at Stonyhurst the expression of their sincere sympathy and condolence on this sad event."

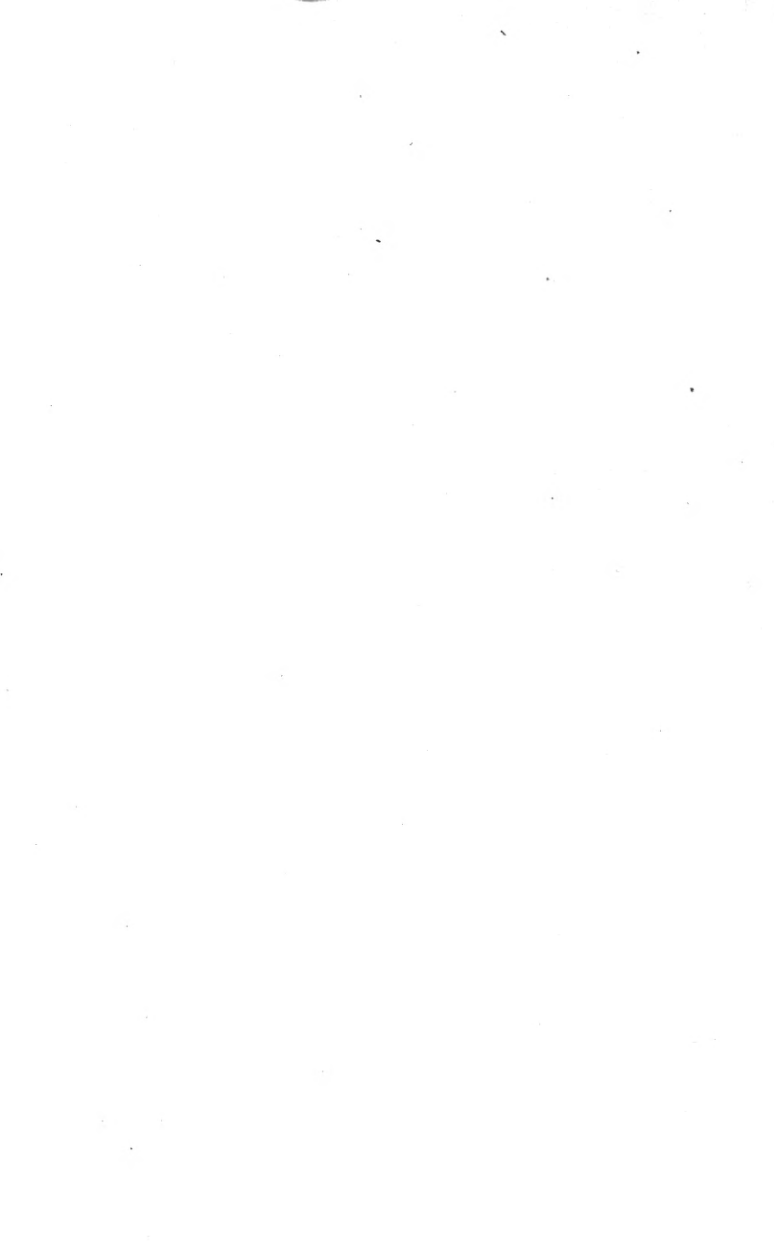
Such were the honours which were bestowed upon him on earth. But having fought the good fight for the greater glory of God, having lived a holy life and died a holy death, may we not confidently hope that there may soon be verified in him the words of the Prophet Daniel: "They that are learned shall shine as the brightness of the firmament, and they that have instructed many unto justice as the stars to all eternity."

THE END.



APPENDIX.

- I. LIST OF FATHER PERRY'S SCIENTIFIC PAPERS.
- II. NOTES ON FATHER PERRY'S OBSERVATIONS
ON "FACULÆ" AND "VEILED SPOTS."
- III. SONNET—"TRUE SCIENCE."



I.—LIST OF FATHER PERRY'S SCIENTIFIC PAPERS.

I.—METEOROLOGY AND MAGNETISM.

1. Stonyhurst College Observatory. Results of Meteorological and Magnetic observations ; twenty-eight volumes, 1860—88. Edited by Father Walter Sidgreaves during the years 1863—68. The Results of Meteorological observations taken at St. Ignatius' College, Malta, by Father James Scoles, have appeared as an Appendix in the vols. 1883—88.

During the last few years this Annual Report has also contained a table showing the dates on which solar drawings, observations of the chromosphere, and of spot-spectra have been taken.

The magnetic portion contains the absolute values of the elements of terrestrial magnetism for every month, and a discussion of all magnetic disturbances.

In the Reports for 1883—88, a full description is given of the "upper-glows" which surrounded the sun consequent on the Krakatoa eruption, and a list of all the dates on which the phenomenon was observed.

In the Reports for 1882—83, a connection is traced between sun spots and auroræ.

From time to time summaries of the principal meteorological and magnetic data collected during a course of years have appeared as Appendices to the Report. Such are :

i. Secular variation of the meteorological elements, containing a Table of the yearly values of the meteorological elements extending over a quarter of a century; 1848—72. In this Table the two principal maxima of the adopted mean temperature occur in the years 1857 and 1868. Attention is likewise called to the fact that in each case the minimum of solar activity occurred just one year previously, viz., in 1856 and in 1867.

ii. A Table showing the hours of maxima and minima temperatures during the period of eight years, from 1868 to 1875.

iii. A similar Table of hours of maxima and minima atmospheric pressures for the same period.

iv. A Table of Rainfall for thirty years.

v. General Tables, exhibiting the direction and velocity of the Wind, with diagrams, for the period of sixteen years from 1868 to 1883.

vi. Daily Range of the Magnetic Declination, and of the horizontal component of the earth's magnetic intensity from 1868 to 1879; illustrated by curves.

The Reports also contain descriptions of all Auroræ and Earthquakes observed at Stonyhurst since 1860.

2. Magnetic Survey of the West of France. Proc. R.S. vol. 17, 1869; Phil. Trans. R.S. vol. 160, 1870.

3. Magnetic Survey of the East of France. (Perry and Sidgreaves.) Phil. Trans. R.S. vol. 162, 1872; Proc. R.S. vol. 22, 1872.

4. Magnetic Survey of Belgium, 1871. Phil. Trans. R.S. vol. 163, 1873; Proc. R.S. vol. 21, 1873; *Nature*, vol. 7, 1873.

5. Results of seven years' observations of the dip and horizontal force, at Stonyhurst College Observatory, from April, 1863, to March, 1870. Phil. Trans. R.S. vol. 161, 1871; Proc. R.S. vol. 19, 1871; Phil. Mag. vol. 42, 1871.

6. Note on a simultaneous disturbance of the Barometer and of the Magnetic Needle. Proc. R.S. vol. 25, 1877.

7. Magnetic observations made at Stonyhurst College Observatory from April, 1870, to March, 1876. Proc. R.S. vol. 25, 1877.

8. Magnetic observations taken during the Transit of Venus Expedition to and from Kerguelen Island. Proc. R.S. 1878, vol. 27.

9. Du Magnétisme Terrestre, Anvers, Congrès Scient. Géogr. vol. 2, 1872.

10. Tableau des Eléments Magnétiques de certaines villes de France pour l'année 1869. Journal de Physique, vol. 2, 1873.

11. Terrestrial Magnetism. *Nature*, vol. 7, 1873; Journal of the Liverpool Polytechnic Society.

12. Magnetic storm of October 14—18, 1872. *Nature*, vol. 6, 1872.

13. Magnetic Observations at Kerguelen. Proc. R.S. vol. 26, 1878.

14. Report of the Meteorology of Kerguelen

Island, published by the authority of the Meteorological Council. London, 1879. Association Française pour l'avancement des sciences, 1880.

15. Preliminary results of a comparison of certain simultaneous fluctuations of the Declination at Kew and at Stonyhurst during the years 1883 and 1884. (Perry and Balfour Stewart.) Proc. R.S. vol. 39, 1886. *Nature*, vol. 33, 1886.

16. The following is a list of Father Perry's Articles and Letters in *Nature*, on Terrestrial Magnetism: On Terrestrial Magnetism, vol. 2, 1870. Magnetic Disturbances during the late Total Eclipse, vol. 5, 1872. History of Magnetism, vol. 14, 1876. Magnetic Observations in China, *ibid.* Magnetic Storm of May 14, 1878, vol. 18, 1878. Magnetic Storm of May 14—15, 1879, vol. 19, 1879. Comparative Curves in Terrestrial Magnetism, vol. 22, 1880. Aurora Borealis and Magnetic Storms, *ibid.*

17. Father Perry was also a member of the British Association Committee for comparing and reducing Magnetic Observations. Reports of Brit. Assoc., 1885, 1886, 1887, 1888.

18. Letters on Meteorology to *Nature*. Lowest Temperature, vol. 15, 1877. Low Temperature, vol. 23, 1881. Extraordinary Darkness at Midday, vol. 30, 1884. Black Rain, *ibid.*, and vol. 34, 1886.

II.—ASTRONOMY.

I. *Transit of Venus.*

Manila photographs of the Transit of Venus. Monthly Notices, R.A.S. vol. 36, 1876. *Astronom. Register*, vol. 14, 1877.

On the phenomena exhibited by a planet in its transit across the solar disc, from observations made by M. Ch. André. Monthly Notices, R.A.S. vol. 37, 1877. *Astronom. Register*, vol. 15, 1878.

Some experiments bearing on the Transit of Venus. Monthly Notices, R.A.S. vol. 37, 1877. *Astronom. Register*, vol. 20, 1883.

Le Passage de Vénus, 8 Décembre, 1874, observé à Kerguelen. Annales de la Soc. Scient. de Bruxelles, vol. i. 1877.

Sur le prochain passage de Vénus (1882). Annales de la Soc. Scient. de Bruxelles, vol. vi. 1882.

The Government Expedition to Madagascar to observe the Transit of Venus, on December 6, 1882. *Copernicus*, vol. iii. 1884.

On the Transit of Venus. Royal Institution of Great Britain. February 25, 1876.

Transit of Venus, December 8, 1874. Report of Brit. Assoc. 1875. *Nature*, vol. 12, 1875.

On the Methods employed and the Results obtained in the late Transit of Venus Expedition. Free evening lectures. South Kensington Museum, 1876.

Father Perry's observations of the Transits of

Venus of 1874₁ and 1882 are to be found in the official volumes, viz., Observations of the Transit of Venus made at Kerguelen Island in 1874, pp. 405, seq. in Account of Observations of the Transit of Venus 1874, December 8, made under the authority of the British Government, Edited by Sir George Airy. And Observations of the Transit of Venus made at Madagascar in 1882, pp. 9, seq. in Report of the Committee appointed by the British Government to superintend the arrangements to be made for the sending of Expeditions at the Government expense, and securing co-operation with the Government Expeditions for the Observation of the Transit of Venus, 1882, December 6.

2. *Eclipses of the Sun.*

Eclipse of December 22, 1870, observed at San Antonio. Monthly Notices, R.A.S. vol. 31, 1871. Two papers, pp. 62, 149. *Astronom. Register*, vol. 9, 1872.

Eclipse of May 16, 1882. Monthly Notices, R.A.S. vol. 42, 1882.

Report of the observations of the Total Solar Eclipse of August 29, 1886, made at the Island of Carriacou. Phil. Trans. R.S. vol. 180, A. 1889. Proc. R.S. vol. 42, 1887. *Astronom. Register*, vol. 24, 1886.

Eclipse of August 19, 1887, observed at Pogost, near Kineshma. Monthly Notices, R.A.S. vol. 48, 1888. (Copeland and Perry.)

Partial Solar Eclipse of May 25, 1873. Monthly Notices, R.A.S. vol. 33, 1873.

3. *Eclipses of the Moon.*

Eclipse of February 27, 1887. Monthly Notices, R.A.S. vol. 37, 1877.

Eclipse of October 4, 1884. Monthly Notices, R.A.S. vol. 45, 1885.

Eclipse of January 28, 1888. *The Observatory*, vol. xi. 1888. Monthly Notices, R.A.S. vol. 48, 1888.

4. *Phenomena of Jupiter's satellites, occultations of stars by the moon, comets, meteors, &c.*

Occultations of Stars by the Moon, and observations of Jupiter's Satellites made at the Stonyhurst Observatory. Monthly Notices, R.A.S. vols. 33, 1873; 34, 1874; 38, 1878; 39, 1879; 40, 1880; 41, 1881; 42, 1882; 43, 1883; 44, 1884; 45, 1885; 46, 1886; 48, 1888; 49, 1889.

Occultation of C¹ Capricorni. *Astronom. Register*, vol. 21, 1884.

Observations of Winnecke's Comets. Monthly Notices, R.A.S. vols. 29, 1869; 30, 1870; 31, 1871. *Astronom. Register*, vols. 8, 1870; 9, 1872.

Observations of Coggia's Comet. Monthly Notices, R.A.S. vol. 31, 1871.

The Comet. *Nature*, vol. 24, 1881.

Observations of Comet b, 1881. Monthly Notices, R.A.S. vol. 42, 1882.

The November Meteors. Proc. Brit. Meteor. Soc. vol. 5, 1869. *Nature*, vols. 3, 1870; 7, 1873; 21, 1880. Monthly Notices, R.A.S. vols. 33, 1873; 34, 1874; 36, 1876; 40, 1880. *Astronom. Register*, vols. 11, 1874; 14, 1877.

Meteor Shower connected with Biela's Comet. Monthly Notices, R.A.S. vol. 36, 1876.

Meteors and Fireballs. *Nature*, vols. 22, 1880; 23, 1881; 25, 1882; 26, 1882; 28, 1883.

The planet Vulcan. Monthly Notices, R.A.S. vol. 37, 1877.

The new star in Andromeda. Monthly Notices, R.A.S. vol. 46, 1886. *Astronom. Register*, vol. 23, 1885.

5. *Instruments, &c.*

A self-recording transit micrometer; Monthly Notices, R.A.S. vol. 33, 1873.

On some diffraction experiments of M. Ch. André, with reference to astronomical instruments. Monthly Notices, R.A.S. vol. 37, 1877. *Astronom. Register*, vol. 15, 1878.

The illumination of micrometers. Monthly Notices, R.A.S. vol. 44, 1884. *Astronom. Register*, vol. 22, 1884.

L'Observatoire de Stonyhurst. *Annales de la Soc. Scient. de Bruxelles*, vol. iv.

The Instruments of 1889 for Celestial Photography. The British Journal Photographic Almanac, 1890.

6. *Solar Physics.*

Observations on the Chromosphere and Solar Prominences since 1880. An annual table giving a summary of these observations was published at first in *Copernicus*, vols. i.—iii. 1881, 1882, 1884,

and since 1884, in the *Observatory*, vols. viii.—xii. 1885—1889.

The Chromosphere. *Nature*, vol. 3, 1871.

Observations of the Chromosphere from 1880 to 1888. The *Observatory*, vol. 12, 1889.

Note on the Chromosphere. Monthly Notices, R.A.S. vol. 43, 1883. *Astronom. Register*, vol. 21, 1884.

Phenomena observed upon the Solar Surface from 1881 to 1884 at Stonyhurst Observatory (a paper read before the American Association at Philadelphia). *Astronom. Register*, 1884. Proc. Amer. Assoc. vol. 33, 1885.

The Solar Surface in 1885. *Astronom. Register*, 1886.

On the birth and development of Sun Spots, and the measurement of Solar Areas. Proceedings of the Liverpool Astron. Soc. Session, 1883—1884.

The Solar Surface during the last ten years. Royal Institution of Great Britain, May, 24, 1889.

Notes on the Solar Surface of 1887. Monthly Notices, R.A.S. vol. 48, 1888.

Note on Solar Spots in high South latitudes. Monthly Notices, R.A.S. vol. 50, 1890.

Photographs and Drawings of the Sun (with plates). Memoirs R.A.S. vol. 49, part i.

Observations of Sun Spots. *Astronom. Reg.* vol. 22, 1884; the *Observatory*, vol. 7, 1884.

Sun Spot. *Astronom. Reg.* vol. 21, 1884.

Articles and Letters on Sun Spots in *Nature*. The Solar Outburst of July 25, 1881, vol. 24, 1881. Sun Spots, vol. 25, 1882. Sun Spots in Earnest,

vol. 20, 1879. The Sun Spot Cycle, vol. 39, 1889. The Surface of the Sun in 1888. Monthly Notices, R.A.S. vol. 49, 1889.

Observations of Sun Spot Spectra in 1883. Monthly Notices, R.A.S. vol. 44, 1884.

Comparison of the Spectrum, between C and D, of a Sun Spot, observed May 27, 1884, with another of May 7, 1889. (Perry and Cortie.) Monthly Notices, R.A.S. vol. 49, 1889.

On the Spectrum of Sun Spots, from B to D. British Association Report, 1884.

President's Address to the Liverpool Astronomical Society, at the Royal Institution, Liverpool, Oct. 14, 1889. The Journal of the Liverpool Astronomical Society, vol. 8.

III.—MISCELLANEOUS.

On the Island of Nos Vey, Madagascar. British Association Report, 1883.

Total Solar Eclipse of December 22, 1870. *The Month*, April, 1871.

The approaching Transit of Venus. *The Month*, March, 1873.

Preparations for the coming Transit of Venus. *The Month*, November, 1874.

Notes on a Voyage to Kerguelen Island to observe the Transit of Venus, December 8, 1874. *The Month*, November, December, 1875, January, February, 1876. These four magazine articles were afterwards reprinted and published in pamphlet form.

Celestial Photography. *The Month*, December, 1885.

Total Solar Eclipse of August 29, 1886. *The Month*, December, 1886.

Stonyhurst Climate. *Stonyhurst Magazine*, vol. 3, July, 1887.

The following Articles appeared in the *British Journal of Photography*: The Observatory at Stonyhurst College, vol. 30, 1883. Photography in the Meteorological Observatory, vol. 31, 1884. Astronomical Photography, vol. 32, 1885. The Photographic Solar Spectrum, vol. 35, 1888. Further Progress in Spectroscopic Photography, vol. 36, 1889.

There appeared in the *British Journal Photographic Almanac*: Photography and Astronomy, 1886. Celestial Photography, 1887. Photographic Astronomy in 1887, 1888. Celestial Photography in 1888, 1889.

Miscellanea in *Nature*: The Cyclone of December 17, 1869, vol. 1, 1870. The Earthquake of March 17, 1871, vol. 3, 1871. Aurora Borealis of November 9—10, 1871, vol. 5, 1872. Aurora Borealis of February 4, 1872, vol. 5, 1872. The Aurora and Electric Storm of January 31, 1881, vol. 23, 1881. Earth Currents, vol. 25, 1882. The Earthquake, vol. 35, 1887.

The Transit of Venus Expedition to the Southwest of Madagascar, *Stonyhurst Magazine*, May, 1881, July, 1884.

Lecture on the Transit of Venus. Transactions of the Burnley Literary and Scientific Club, 1886.

II.—NOTES ON FATHER PERRY'S OBSERVATIONS ON "FACULÆ" AND "VEILED SPOTS."

We have already, in the latter part of the third chapter, given a short account of the work in the domain of solar physics undertaken by Father Perry at Stonyhurst. There are, however, two points in which Father Perry's deductions from the drawings are most original, and which deserve a somewhat more detailed notice. We have reserved such notice to the Appendix, in order not to burden the narrative with details of observation which have an interest rather for the astronomer than for the general reader. Nevertheless, we shall endeavour to make our remarks as untechnical as the nature of the subject admits. The two points to which we would wish to draw notice regard the relation of faculæ to sun spots, and the observations of Father Perry on those evanescent markings on the solar surface called "veiled spots." And first with regard to *faculæ*. This generic name is attached to some objects on the sun of a greater brilliancy than the surrounding surface, and which generally present the appearance of long, white streaks of matter. They are most easily observed in the neighbourhood of the edges of the sun, owing to the contrast

which they offer to those apparently darker portions of the disc. They are not, however, confined to the limbs, as under favourable circumstances they can be traced far into the central regions, and a ring of bright faculæ always surrounds the *penumbra* of a spot, even at the centre of the sun. In passing we may remark, that every statement we make in this connection, is supported by evidence drawn from the Stonyhurst drawings. The dark spots of the solar surface are invariably accompanied by faculæ, and so far as the Stonyhurst observations have been studied by Father Perry, it would appear that their distribution is in the main identical with that of the spots, though extending to much wider limits N. and S., owing to their peculiar tendency to spread. Faculæ have, however, been frequently seen even near the sun's poles, especially as we have approached nearer the minimum of the cycle, but there would seem to be some difference between the nature of these isolated jets and the streaks of the ordinary kind.

So far, then, we have the facts that faculæ always accompany sun spots, and that the distribution of the two phenomena, if we except the outstanding examples last mentioned, is in general the same. The question, however, still remains as to whether the faculæ precede the sun spots in the order of their appearance, or whether the sun spots precede the faculæ. It used to be held that the faculæ were the forerunners of the advent of a sun spot, but the long series of Stonyhurst drawings show exactly the contrary to be the case, and there

is not a single instance recorded in which faculæ were the first evidence of a coming disturbance. The general order of the phenomena in the appearance of a spot is as follows. A few small dots first appear, which rapidly increase in size and form a spot. Around this nascent spot the faculæ cluster in a relatively very small space. The spot increases in size, and the faculæ begin to spread in all directions. Then comes a period in the life of the spot when it attains a more or less regular outline, and when the disturbing forces seem to have given place to a period of quiet. Then the spot begins to diminish and decay, and the faculæ at this stage spread over greater areas of the solar surface, and oftentimes remain visible for more than a month after the parent spot has wholly vanished. Oftentimes it happens that a new outburst of spots will take place in the region of this faculæ, thereby giving rise to the notion that faculæ precede the birth of spots, while in reality they are only the remains of former spots which have disappeared. Faculæ are therefore but the glowing embers of an old solar storm, not the first flickerings of a new one. Nor would it further appear that the view that faculæ always lag behind a sun spot receives any confirmation from the Stonyhurst drawings.

On days when our atmosphere is very steady, and clear of all mist or dust, or to speak technically, should the "definition" be very good, it is observed that the mottled surface of the solar disc is in a state of constant change and turmoil.

These changes are very minute and rapid, and require a most constant and patient watch to detect them. The magnificent photographs of M. Janssen, of Meudon, had shown that in parts the mottled surface puts on an appearance of blurring, and M. Trouvelot, in 1875, called attention to minute evanescent spots, which he termed *veiled spots*.¹ He, however, did not follow out the subject to any great extent. These veiled spots were independently discovered at Stonyhurst in 1881, and have been, and are being persistently watched on every possible occasion. Trouvelot's main conclusion was, "that the veiled spots are scattered through all latitudes, though more complicated in the regions where the ordinary spots make their appearance." The truth is that they must be divided into two main classes, differing in tint, in mode of behaviour, in duration, and in their distribution in latitude. To one class, which seems to most closely answer M. Trouvelot's description, Father Perry has given the name of *sub-permanent spots*. When first detected all the veiled spots are very much alike, "resembling small fragments of ill-defined penumbra, but their position on the disk, and still more their duration, soon enables the observer to distinguish the class to which they belong."² In colour they are of a cold grey tint,

¹ "On the veiled Sun Spots." (*Proc. Amer. Acad.* October 12, 1875.) See also "Sur la structure intime de l'enveloppe solaire." (*Bull. Astron.* June, July, August, 1885.)

² The quotations are taken from Father Perry's Royal Institution lecture, May, 1889.

and besides are never well defined. To treat first of the sub-permanent spots. These "are confined exclusively to the spot-zones on either side of the equator, and may remain on the disk for two or more days. Sub-permanent spots are not always to be found on the surface of the sun, their tint is a shade less dull than that of the other veiled spots, and occasionally there is almost the appearance of an umbra in their midst, though this rarely could be mistaken for a true umbra. For even when their shading is in some parts more intense than in others, the whole remains always ill-defined, and the limits of its several parts are hard to distinguish. Frequently these dim objects show themselves in considerable numbers in the neighbourhood of fully developed spots, but then the latter are generally approaching their time of dissolution. They may, perhaps, aptly be described as imperfectly developed, or penumbral spots, and consequently be included in the ordinary spotted area." The other class of "veiled spots," however, differ a good deal in their behaviour from those just described. They are found in all parts of the solar surface, and are distinguished by the shortness of their duration, never remaining visible for more than two or three minutes. They are, moreover, as frequent at the epoch of spot minimum as at the maximum. Some are seen as a slight cloud, which rapidly changes its outlines, becomes fainter, and disappears. Others again present at first the appearance of a round black dot, which becomes diffused into a cloud-like mass, and very soon

vanishes. "The most striking characteristic of this class of spots is the rapidity with which they invariably disappear; but although no individual spot ever lasts more than about three minutes, the first seen may be joined in quick succession by a multitude of others similar to itself, and thus transform vast areas, and give to portions of the solar surface that blurred appearance which is so marked a feature in Janssen's magnificent sun-pictures." This last remark, quoted from Father Perry's lecture before the Royal Institution, is most important, as indicating the probable genesis of the blurred patches, first discovered by the illustrious French spectroscopist. To proceed with our quotation: "The general distribution of these faint objects, their evanescent character, and their ill-defined appearance, seem to connect them more immediately than any other feature of the solar surface with the vertical convection currents which form so important a part of the sun's internal economy. An exceptional observation of the formation of veiled spots may be of interest, as showing the strange phenomena we may occasionally witness by a lengthened examination of the solar image. At 10h. 15m. one morning, a group of spots was visible on the sun, and presented no special feature; less than half an hour later the leader of the group had apparently shot out a number of minute bodies, and then five minutes sufficed for all these to be transformed into veiled spots, which disappeared as rapidly as usual."

Finally, it may be well to mention another class of small bodies which have been seen on some twenty occasions projected on the solar disc. These are moving bodies, having a diameter varying from 7" to 12". They generally start from the neighbourhood of a spot, and move rather slowly in a zig-zag path, at times appearing to halt in their course. With one or two exceptions, they have all both appeared and disappeared within the solar limb. Nor do they fade away gradually, but vanish quite suddenly. The similarity both in form and mode of motion of all these minute bodies would on the one hand seem to stamp them as of solar origin, but on the other the huge velocities involved would almost compel the acceptance of any other plausible explanation. If really solar in origin, the only analogous observation is the well-known one of September 1, 1859, made by Carrington and Hodgson, although in this case the moving clouds were bright and not dark. "But there would be little use in dwelling upon even well-established cases of this nature, as they all probably find their explanation in the passage of bodies between the sun and the observer, and promise very little additional light for an inquiry into the nature of the solar photosphere." Nevertheless, in the spirit of the motto of the Royal Astronomical Society, *Quidquid nitet notandum*, such observations are at least worthy of record.

III.—TRUE SCIENCE.

“Lo ! one,” saith Christ, “who took Me for his guide,
Walked by My light, clung to My wounded hand,
Knowing one only fear, lest in the land
Of death and sin, through weakness or through pride,
He should be severed from his Saviour’s side ;
For he was numbered of that chosen band
Who lead their fellows, and in knowledge stand,
Like Saul among his warriors, glorified.
A Saul in stature, but a child in heart,
Nor proud, nor jealous, nor presumptuous he.
Whate’er he learnt from heaven’s luminous chart,
Yon flame-wreathed orb, yon starred immensity,
Made him more loyal and more dear to Me.
God was his science, God’s love all his art.”

(From the *Demerara Catholic Calendar*, Jan., 1890.)

