appointments of Engineer of the Admiralty Works at that station and Aide-de-Camp to the Governor.

In 1881 he drew up a design for a Physical Observatory for Hong Kong, to comprehend Astronomical, Magnetical, Meteorological and Tidal observations. This project and the report accompanying it * were referred to the Kew Committee of the Royal Society, who recommended their adoption without the alteration of a single item; and Major Palmer received the official thanks of the Secretary of State for the Colonies. Though the scheme was afterwards somewhat cut down by the Colonial Office, on the grounds of economy, the present Observatory, as far as it goes, is in conformity with his project—on which competent authorities have since pronounced in terms of the highest approval, insisting that it deserves to rank as a standard guide for constructing observatories of that class in the Colonies or elsewhere.

In 1882 Colonel Palmer was invited to conduct a second time an expedition for observing the transit of *Venus* (1882 December 6), at New Zealand, but declined the offer, having other aims in view. In the same year he made an exact determination of the latitude of the proposed Hong Kong Observatory Station (on Mount Elgin, Kaûlung), with observatory instruments lent for the purpose from the U.S. surveying-vessel *Palos*.

From 1883 onwards, Colonel Palmer did much engineering work in Yokohama. He designed and carried out extensive water works and harbour works; and his services to the Japanese Government were recognised by the third-class decoration of the Order of the Rising Sun from the Emperor of Japan in 1887. His graphic and interesting letters from "Our own Correspondent in Japan," which appeared in the columns of the *Times*, gave much valuable information about that country. In 1887 he retired from the Corps of Royal Engineers with the honorary rank of Major-General.

He had married in 1863 the eldest daughter of the Ven. Archdeacon Wright.

He was elected a Fellow on 1874 January 9, and in 1876 contributed to the Society a paper concerning the methods of the U.S. Coast Survey (*Monthly Notices*, vol. xxxvi. p. 300).

He died at Tokio on 1893 March 10.

Charles Pritchard was born at Alberbury, Shropshire, on 1808 February 29, being the fourth son of Mr. William Pritchard. After a few years at a private school at Uxbridge, he was admitted to Merchant Taylors' School in 1819 January, his attendance as a day-boy involving a long walk of four miles, in all weathers, before commencing work at 7 A.M.—a severe experience for a boy of 11. After a year and a half, he was removed to a school at Poplar, where the foundation of his

* See *Hong Kong Blue-books*, 1881.

scientific, and especially of his astronomical, training was laid; for a number of instruments and models made and used by the astronomer Ferguson, including some antiquated telescopes and quadrants, were put into the hands of the senior pupils for their instruction. He has himself recorded the fact that "very many of us could use the theodolite, and could survey and plot an estate. Our practice-ground was mainly in the Isle of Dogs, at that time an all but unoccupied waste; and I well remember how, at the age of less than sixteen, I earned two guineas for indoctrinating an intending colonist in the art of field-surveying."

His last school was Christ's Hospital, and he used to recall with satisfaction that for a twelvemonth he was placed at the head of the Deputy Grecians. Pecuniary difficulties at home compelled him, however, to leave, and he began to read for entrance to the University under particularly unfavourable circumstances; but by dogged perseverance on his own part, and with the assistance of friends and relatives, he entered St. John's College, Cambridge, in 1826. Here he worked well and successfully under Charles Jeffreys, who was Second Wrangler in Airy's year, 1823; and in 1830 graduated as Fourth Wrangler. He spent a couple of years in reading for his Fellowship, for which a knowledge of classics was then necessary, taking pupils at the same time, and was elected Fellow in 1832 March. He remained at the University a short time as a tutor, but being offered the headmastership of a school at Stockwell, formed under the auspices of King's College, London, he decided to leave Cambridge for the busier life near London. The school flourished under his guidance; but unfortunate differences with the governing body, which became more troublesome as time went on, caused him to resign the appointment, and he thought of returning to the University. But his talents had so far been appreciated by the parents of his scholars that they proposed to establish a new school over which he might preside with a freer hand; and the famous Clapham Grammar School was therefore founded in 1834. For nearly thirty years he here laboured successfully. His practical views of a liberal education have been well and fully described by one of his old pupils, Dr. Bradley, Dean of Westminster, in the *Nineteenth Century* for 1884 March. Five-and-twenty years after he had left the school, his old pupils gave a dinner in his honour, at which the roll was called over in the old style; and men bearing names honoured by the world—such as those of Airy, Darwin, Herschel, Hemming, Mivart, Pritchard—stood up in their places to let their old schoolfellows see and know them again in the flesh, and answered "Here, sir!" as in their schooldays. An outcome of the meeting was the publication of a short autobiography by Professor Pritchard.

His life at Clapham was brought rather suddenly to a close in 1862, when he transferred all his interests in the school, including a small observatory which he had built there, to Dr.

Alfred Wrigley, and retired to Freshwater, Isle of Wight. He was very anxious for pastoral work, but was disappointed in his endeavours to obtain it—a reverse which he felt very keenly. In the pulpit he was very successful, especially on occasions which gave him an opportunity of using his scientific knowledge in the interests of religion. He was invited to preach before the British Association at Nottingham in 1866, and this particular sermon had at least three important results: he was in 1867 appointed Hulsean Lecturer at Cambridge; his line of argument suggested to Vice-Chancellor Sir W. Page Wood a treatise on the "Continuity of the Holy Scriptures;" and the preacher was again and again invited to address the Association at its meetings—as in 1867 at Dundee, in 1868 at Norwich, and so on; so that he came to be called the "Chaplain to the British Association."

We now approach Professor Pritchard's definitely astronomical career. Apart from this, he was already a man of undoubted eminence in the educational world. But space cannot be spared in this Notice for more than the above brief notes of his scholastic and clerical life. He had been elected a Fellow of this Society in 1849, and contributed three small but interesting papers while still at Clapham—the first being on the "Amalgamation of the Mercury Trough;" the second (published in the *Memoirs*) a correction to Ideler's "Calculations of the Three Conjunctions of *Jupiter* and *Saturn* in B.C. 7" (which were conjectured to explain the phenomenon known as the Star of Bethlehem); and the third on "Some Photometric Experiments during the Annular Solar Eclipse of 1858." He also went with the Himalayan Expedition to Spain to observe the total solar eclipse of 1860. He was elected on the Council of the Society in 1856, Secretary in 1862, and President in 1866. During his seven or eight years' stay at Freshwater, he was thus taking a particularly active share in the affairs of the Society, in spite of the long journey to London. He built a small private observatory at Freshwater; but his contributions to the publications of the Society do not include any observations made by him there, being chiefly of the nature of comments and criticisms upon current astronomical work. His presidential addresses were delivered on presenting the Medal to Mr. (now Dr.) Huggins and Dr. Miller for their researches in Astronomical Physics, and to M. Le Verrier for his Solar and Planetary Tables.

On the death of Professor Donkin in 1869 November, Mr. Pritchard was elected to succeed him as Savilian Professor of Astronomy in the University of Oxford; and from that time to his death his astronomical life was a model of untiring zeal and energy. When he was appointed, his only appliances for teaching astronomy practically were a few small instruments which his predecessor had purchased privately, mounted behind the University Museum. Professor Pritchard applied to Convocation for an observatory worthy of the University, and his request

was granted in 1873 by the vote of a sum of 2,500*l.* for the purchase of a 12¼-inch refractor and a suitable building in the University Parks. This grant was supplemented almost immediately by the generosity of the late Dr. Warren de la Rue, who presented to the University his own instruments, which had been erected at Cranford, including a 13-inch reflector, mounted equatorially, and a 13-inch reflector, mounted as an altazimuth. The Grubb 12¼-inch refractor and the equatorial reflector were mounted under two domes, and the altazimuth in the building connecting them, computing rooms, &c., occupying the lower portions of the towers for the domes. Some years later a library and a fine lecture-room were added. The domes are truncated in form, as a concession to architectural effect, for the observatory occupies a conspicuous position in the Parks.

It is interesting to note that Professor Pritchard originally described the observatory as the "New Savilian Observatory for Astronomical Physics at Oxford." * It was the outcome of a representation to the University of the importance of the Savilian Professor "being furnished with instrumental means adequate to the instruction of his class, and for the purposes of original research."

No work in Astronomical Physics done at the observatory has yet been published; but there can be no question as to the success of the Director in using his opportunities for original research. He was particularly happy in selecting problems suited to the capacity of an academic observatory; and in solving each of them in turn. Three of minor and two of major importance he lived to see completed to a definite stage; the three are, "Measures of Photographs of the Moon;" "Work on Double Stars;" "Measurements of the *Pleiades*;" and the two, "Wedge Photometry," and "Photographic Stellar Parallaxes." He lived also long enough to initiate the work which falls to the Oxford University Observatory as its share in the international undertaking for forming a photographic chart of the heavens.

His work on the "Measurement of Lunar Photographs" takes rank as one of the earliest proofs of the accuracy of such measures. Rutherfurd had found in 1872 how accurately stellar photographs could be measured; but his work remained for many years unpublished, and was little known; and as regards work on objects like the Sun and Moon, the measures of the photographs of the Transit of *Venus* in 1874 had proved quite unsatisfactory. In *Monthly Notices*, vol. xxxviii. p. 513, Captain (now Colonel) Tupman concludes that the discordances "support the decision of the American Commission that the photographic diameter of the Sun cannot be relied on when accuracy is required." The lunar image, no doubt, differs in many respects from the solar; but still the value of Professor Pritchard's

* *Monthly Notices*, vol. xxxiv. p. 49. Other papers referring to the observatory and its development will be found in vol. xxxv. p. 376, and vol. xxxvi. p. 1 etc.

conclusion in his memoir "On the Moon's Photographic Diameter, and on the Applicability of Celestial Photography to Accurate Measurement" (*Mem. R.A.S.* vol. xlvii.), that "The result of all this protracted enquiry leaves no doubt on my own mind that measures taken on the photographic film are interchangeable with direct telescopic measures between the same points on the focal image of the Moon itself, but with this advantage in favour of photography, that the measures on the film can be examined or re-examined at any time, and at all times made in a leisurely manner"—the value of this conclusion consists in the fact that, familiar as it is to us now, it was then new, and must, therefore, be considered as a great advance in the history of the subject. It loses nothing in importance by the confirmation quoted in the same paper (p. 16, foot-note): "Since this paper was completed for publication, the elaborate discussion by the American astronomers of the results of the photographic measures of the Transit of *Mercury* in May 1878 have amply confirmed the conclusions regarding the reliability of photography, properly applied, as derived from the present investigations."

As regards the investigation of the lunar libration, to which the above research on the lunar diameter was incidental, the results of two series of measures are given in the same paper, and agree generally with those of Wichmann and Hartwig; but a new method of measurement had in the meantime suggested itself, whereby some of the systematic errors of that originally adopted might be avoided; but the results of the remeasurement have not yet been published.

Four volumes have been published, with the general title *Astronomical Observations made at the University Observatory, Oxford.*

The first may be regarded as preliminary, and contains observations of *Saturn's* satellites, of double stars, of comets of the year 1877, and the elements of the orbits of three double stars (*ξ Ursæ Majoris*, 70 *Ophiuchi*, and μ^2 *Bootis*), on which special attention was bestowed.

The second volume is the "Uranometria Nova Oxoniensis," and contains wedge photometer determinations of the magnitudes of all naked-eye stars from N.P.D. 0° to 100°—the record of three years' labour. In 1886 the gold medal of the Royal Astronomical Society was awarded jointly to Professor E. C. Pickering and Professor Charles Pritchard, for their photometric researches; and an excellent account of the work will be found in the President's address (*Monthly Notices*, vol. xlvi. p. 272). It may be mentioned that, in order to more thoroughly investigate the absorption of light by the atmosphere, Professor Pritchard, with his assistant, Mr. Jenkins, spent five or six weeks at the Khedive's observatory, near Cairo, in the early months of 1883.

The third and fourth volumes of the Oxford observations are

entitled "Researches in the Stellar Parallax by the aid of Photography." The third contains elaborate investigations of the parallaxes of the double stars 61 *Cygni*, μ *Cassiopeiæ*, and *Polaris*, and complete, though less extended, series of observations on α, β, and γ *Cassiopeiæ* and α *Cephei*. Professor Pritchard was led to restrict the number of observations made on any individual star in order that more stars might be examined, his aim being to obtain within a short time a general estimate of the parallax of all stars to the second magnitude; and this object he attained, the fourth volume of the Oxford observations giving the results for the remaining twenty-one stars. The idea of mapping out a research on such lines that it could be completed in a few years is characteristic of Professor Pritchard; and though it may have originated in his own case from the knowledge that the remaining years of his astronomical life, already a long and active one, could not be many, it is also particularly appropriate to the requirements of a university observatory. Professor Pritchard was careful to emphasise the completeness of the research by adding a historical survey of previous work on the same lines, both in the case of the photometric and of the parallax work; and these two essays are in every way worthy of their author. For his stellar parallax work he received the medal of the Royal Society, in 1892.

Two smaller but valuable investigations carried out by Professor Pritchard are well worthy of mention: the first, undertaken at the request of a committee of the Royal Society, being a "Report on the Capacities in respect of Light and Photographic Action of two Silver on Glass Mirrors of Different Focal Lengths" (*Proc. R. S.*, vol. xliv. p. 168), the verdict being in favour of the longer focus; and the second, his work in determining the magnitudes of selected stars, for the settlement of questions relating to the Astrographic Chart, and especially that of the value of the suggested gauze screens. Altogether the record of work accomplished would be well worthy of an energetic man in the prime of life, and excites our keenest admiration when we reflect that it is the record of a veteran astronomer from his sixty-third to his eighty-third year.

No notice of Professor Pritchard would be complete without a reference to his great love of flowers. It may be doubted whether the growth of the University observatory itself was more pleasing to him than that of the flowers and shrubs which he so lovingly nurtured round it, and of the creepers which he coaxed over its walls. Indeed, in the heart of the observatory, the stranger who opened a particular door was startled to find himself suddenly in a well-tended fernery.

Professor Pritchard took his M.A. degree at Cambridge in 1833, at Oxford in 1870, and D.D. at Oxford in 1880. He was ordained deacon in 1833, and priest in 1834. He was elected F.R.S. in 1840, and served on the Council in 1885–7. He became a Fellow of New College, Oxford, in 1883, as Savilian

Professor under the new statutes. He was made an Honorary Fellow of St. John's College, Cambridge, in 1886.

He was twice married: first in 1834 to Emily, daughter of J. Newton, Esq.; secondly in 1858 to Rosalind, daughter of Alexander Campbell, Esq., of Tunbridge Wells. His second wife died about a year before him. He died on Sunday, 1893 May 28, in the eighty-sixth year of his age. H. H. T.

WESLEY STOKER BARKER WOOLHOUSE was born at North Shields on 1809 May 6. His father was a greengrocer in North Shields, and in the boy's earlier years he carried the wares to the customers. At an early age, however, he showed a great facility in solving mathematical problems, and was often stopped on his way with his basket by an old mathematician who delighted in testing his powers. He went to Leitch's school, a famous academy in North Shields, and doubtless owed much to the excellent teaching he there received. But his love of science was hereditary, for his father was a keen amateur astronomer, and, it is said, injured his sight by his devotion to observing; indeed, during his latter years he became quite blind, and his son would lead him by the arm for a walk in the fields. There is evidence extant of the interest taken in the clever boy by his teachers in the shape of three testimonials dated 1821 July, and signed by George Sharp, the head-master, and John Charlton and Robert Marshall "mathematicians;" the first of which commences: "This book contains 395 problems in Mensuration and Algebra, solved and written down in my school in thirty-six days, by Wesley Woolhouse, a boy aged twelve"—thirty-three of the problems being in quadratic equations—and concludes, "I have no hesitation in stating it as my opinion that, should he have the fortune to be taken under the patronage of the learned, his genius in mathematics will amply compensate their attention." He obtained the prize in the *Ladies' Diary* at thirteen years of age. Nothing of particular interest, however, is recorded about his next few years, until at nineteen he published a little work on "Geometry of Two Dimensions," and wrote a paper on "Analytical Dynamics," in both cases depending upon his own invention or rediscovery rather than on his reading of existing works, to which, apparently, he had not had access. About the same period many eminent mathematicians were contributors to the mathematical department of the *Newcastle Magazine*, and here Woolhouse gained several triumphs, as in the case of his own problem of a heavy bar falling over a pulley, to which he received only one solution. He thus became known as a mathematician throughout England, and when the *Nautical Almanac* Office was reconstructed in 1830, he was made deputy superintendent. The Almanac had previously been prepared under the Astronomer Royal's direction, and the contents had remained generally unchanged for many years. But a Committee appointed by the Royal Astronomical Society drew up an entirely new plan for the