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CHARLES PIAZZI SMYTH

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> The human race, to which so many of my readers belong, has been playing at children's games from the beginning, and one of the games to which it is most attached is called 'Keep tomorrow dark', and which is also named 'Cheat the Prophet'. The players listen very carefully and respectfully to all that the clever men have to say about what is to happen in the next generation. The players then wait until all the clever men are dead, and bury them nicely. They then go and do something else. That is all. For a race of simple tastes, however, it is great fun.
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> —G. K. Chesterton

These lines, written as an introduction to a hilarious fantasy of the future entitled *Napoleon of Notting Hill*, were inspired by Charles Piazzi Smyth, one-time Astronomer Royal for Scotland and a contemporary of Chesterton. Professor Smyth has since disappeared into undeserved obscurity and all that can be done in this Leaflet is to direct the reader's attention to a man, the story of whose life has something of interest for everyone. The general reader with astronomical tastes will enjoy following a career that, in addition to astronomy, touched on such diverse subjects as the pyramids, Jehovah's Witnesses, and the Boy Scouts. Astronomers should not ignore the man

who first demonstrated with great enthusiasm the advantages of observatory sites at high altitudes and who made real contributions nearly a hundred years ago to the then infant study of spectroscopy.

Charles Piazzi Smyth was born in Naples on January 3, 1819, the second son of that Admiral Smyth whose *Cycle of Celestial Objects* has been the amateur astronomer's companion for over a century. His middle name honored his godfather, Giuseppe Piazzi, well known as the discoverer of the first asteroid. The godfather, at the christening, expressed the wish that the child become an astronomer.

Smyth began his astronomical career at the age of 16 when he obtained an assistantship under Sir Thomas Maclear at the Cape Observatory. While at the Cape he first demonstrated the great artistic talent that was to mark him as the leader in the field of astronomical drawing. To my knowledge no one has attempted to make a collection of the original drawings and paintings of astronomical artists, such as Trouvelot and Smyth, but such a collection should certainly include the scene painted by Smyth near Bergen, Norway. during the total solar eclipse of July 1851, and the zodiacal light as seen by him at Palermo in April 1872. Reproductions of Smyth's work may be found in the frontispieces of Edinburgh Observatory publications and in several popular astronomy books published in the 1890's by Richard Proctor.

After ten years at the Cape, Smyth was chosen to succeed Thomas Henderson as Director of the Edinburgh Observatory and, at the age of 26, he became Astronomer Royal for Scotland.

In the second edition of Newton's *Optics* published in 1717 we find the following statement: "If the Theory of making Telescopes could at length

be fully brought into practice, yet there would be certain Bounds beyond which Telescopes could not perform. For the Air through which we look upon the Stars is in a perpetual Tremor; as may be seen by the tremulous Motion of Shadows cast from high Towers, and by the twinkling of the fixed Stars. . . . The only remedy is a most serene and quiet Air, such as may perhaps be found on the tops of the highest Mountains above the grosser Clouds." In 1856 Charles Piazzi Smyth set out to search for Newton's "most serene and quiet air" on the mountains of Teneriffe, one of the Canary Islands. The expedition, conceived and executed by Smyth alone, was subsidized in the sum of £500 by the British Admiralty, advised by Sir George Airy and Sir John Herschel, and transported in the 140-ton yacht, *Titania*, owned by Robert Stephenson, noted British engineer. The use of the yacht was acknowledged in the naming of Smyth's nephew, George Stephenson Smyth Baden-Powell, the hero of Mafeking, who is perhaps best known as the founder of the Boy Scouts. The question of "how much astronomical observation can be benefited by eliminating the lower part of the atmosphere" was for the first time plainly stated and partially solved by this expedition. A scientific report was made in the *Philosophical Transactions* of the Royal Society and a more popular account in *Teneriffe, an Astronomer's Experiment.* This latter volume, subtitled *Specialities of a Residence above the Clouds,* is delightful reading to anyone interested in astronomical side-lights and is of added interest because it is the first book published with stereoscopic illustrations. Smyth deserves the lasting gratitude of astronomers for undertaking the Teneriffe experiment, which demonstrated the advantages of high altitude sites for

observational astronomy. Teneriffe is in reality the forerunner of all mountain observatories.

Smyth's popular account of the Teneriffe expedition was such a literary success that after his travels in Russia in 1859 he wrote another book, *Three Cities in Russia.* This volume is rarer and more difficult to obtain than *Teneriffe* but the effort of finding it will be repaid by reading the account of the Pulkova Observatory and its distinguished staff of astronomers headed in succession by Wilhelm Struve and his son Otto. The charm of the narrative is increased by Smyth's own characteristic illustrations.

Soon after the Russian voyage, Smyth met a London publisher named John Taylor whose influence led to unfortunate consequences in his life. Taylor had just published a book entitled *The Great Pyramid: Why Was It Built? and Who Built It?* which claimed that all kinds of mathematical truths were built into the great pyramid of Gizeh. Taylor's eccentric ideas would probably have been quickly forgotten if Smyth had not decided that they warranted wider investigation. In fact, Smyth soon convinced himself that there were even greater truths symbolized in the pyramid than Taylor had suspected, and in 1864 he wrote a 600-page book, *Our Inheritance in the Great Pyramid.* Although Smyth, like Taylor, had never visited the pyramid, the book was an immediate success, went through four editions, and was translated into many languages. Smyth was not satisfied with the available measurements of the pyramid and in 1865 he traveled to Egypt to determine them for himself. Living in an abandoned tomb for four months, he made careful measures of the orientation of the Great Pyramid, the sizes and slope of its passages, and the dimensions of its inner cham-

bers. These investigations, which are discussed with much detail and illustrated with many plates in the publications of the Edinburgh Observatory, are still regarded as a standard reference on the metrology of the pyramid. The Royal Society of Edinburgh recognized the value of these measurements and the skill with which they were made by awarding a prize to Smyth in 1867. In the meantime public interest was aroused and Smyth wrote a three-volume popular work entitled *Life and Work at the Great Pyramid* that was followed, in 1868, by the *Antiquity of Intellectual Man From A Practical and Astronomical Point of View.* These books, which are full of mystical speculations about a supposed purpose for the pyramid, are classics of their kind. Few books illustrate so well the ease with which an intelligent man, passionately convinced of the truth of a theory, can interpret his subject matter so that it will substantiate his previously held opinions.

For example, Smyth found that the length of the base of the pyramid, divided by the width of one of its casing stones, is exactly 365, the number of days in a year. The width of the casing stones measured slightly more than twenty-five inches, a distance which he took to be the length of the "sacred cubit" used by Noah in the construction of the Ark. He then found that the width of the stone was "exactly one ten-millionth of the earth's polar radius." He believed that the "pyramid inch"—one twenty-fifth of the width of a casing stone—has been passed on through generations since the building of the pyramid but in the process it has become slightly altered so that the modern British inch is a trifle short of the sacred unit. From various combinations and multiples of pyramid dimensions he found such things as the distance from the earth

to the sun, the earth's mean density, the precession of the equinoxes, mean temperatures of various astronomical sources, and many other "scientific truths" known to the pyramid builders.

It is of course obvious that by taking the various dimensions of the 120-inch telescope and its dome, or, for that matter, the dimensions of this Leaflet, one can "discover" the same truths. Smyth went even further and saw a great outline of history, past and future, symbolized by the pyramid's internal passageways. It was these prognostications that led Chesterton to write the lines quoted at the beginning of this Leaflet. Nevertheless Smyth's work made a profound impression on many people. A movement was started in Boston, in 1879, to combat the "atheistic metrical system" of France and to adopt the sacred pyramid standards. President James Garfield was a supporter of this movement. Charles Taze Russell, founder of the Jehovah's Witnesses, incorporated Smyth's results in his teachings, and his famous *Studies in the Scripture* contains an interesting letter from Smyth.

Keeping in mind Smyth's previous and later scientific work, one has difficulty in understanding his infatuation with pyramidology. However, he must have been convinced of its importance because, as an indirect result of his pyramid researches, he resigned from the Royal Society in 1874. His books have become standard references in the pseudo-science of pyramidology. Although there is no alternative but to regard Smyth as highly eccentric, there are reasons for not classing him as a genuine crank. For example, he did not exhibit any of the symptoms by which the paranoid tendencies of the pseudo-scientists are usually recognized: (1) he did not take great pains to point out his own genius and to label his col-

leagues, without exception, as ignorant blockheads; (2) he did not, and could not, complain that the doors of scientific societies were closed to him because of the blind prejudice of the established hierarchy; and (3) his books, unlike most classics of crackpot science, are not filled with the form of jabberwocky that psychiatrists call "neologisms". On the contrary, his contemporaries generally were struck by his retiring disposition and gentle amiability, both unusual attributes for a typical crank. After a visit to Smyth in 1892 John Brashear wrote, "I can remember his words as we shook hands; 'My dear Brashear, if you will stay all day with me, I will promise not to talk pyramid once while you are here.' I told him I would stay until the last train to London whether he talked pyramid or not."

It seems remarkable that after this excursion into unorthodoxy, which he never publicly recanted, Smyth began to make numerous contributions to the new, and orthodox, science of astronomical spectroscopy. Anyone interested in the history of this subject will profit by reading his letters and papers in the first thirty volumes of *Nature*. By the use of powerful prism and grating spectrographs of his own design, Smyth extended the visual mapping of the dark-line spectrum of the sun begun by Angstrom. In the laboratory, he investigated the spectrum of gases at low pressure, subjected to electrical excitation. His work emphasized the use of low excitation electric discharges, with the result that his studies of molecular spectra, particularly of molecules containing at least one atom of carbon, constituted an important contribution in the infant days of spectroscopy. He experimented with the thermopile for the measurement of radiation, with the spectroscope

for the determination of the water-vapor content of the atmosphere, and with the use of deep soil temperatures for the study of solar heat. He was interested as well in the spectrum of the aurora and of the zodiacal light. In Volume 62 of *Nature* there is an interesting account of the history of astronomical spectroscopy by A. S. Herschel with special emphasis on Smyth's work. We quote a portion of Herschel's sincere, although flowery, tribute: "Lamenting, as we must do, that time has stolen from us a mighty Ajax in the field of science, a sturdy, patient Atlas who through more than half of this fast waning century robustly upheld on his strong shoulders the growing spires and architraves of science's ever-increasing edifice, it is with keenest sorrow that the writer turns over the ample pages, rich to profusion in details and superb in colour, of the monumental works of spectroscopy left to us by the late Professor C. Piazzi Smyth, with the nearly hopeless intention of endeavouring to give a short account of some of his most conspicuously important contributions to that branch of science . . . his mastery of the state of science in the questions which he set himself to solve or to explore was acquired with so much inventive skill, inspiring pains and ardour, as always to make the character of the work which he accomplished in them permanent and thorough."

Smyth died on February 21, 1900. His will provided for the assistance or promotion of expeditions for the study of some particular branch of astronomical spectroscopy at mountain elevations of not less than 6,000 feet. In any study of abnormalities of scientists, his case-history may be as valuable as those of the eccentric physicists, Oliver Lodge and Nikola Tesla.