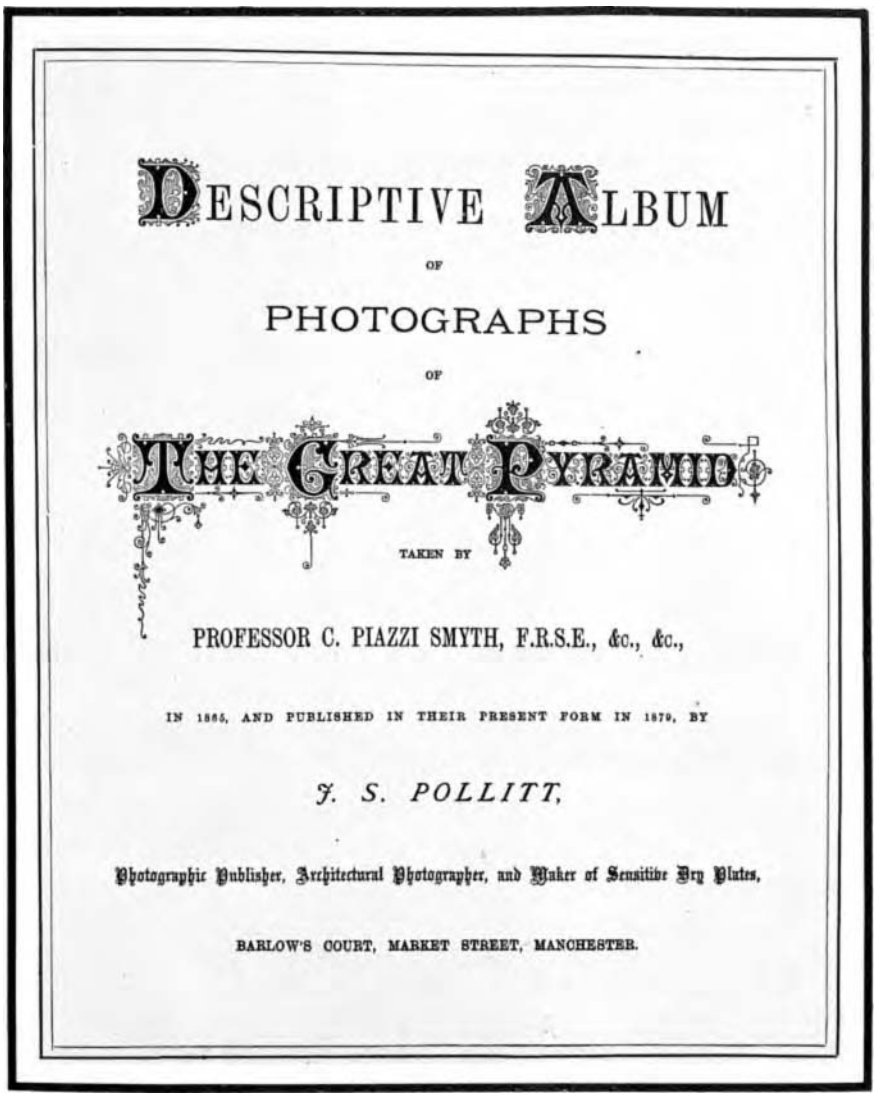
# Charles Piazzi Smyth's 1865 Conquest of the Great Pyramid

by Larry Schaaf

Most photo-historical accounts of the development of miniature cameras and artificial lighting cite Charles Piazzi Smyth's pioneering photographic work at the Great Pyramid in 1865. This article, based on the recent rediscovery of an album of his photographs and subsequent new information on his estate, is a more detailed examination of that work than has previously been possible.

Smyth, a 19th-century experimentalist with 20th-century ideas, clearly saw the importance of photography as a documentary tool:

> When I went to Egypt . . . I went . . . a private individual and a poor man. I only, in this country . . . then saw the exceeding importance of modern scientific examination being applied without further delay to that most ancient architectural monument of all the earth, the Great Pyramid . . . I was left by both government and all other authorities to . . . pay all expenses there out of my very slender salary . . . the strictest economy, therefore, had to be the order of the day . . . there was sadly little left for photography. But photography must be taken, for what monumental research of the present age can be effectively treated without its marvellous aid. It must be taken, but the apparatus could only be very small.


DESCRIPTIVE ALBUM

OF

PHOTOGRAPHS

OF

THE GREAT PYRAMID

TAKEN BY

PROFESSOR C. PIAZZI SMYTH, F.R.S.E., &c., &c.,

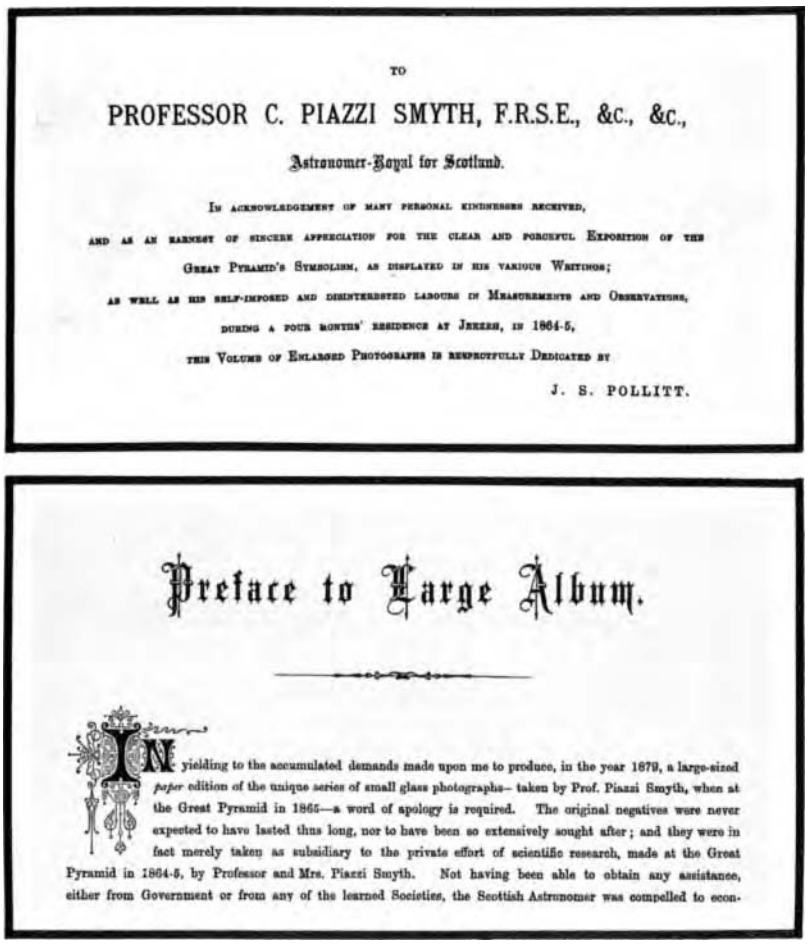
IN 1865, AND PUBLISHED IN THEIR PRESENT FORM IN 1879, BY

*J. S. POLLITT,*

Photographic Publisher, Architectural Photographer, and Maker of Sensitive Dry Plates,

BARLOW'S COURT, MARKET STREET, MANCHESTER.

*Figure 1. Title page from Pollitt's 50-print portfolio of Smyth's prints. This copy, the only one known to exist now, is still in the Manchester Central Library. Pollitt sold it to them in 1879.*



TO

PROFESSOR C. PIAZZI SMYTH, F.R.S.E., &c., &c.,

Astronomer-Royal for Scotland.

IN ACKNOWLEDGEMENT OF MANY PERSONAL KINDNESSES RECEIVED,

AND AS AN EARNEST OF SINCERE APPRECIATION FOR THE CLEAR AND FORCEFUL EXPOSITION OF THE GREAT PYRAMID'S SYMBOLISM, AS DISPLAYED IN HIS VARIOUS WRITINGS;

AS WELL AS HIS SELF-IMPOSED AND DISINTERESTED LABOURS IN MEASUREMENTS AND OBSERVATIONS,

DURING A FOUR MONTHS' RESIDENCE AT JEEZEH, IN 1864-5,

THIS VOLUME OF ENLARGED PHOTOGRAPHS IS RESPECTFULLY DEDICATED BY

J. S. POLLITT.

Preface to Large Album.

IN yielding to the accumulated demands made upon me to produce, in the year 1879, a large-sized *paper* edition of the unique series of small glass photographs– taken by Prof. Piazzi Smyth, when at the Great Pyramid in 1865—a word of apology is required. The original negatives were never expected to have lasted thus long, nor to have been so extensively sought after; and they were in fact merely taken as subsidiary to the private effort of scientific research, made at the Great Pyramid in 1864-5, by Professor and Mrs. Piazzi Smyth. Not having been able to obtain any assistance, either from Government or from any of the learned Societies, the Scottish Astronomer was compelled to econ-

*Figure 2(a) and (b). Dedication and start of the preface. The text in this album includes a two-page preface, six pages of text about Smyth's controversial Pyramid theories authored by 'A Watcher', and titles and captions on each of the plate pages.*

These words, taken from Smyth's *A Poor Man's Photography at the Great Pyramid in the Year 1865*[1], introduce a fascinating account of the photographs that he took to document his theories of the Pyramid's significance. Shunning the massive glass negatives conventionally employed by his peers, Smyth conceived and perfected a system for taking detailed 1-in.-square images on wet collodion, suitable for later enlargement. For the scientific documentation of the Pyramid's gloomy interior, he also embraced the new technique of magnesium lighting for photography.

Unfortunately, his early miniature negatives, appealing to pyramidologists and certainly valuable as artefacts of photographic history and documents of 19th-century Egypt, were thought to have been lost after Piazzi Smyth's death. The first modern publication of photographs made from them was in 1964, when the British historian Arthur T. Gill was able to crown a four-year search with the announcement that the Royal Society of Edinburgh had located some of Smyth's glass-lantern slides of the Pyramid that he had used in lectures. Gill was able to exhibit some of these and to publish a few reproductions, but still was forced to lament that the original negatives had not been found, in spite of extensive enquiries addressed to Smyth's surviving relatives[2].

A possibly unique album in the Manchester Central Library provides significant new clues to the fate of the photographs. This trail, starting with a Scottish astronomer photographing in Egypt, has led from Edinburgh to Manchester to Ripon to York and finally, with a possible

*Figure 3. Charles Piazzi Smyth, the Astronomer Royal for Scotland, in a carte-de-visite portrait taken in Dundee. The Egyptian motif headdress is unexplained. This portrait, in a private Herschel family album, was probably given to Professor Alexander Herschel. Smyth learned the details of photography's invention from Sir John Herschel and later co-authored photographic research with Professor Herschel. (By courtesy of Mrs Eileen Shorland.)*

*Figure 4. John Smith Pollitt (centre back row, with top hat), the publisher of Smyth's lantern slides and portfolio, as he appeared at the 21st Annual Meeting of the Manchester Photographic Society in 1876. He was the president of this society from 1884–1885. (Reproduction from Charles Eshborn's (1955) '100 Years of Photography. The Centenary of the Manchester Photographic Society'.)*

involvement of George Eastman, to Vancouver, British Columbia. It unfortunately appears that the original negatives may indeed truly be lost, but the Manchester album contains 50 high quality albumen prints made from enlarged negatives of Smyth's originals and explains more of their history. Smyth had written with regret, in his 1867 *Life and Work at the Great Pyramid* that 'preparing good and large-sized paper prints from [the negatives] was too expensive for me to contemplate'[3]. Twelve years later, these were first published in a *Descriptive Album of Photographs of the Great Pyramid taken by Professor C. Piazzi Smyth, F.R.S.E., &c., &c., in 1865, and Published in their Present Form in 1879, by J. S. Pollitt.* In the preface, Pollitt, a Manchester manufacturer, photographer and publisher, wrote that

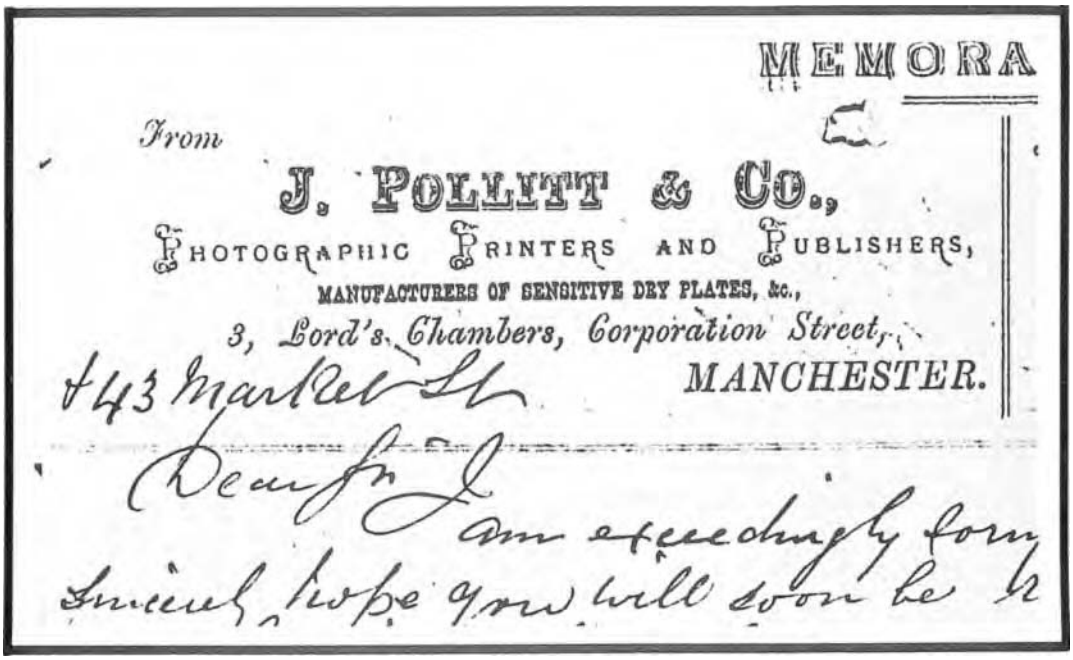
> not content with the mere ephemeral shadow on the wall and passing away again of optical 'projections' at public Lectures, many earnest minds in the community seem now to demand to have copies of the photographs themselves, of large size and permanent quality, for their own study and reflection at home; and Professor Piazzi Smyth, at the recommendation of a mutual friend, Joseph Sidebotham, Esq., of Bowden, placed the original negatives in my hands in the autumn of 1873, on no other condition, and without any further stipulation, than that no bad copies should be issued.

The preface is dated 'Manchester, March 1879'. The 39 cm × 29 cm album consists of a letterpress title-page, dedication page, two-page preface, and six pages of descriptive material about the Pyramid. Each of the 50 plate pages includes a mounted albumen print, ranging in size approximately from 18 cm × 21 cm to 20 cm × 25 cm, and a title and letterpress caption pasted on the page. It was originally issued half-bound in calf-leather; however, a description of this album must really start with the fascinating project that Piazzi Smyth conceived and executed. The photographs that resulted are pioneering efforts in both content and production.

The pyramids of Egypt have been a favourite visiting spot for tourists for all of their thousands of years of existence, but it was not until the 19th century that really detailed examination of them began[4]. It is fitting (if strange for an Englishman) that Piazzi Smyth dedicated his *Life and Work at the Great Pyramid* to Napoleon Bonaparte, for it is to the great French military leader that modern scientific studies of pyramids are indebted. The 175 savants who accompanied Napoleon's forces to Egypt in 1798 made a remarkable start on measuring and picturing the antiquities of that land.

The results of several immediately pre-photographic expeditions to the Great Pyramid were added to the knowledge published by the savants, and the combined effort enabled John Taylor, a London bookseller's son and editor of the *London Observer*, to form some of the first truly scientific theories about the construction and meaning of the Pyramid. Taylor, employing the field calculations, some postulates by Sir John Herschel, and the newly-issued detailed maps by the British Ordnance Survey, discovered a number of peculiar coincidences about the dimensions of the Pyramid. The calculations, done from published data rather than first-hand observation, included derivations for the value of pi, and a cubit measure seemingly based on the length of the polar axis of the earth.

Taylor, unable to explain the sophisticated incorporation of geometric and astronomical laws into the construction of what had generally been considered to be a pagan monument, and further constrained by a European Victorian mind, came to the conclusion that the only possible explanation lay in divine guidance. His theories,



MEMORA

From

J. POLLITT & Co.,

PHOTOGRAPHIC PRINTERS AND PUBLISHERS,

MANUFACTURERS OF SENSITIVE DRY PLATES, &c.,

3, Lord's Chambers, Corporation Street,

MANCHESTER.

THE BRITISH JOURNAL ALMANAC ADVERTISEMENTS. xxxix

DRY-PLATE PHOTOGRAPHY.

J. POLLITT,

Photographic Printer and Publisher,

MAKER OF SENSITIVE DRY PLATES,

BARLOW'S COURT, MARKET STREET, MANCHESTER,

HAVING had a long and successful experience in the preparation and use of Sensitive Dry Plates, is now able to supply his COLLODIO-ALBUMEN PLATES of undoubted excellence, and possessing a degree of certainty altogether unsurpassed; at the same time their fine keeping qualities, tested by disinterested parties to the extent of seven years, specially recommend them to those who undertake Foreign Tours of long duration as the great desideratum in Photography.

LIST OF PRICES

For the various sizes in ordinary use; other sizes prepared to order at a few days' notice:—

| Size of Plate. | £ s. d. Per Dozen. | Size of Plate. | £ s. d. Per Dozen. |
|---|---|---|---|
| 4¼ by 3¼ | 0 4 2 | 8½ by 6½ | 0 15 0 |
| 5 „ 4 | 0 5 6 | 9 „ 7 | 0 17 6 |
| 6½ „ 3½ | 0 7 6 | 10 „ 8 | 1 2 0 |
| 6½ „ 4¼ | 0 10 0 | 11 „ 9 | 1 7 6 |
| 7¼ „ 4½ | 0 10 0 | 12 „ 10 | 1 13 0 |
| 7½ „ 5 | 0 12 0 | 15 „ 12 | 2 10 0 |

*Sizes not mentioned in the List are charged the same as the next size larger mentioned therein.*

The Plates are not advertised or represented as the most rapid of all Dry Plates, although they are more rapid than formerly, but, when fairly exposed and developed according to the printed instructions, a degree of excellence will invariably be obtained, and an amount of detail in heavy shadows given, which no other process, either wet or dry, can rival.

Testimonials of the most flattering nature have been received from time to time during the past ten years from eminent photographers, both amateur and professional; but the maker has always had a disinclination to make use of them as a means of advertising, preferring that the Plates should sustain their reputation by their own intrinsic merit.

J. P. is also publishing TRANSPARENCIES FOR THE LANTERN from Professor Piazzi Smyth's Fine Negatives taken at the GREAT PYRAMID in 1865. Price for single copies, 2/6 each. The whole series of Fifty, in a grooved box, with Descriptive Catalogue, £5 5/-

P S.—All orders from strangers must, to ensure attention, be accompanied by a remittance or sent on receipt of invoice.

Post Office Orders made Payable at Manchester.

J. POLLITT,

BARLOW'S COURT, MARKET STREET, MANCHESTER.

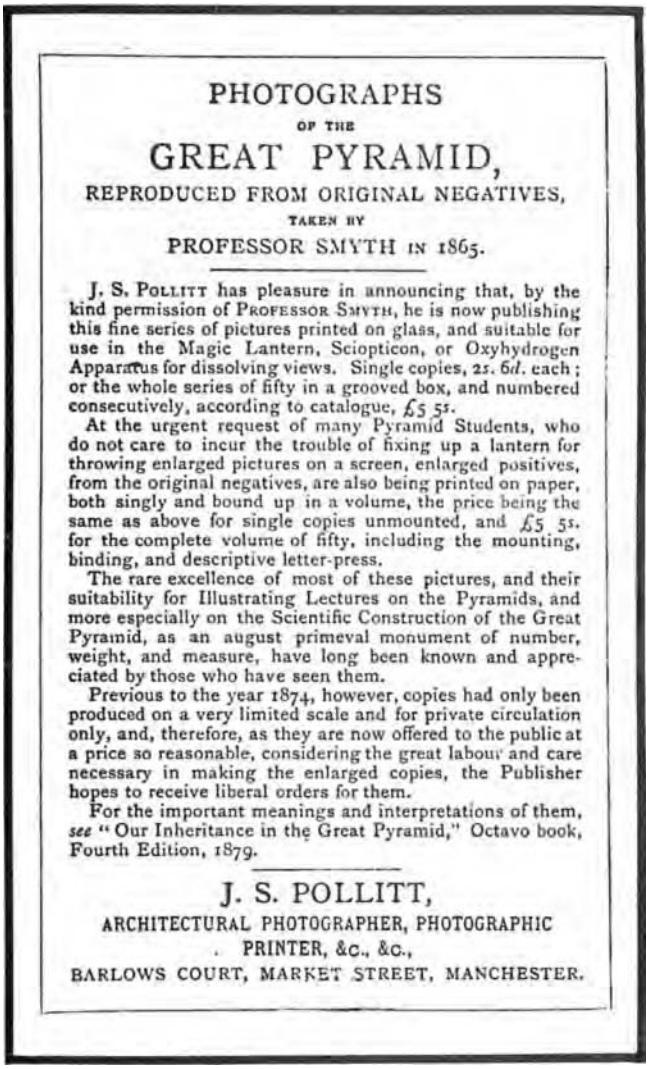
*Figure 5(a) and (b). Pollitt at various times advertised himself as an architectural photographer, a dry-plate maker, and a photographic printer and publisher. Advertisement from the (1878) 'British Journal Photographic Almanac'. (Memorandum form in the collection of the Royal Observatory, Edinburgh.)*

rejected by the Royal Society, were published in 1859 in *The Great Pyramid. Why was it Built? & Who Built it?*[5], but the ageing essayist was unable to defend his controversial work against the immediate criticism that it encountered.

There was strong support, to be sure, for the idea that the Great Pyramid might be of more significance than a mere tomb or granary. Controversy over standards of measure was rampant at that time, with many prominent scientists expressing opposition to the French metre, and the possible incorporation of a 'natural' unit of measure in the Great Pyramid was an intriguing resolution to the controversy. Piazzi Smyth was opposed to the metre because he was convinced it was a communist plot, designed to unify the workers of the world by destroying each country's unique system of measures[6]. Sir John Herschel, on the other hand, was opposed to it since it was based on what he felt were erroneous calculations.

Herschel suggested that the most reliable and logical unit of measure would be a fraction of the earth's polar axis, one which very nearly coincided with the British inch. Taylor found by happy coincidence that the Pyramid appeared to be constructed to just this standard. Exactly where Charles Piazzi Smyth entered this fray is unclear but, once he did, he became Taylor's most avid scientific supporter. It is possible that Herschel, a long-time friend, interested the younger astronomer in the question, or possibly it was Dr John Lee, a neighbour of Herschel, an amateur astronomer, close friend of the Smyth family, and an active collector of antiquities.

Smyth, the Astronomer Royal for Scotland and a



PHOTOGRAPHS
OF THE
GREAT PYRAMID,
REPRODUCED FROM ORIGINAL NEGATIVES,
TAKEN BY
PROFESSOR SMYTH IN 1865.

J. S. POLLITT has pleasure in announcing that, by the kind permission of PROFESSOR SMYTH, he is now publishing this fine series of pictures printed on glass, and suitable for use in the Magic Lantern, Sciopticon, or Oxyhydrogen Apparatus for dissolving views. Single copies, 2s. 6d. each; or the whole series of fifty in a grooved box, and numbered consecutively, according to catalogue, £5 5s.

At the urgent request of many Pyramid Students, who do not care to incur the trouble of fixing up a lantern for throwing enlarged pictures on a screen, enlarged positives, from the original negatives, are also being printed on paper, both singly and bound up in a volume, the price being the same as above for single copies unmounted, and £5 5s. for the complete volume of fifty, including the mounting, binding, and descriptive letter-press.

The rare excellence of most of these pictures, and their suitability for Illustrating Lectures on the Pyramids, and more especially on the Scientific Construction of the Great Pyramid, as an august primeval monument of number, weight, and measure, have long been known and appreciated by those who have seen them.

Previous to the year 1874, however, copies had only been produced on a very limited scale and for private circulation only, and, therefore, as they are now offered to the public at a price so reasonable, considering the great labour and care necessary in making the enlarged copies, the Publisher hopes to receive liberal orders for them.

For the important meanings and interpretations of them, *see* "Our Inheritance in the Great Pyramid," Octavo book, Fourth Edition, 1879.

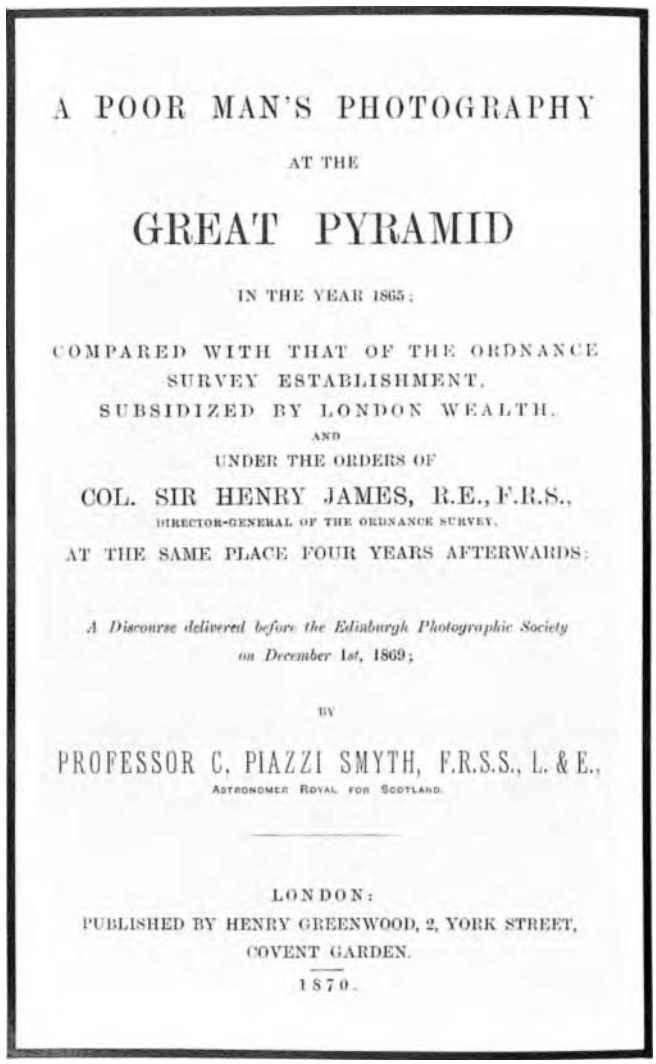
J. S. POLLITT,
ARCHITECTURAL PHOTOGRAPHER, PHOTOGRAPHIC PRINTER, &c., &c.,
BARLOWS COURT, MARKET STREET, MANCHESTER.

*Figure 6. Advertising, p. 678 of the 4th edn. of Smyth's 'Our Inheritance in the Great Pyramid' (1879). This was continued until the 1890 edition when Pollitt died and certainly must have attracted some of Smyth's religious followers to the album.*

Professor at Edinburgh University, was well known for his rigorous mathematical work. He added weight to Taylor's arguments when he was able to confirm the figures, but also added to the controversy as he apparently supported and amplified Taylor's religious beliefs. There are many vague accounts of Smyth's erratic behaviour before this time but in all fairness it can be said that he did not exhibit any particularly strong religious fervour before his association with the Pyramid question. It is quite possible that Taylor's breakthroughs in interpretation slowly lured Smyth into accepting not only the calculations but also the religious convictions that went with them. He soon extended Taylor's theories to the point where he believed that the 'sacred cubit' was used both in the Pyramid and by Noah to build his ark, and was the basis for the British inch. The two men and Smyth's wife Jessie must have felt the peculiar comradeship that common adversaries engender as the trio faced the ridicule of much of the scientific community. The bond grew tighter and Smyth and Taylor carried on a lively and intense correspondence shortly before Taylor's death in July 1864. Smyth had been working on his first edition of *Our Inheritance in the Great Pyramid*[7] and was greatly helped by the donation of Taylor's lifetime accumulation of notes. Increasingly frustrated by the lack of real scientific data and the contradictory nature of what was published, he found that going significantly beyond Taylor's calculations would require measurements of a quality far beyond anything yet accomplished. The only way was to employ the modern scientific instruments, including photography, that he was familiar with as a leading astronomer.

The rigours of travel to a remote land were nothing new to the Smyths. Perhaps their most famous field trip was their 1856 astronomical expedition to Teneriffe, in the

*Figure 7. In Smyth's writings, the best information on his photography is contained in his 'Life and Work at the Great Pyramid', but certainly his most interesting book by title is 'A Poor Man's Photography'. It was actually a reprint of a speech given to the Edinburgh Photographic Society in 1869. Smyth never referred to himself as a 'poor man' during his trip to Egypt and only added this title later after he began attacking the work of Sir Henry James.*



A POOR MAN'S PHOTOGRAPHY
AT THE
GREAT PYRAMID
IN THE YEAR 1865;
COMPARED WITH THAT OF THE ORDNANCE SURVEY ESTABLISHMENT,
SUBSIDIZED BY LONDON WEALTH,
AND
UNDER THE ORDERS OF
COL. SIR HENRY JAMES, R.E., F.R.S.,
DIRECTOR-GENERAL OF THE ORDNANCE SURVEY,
AT THE SAME PLACE FOUR YEARS AFTERWARDS:

*A Discourse delivered before the Edinburgh Photographic Society on December 1st, 1869;*

BY

PROFESSOR C. PIAZZI SMYTH, F.R.S.S., L. & E.,
ASTRONOMER ROYAL FOR SCOTLAND.

LONDON:
PUBLISHED BY HENRY GREENWOOD, 2, YORK STREET, COVENT GARDEN.
1870.

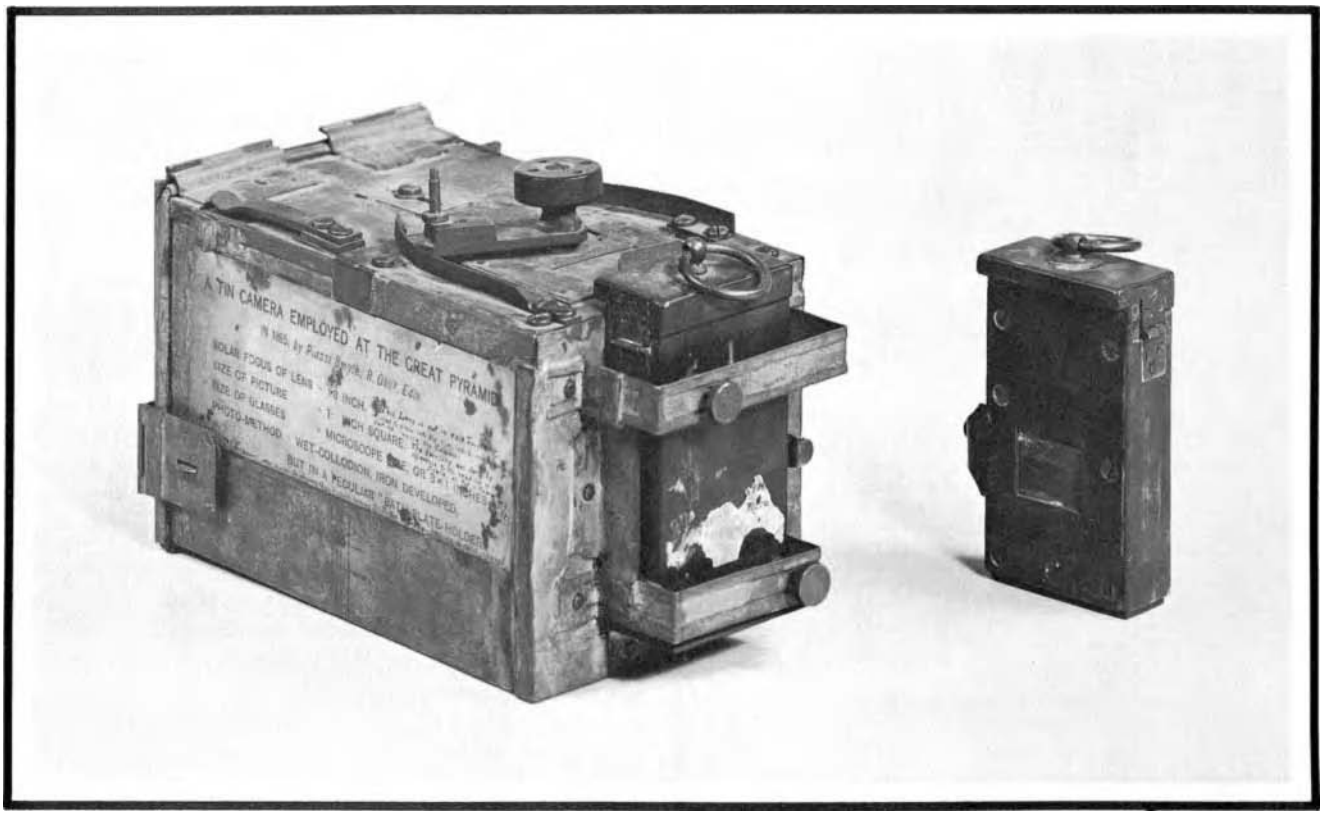
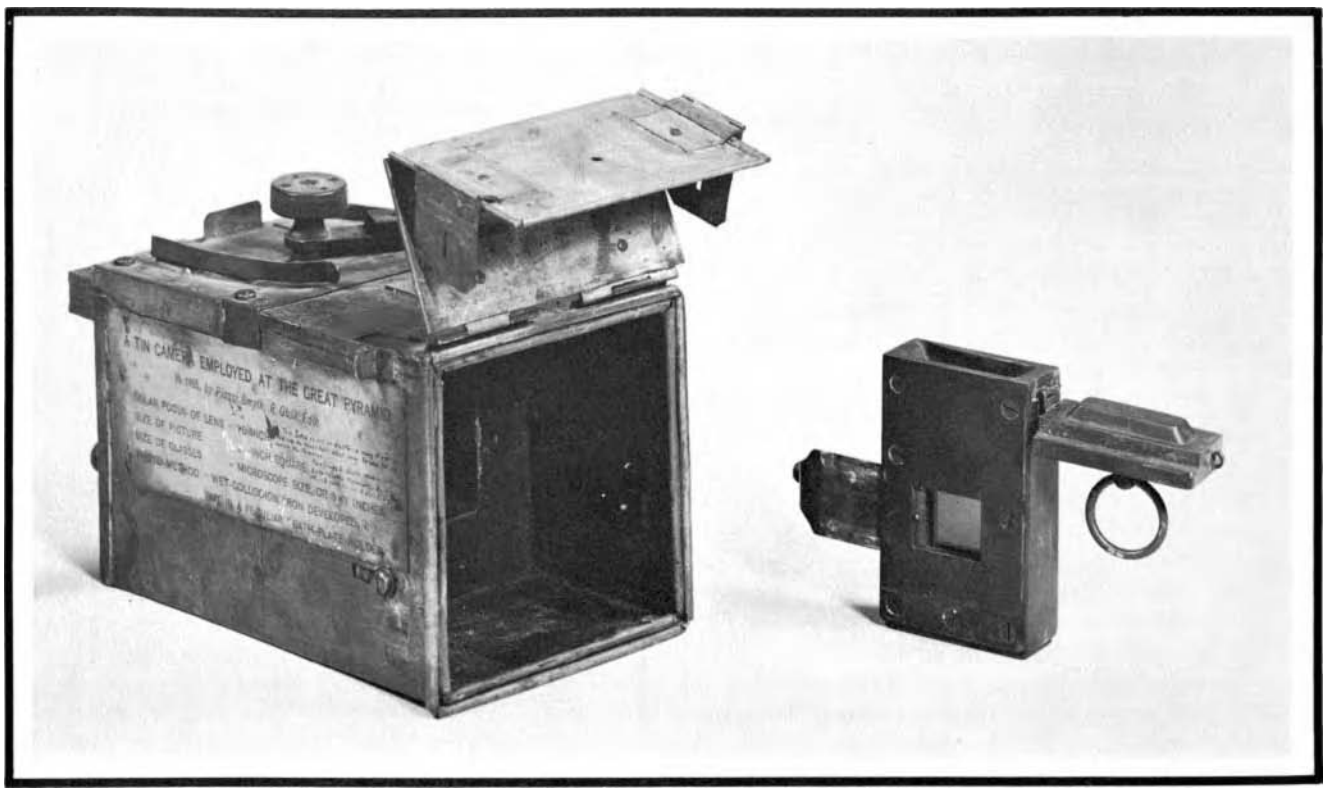



*Figure 8(a) and (b). Piazzi Smyth's custom-designed camera. Only one of the pair of miniature stereo cameras is known to have survived, and it is lacking the lens. The special ebonite plate holders, with their carrying ring, were self contained and kept the miniature 1 in.×3 in. plate moist in the dry and dusty climate. Most of the camera was a lens shade. The camera and the pictures were exhibited frequently in the 19th century and that is probably when the label was applied. (Photographs, copyright 1979, by the Royal Observatory, Edinburgh.)*



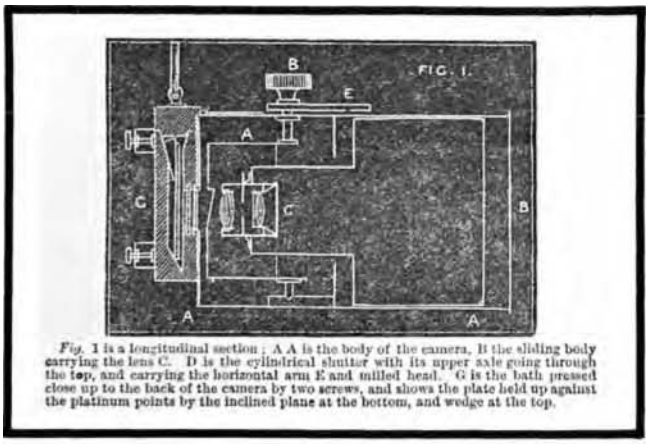



*Fig.* 1 is a longitudinal section; A A is the body of the camera, B the sliding body carrying the lens C. D is the cylindrical shutter with its upper axle going through the top, and carrying the horizontal arm E and milled head. G is the bath pressed close up to the back of the camera by two screws, and shows the plate held up against the platinum points by the inclined plane at the bottom, and wedge at the top.

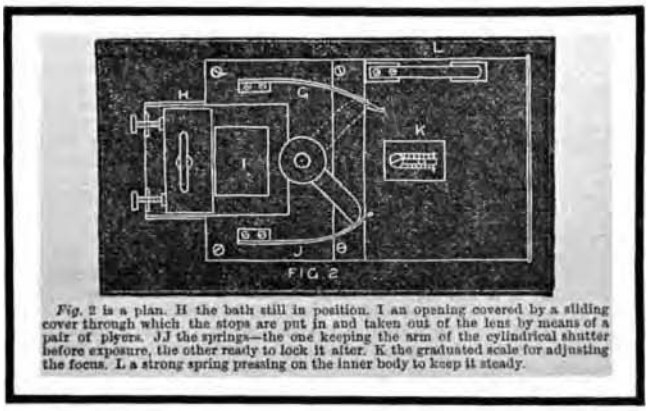



*Fig.* 2 is a plan. H the bath still in position. I an opening covered by a sliding cover through which the stops are put in and taken out of the lens by means of a pair of pliers. JJ the springs—the one keeping the arm of the cylindrical shutter before exposure, the other ready to lock it after. K the graduated scale for adjusting the focus. L a strong spring pressing on the inner body to keep it steady.

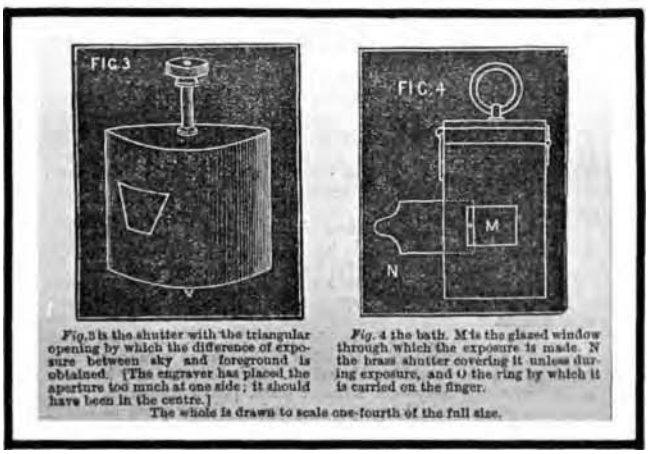



*Fig.* 3 is the shutter with the triangular opening by which the difference of exposure between sky and foreground is obtained. (The engraver has placed the aperture too much at one side; it should have been in the centre.)

*Fig.* 4 the bath. M is the glazed window through which the exposure is made. N the brass shutter covering it unless during exposure, and O the ring by which it is carried on the finger.

The whole is drawn to scale one-fourth of the full size.

*Figure 9(a), (b) and (c). These diagrams of the camera are from John Nicol's article in the 8th June 1866 'British Journal of Photography'. Nicol, a student of Smyth's and his assistant at the Observatory, actively promoted the Pyramid work and later became involved in the Edinburgh Photographic Society. He went on in later years to start the 'Photographic Beacon' in Chicago.*

---

Canary Islands. This experiment, designed to prove the value to astronomy of getting above most of the earth's polluted atmosphere, led to the publication of the first book illustrated with stereo photographs. The Teneriffe expedition had received widespread support from the government and from learned societies. The expedition to the Pyramid, designed to prove that God had been 'The Architect and Construction Superintendent', met with decidedly less enthusiasm in the scientific community. Smyth, a member of the Royal Society of London, applied for funding, was turned down, and then further infuriated by the news that the Society had actually returned some of that year's budget to the government coffers with the complaint that there was nothing worthwhile going on to support. Smyth would have to make the trip with his own modest funds, and with the loan of certain pieces of scientific equipment from the dwindling number of friends that he still had in the scientific community. Photography, as it had been for him at Teneriffe, was to be a peripheral tool to record data for later analysis[8]. It was within this framework that Smyth set about developing a system for a 'poor man's photography' at the massive Egyptian structure.

His approach, planned with typical scientific precision and attention to detail before he left Edinburgh, incorporated techniques in the vanguard of photographic technology in the mid-19th century. He really did not invent anything new—and never claimed to—but his strength lay in his ability to apply and make work advanced processes that others for the most part only toyed with. Dry plates, miniature negatives, enlarging, and magnesium lighting were all known techniques in 1864 but none of them were common. Smyth put together a beautifully orchestrated ensemble of custom-designed equipment and carefully honed techniques that enabled him routinely to employ advances that other photographers considered mere novelties. Of chief interest among these were his ideas on stereo photography, and his employment of miniature negatives and artificial lighting.

Charles and Jessie Smyth left Edinburgh in November 1864 with their personal baggage and with numerous cases of specialized scientific equipment. Eight of these boxes were devoted to photography, the largest one containing the complete dry-plate apparatus that Smyth was later to deem unnecessary. Everything that could be required in a technologically-backward land was brought along, including chemicals, plates, a dark tent, and even a microscope to examine critically the resulting negatives[9]. The month of December was a frustrating one spent in the 'ruinously expensive' city of Alexandria, making the necessary political arrangements to work at the Pyramid. The American Civil War had led to a cotton boom and the Suez Canal was only months from completion, so the Smyth's limited coffer must have seemed all the more sparse. The inflation had to be put up with, interference with the important tourist trade was not to be permitted, but otherwise Smyth would have free access to the area, as long as he did not 'break the Pyramid'. He was even given a limited number of labourers to clean the areas he was interested in. While in Cairo, the Smyths met and stayed with a Mr Schrantz, an artist and photographer by trade, and amongst other things they developed a strong dislike for the native customs.

Late December was spent in Cairo, and by 8th January 1865 they were in residence in a tomb near the Great Pyramid itself. The two worked feverishly to measure precisely all important aspects of the structure covering

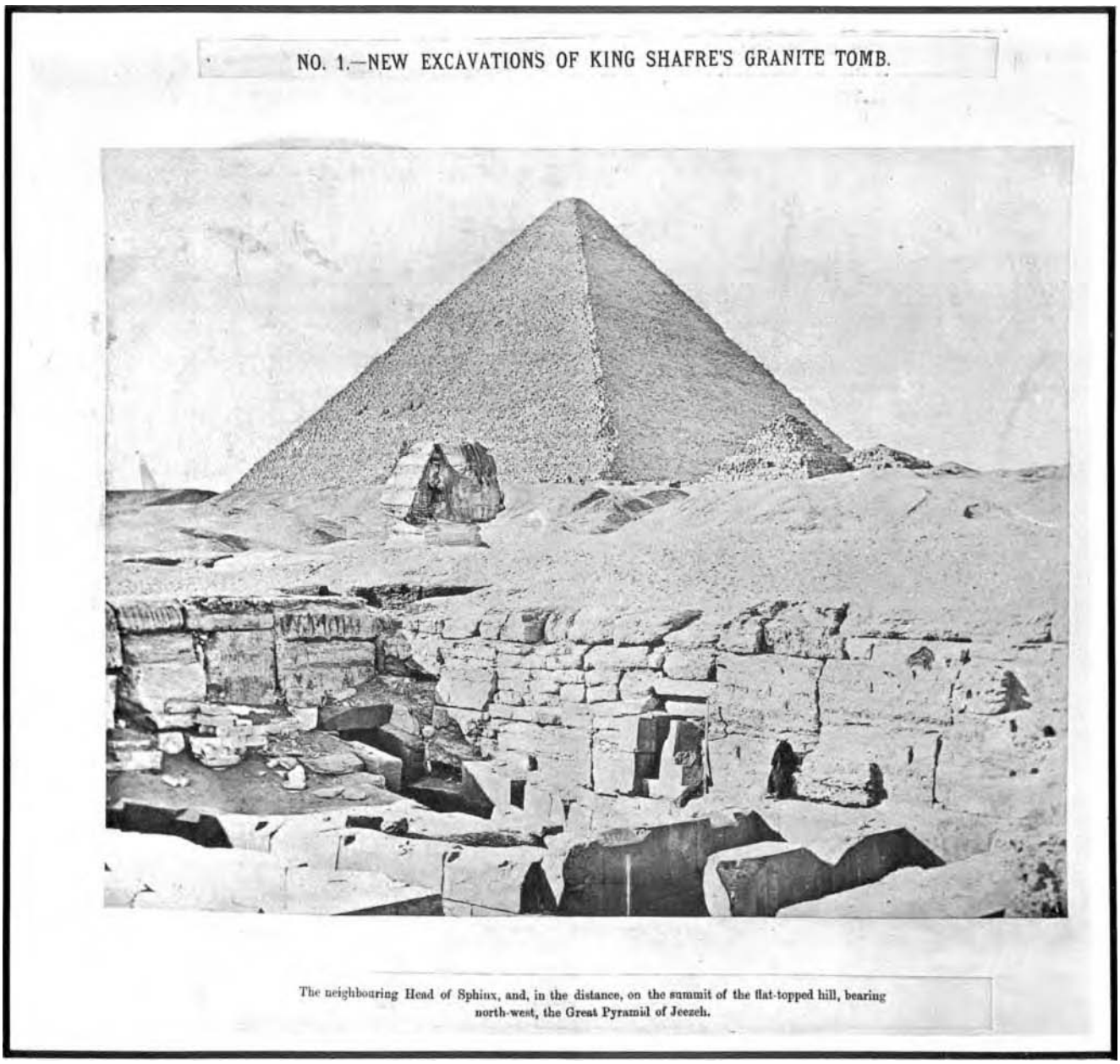



*Figure 10. Plate No. 1 from the 'Descriptive Album' showing the pasted-down albumen print, title, and descriptive caption. Smyth strongly criticized many pictures of the Sphynx as giving the impression that it was nearly as large as the Great Pyramid. 20 × 26 cm.*

13 acres, and built of more than two and a half million stone blocks. Angles and distances, inside the structure and without, as well as astronomical orientations were carefully checked. Photography of the Pyramid was just one of the scientific tools brought to bear on it, and was used with the intent of providing information and reference, not artistic quality. Measuring rods appear in many of the pictures, and Smyth was particularly careful to maintain accurate size relationships. Smyth had carefully planned his time to get everything done and had scheduled various tasks in sequence. Photography commenced on 5th February, using dry plates of the conventional ($3\frac{1}{4}$ in. sq.) stereoscopic size. Dr Hill Norris' dry plates were employed with typical midday exposures ranging from two to four minutes at *f* 20. Some pictures were taken as single negatives, but many were taken as stereo pairs, using two cameras and a synchronizing bar. Smyth was embroiled in the strong controversy about the proper separation distance for stereo effect, and felt more affinity with those who believed that a wider separation would give more stereo effect and was more appropriate for distant objects.

Nearly all of the photography in February and March was done with the dry plates. While these were still in their infancy and their employment in a remote and hostile land is interesting, of far greater interest to us today is the stereo pair of miniature wet-plate cameras that Smyth designed for use inside the Pyramid. It would be more accurate to say that these were cameras that took miniature plates, for the boxes themselves were relatively bulky by today's standards. They were triumphs of rugged,

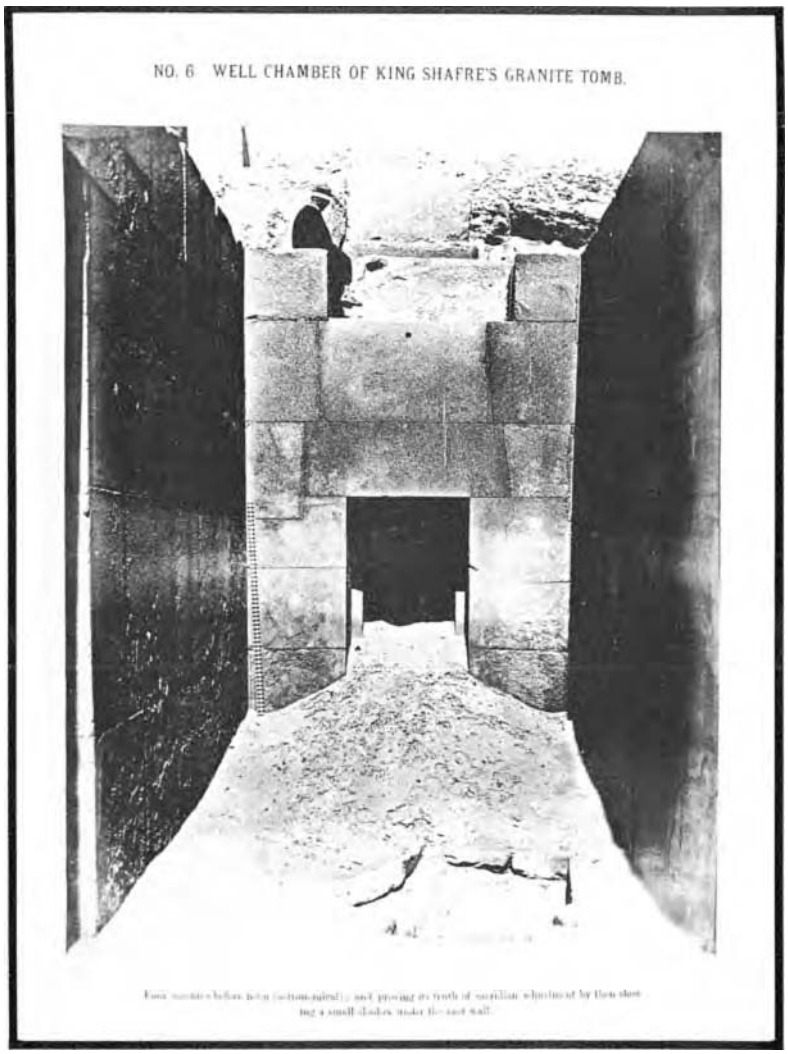



*Figure 11. Plate No. 6 from The 'Descriptive Album'. Smyth, an astronomer, was convinced that the Pyramid not only had religious connotations but also incorporated astronomical truths by virtue of its orientation. This is part of a sequence of three pictures. 26·0 × 19·5 cm.*

simple design that could stand up to the trials of working in the hot, dusty desert. One of them is still preserved at the Royal Observatory in Edinburgh.

Smyth chose to use wet collodion rather than dry plates for the miniature cameras because the wet plates were more sensitive to light, more reliable, and finer-grained than the newer factory-made plates. Other workers in Egypt complained of wet collodion drying out too rapidly and picking up dust particles, problems which Smyth overcame handily. Each camera[10] was a tin box, 5 ins. square and 8 ins. long, of which more than two-thirds of the length was a lens shade. The focal plane shutter had a trapezoidal aperture designed to provide more exposure to the foreground than to the sky. Pivoting smoothly on two bearings, the heavy cylindrical shutter could be controlled by the speed with which the attached knob was twisted, thus allowing a wide range of exposure times at the operator's discretion. It was vibration-free to allow maximum resolution, and was smoothly stopped at the end of its travel by a spring catch. The two cameras could be set off simultaneously by a connecting synchronizing bar of which, unfortunately, no detailed description seems to have survived.

The heart of this system consisted of a set of interchangeable ebonite wet-plate baths that were skilfully built by an Edinburgh carpenter, John Air. Approximately $1 \times 2\frac{1}{4} \times 4$ ins. in size, they were constructed to hold a standard $1 \times 3$ in. glass microscope slide wedged between a sloping bottom and two platinum points to ensure precise alignment. The image area was 1 in. square in the centre. A waterproof seal at the top, and a light-proof brass dark slide made the unit completely self-contained. Plates were prepared by dipping them in collodion, sensitizing them in silver nitrate, and then inserting them in the water bath in the holder. Once the dark slide was pulled, exposure was made through an optical glass window while the plate was submerged in water in the bath. A number of these plates could be prepared at the start of the day in a convenient place, carried by the ring holders on the top, exposed when needed, and processed at the end of the day, again in convenient circumstances. The entire system was trouble free and immune to dust and drying.

The built-in lens was a 1·8 in. hand-selected Dallmeyer locket lens, working at apertures of *f*5, *f*10, and *f*20, with increasing definition at smaller apertures. Focusing was done by reference to a scale which Smyth had painstakingly developed by microscopic examination of test exposures.

The total system was nothing short of brilliant, and it is difficult to imagine any significant improvements that

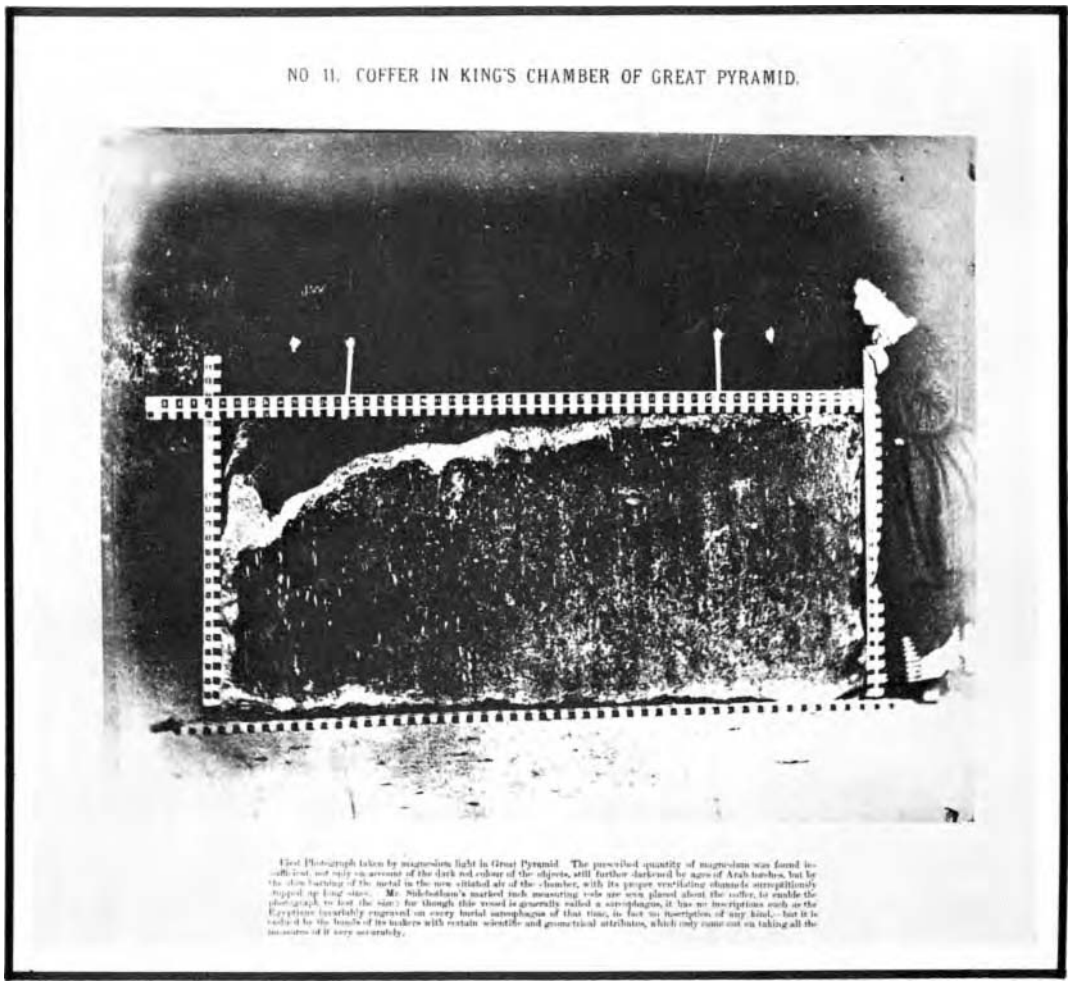



*Figure 12. Plate No. 11 from the 'Descriptive Album'. The first successful magnesium-light picture that Smyth was able to take inside the gloom of the Pyramid. He often incorporated other elements than the main subject in his series of photographs, being more interested in gathering scientific information than in artistic composition. This one, designed to show for the first time the coffer in the King's Chamber, also prominently displays his wife Jessie and the measuring rods lent to him by his friend Joseph Sidebotham, of Manchester. 19·5 × 25·0 cm.*

could have been executed with 19th-century technology. All this was conceived in Edinburgh by Smyth, when his only similar previous experience with photography in the hostile conditions of a desert land was his pioneering work at Teneriffe.

Despite Smyth's painstaking and imaginative planning, some vexation with chemicals turned up when he began field-testing the camera. These problems were soon overcome, and the month of March was used in taking instantaneous views outside the Pyramid, photographs of travellers, animals, Jessie, and of his Arab assistant, Alec Dobree. The instantaneous views of life in Egypt, which are of intense interest to us today, apparently were not planned by Smyth, and the series was commenced only to test his apparatus before entering the Pyramid. He could scarcely mask his delight at the portability and short exposures of his custom-designed machine, and soon came to view his clumsier dry-plate apparatus as unnecessary. Indeed, the pictures from the 1 in. plates show more interesting composition and spontaneity than those from the larger plates.

The miniature wet-plate cameras were ready for their intended purpose, that of taking the first photographs of the interior chambers of the Pyramid. Candles and torches were sufficient to light the way for the curious tourists, but for photography Smyth required the equivalent of the sun. The brilliant light of burning magnesium wire, often suggested in the photographic journals as a theoretical possibility, solved this problem. Magnesium wire had become commercially feasible just before Smyth's trip to Egypt[11]. On 8th March 1864, Sir David Brewster received a sample of magnesium from Manchester and brought it to the regular meeting of the Photographic Society of Scotland in Edinburgh. Henry Talbot, a close friend of Smyth's, was invited to the meeting by Brewster and would certainly have conveyed news of it to Smyth, if Smyth had missed the meeting[12]. A successful portrait of Brewster and Talbot was taken at this meeting by John

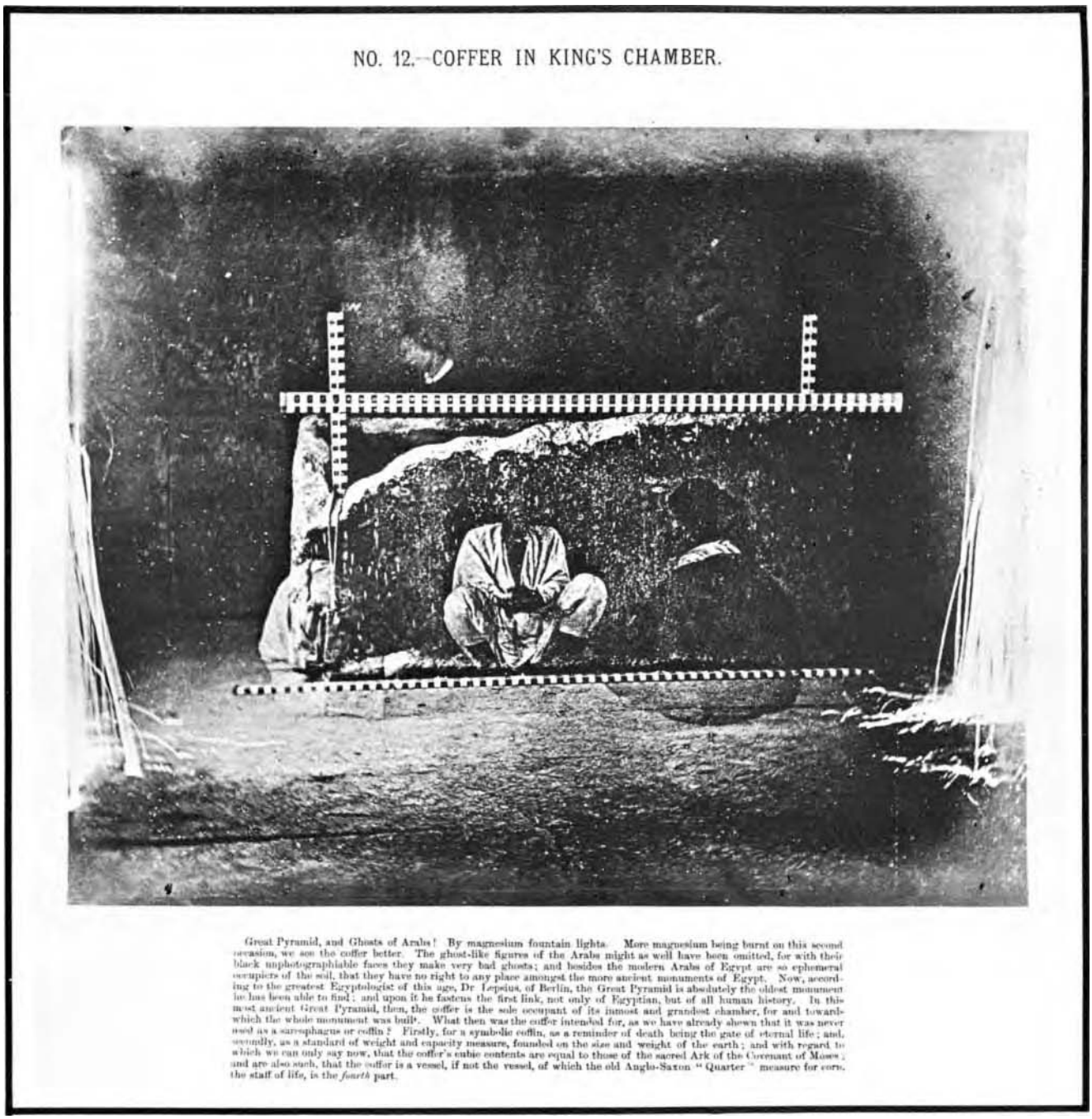



*Figure 13. Plate No. 12 from the 'Descriptive Album'. Another magnesium-light picture of the coffer. Smyth had difficulty with the magnesium separating during burning and going out. It is likely that the ghost-like character of the figures resulted from such an accident when the figures did not resume their prior location after the magnesium was re-lit. The streaks from the burning magnesium are visible on the edges. 20·0 × 24·5 cm.*

Moffatt using the magnesium light. A copy is preserved at Lacock Abbey. A few weeks later, during the annual report, the secretary made an interesting suggestion. Referring to potential uses for the new light, he included lighting interiors, and specifically suggested that magnesium light could be used to photograph the interior of the Great Pyramid[13]. Smyth was already planning his trip to Egypt, and it is intriguing to speculate on whether he made the suggestion or whether the idea came to him from this meeting. In fact, the prospect of burning magnesium engendered quite a bit of comment before the Smyth's departure. The *Telegraph* stated that:

> Was it a wild fancy to imagine the granite gods and goddesses of Misraim walking down Oxford Street, or writing explanations of themselves to a London editor? Not much more, at any rate, than that which is upon the point of fulfilment—a scientific 'savage' of Britain burning a metal that Egypt never heard of, to take, by a process that Moses with 'all the wisdom of the Egyptians'


*Figure 14. Plate No. 30 from the 'Descriptive Album'. This is one plate that can be positively identified from Smyth's writings as being from the 1 in. rather than the larger negatives. Many of these were apparently test exposures originally planned by Smyth merely to hone his technique with the miniature camera. As such, they seem to be composed with more attention to artistic concerns than to scientific ones. 17× 24 cm.*

> never dreamed of, a picture of a secret of secrets, which, hundreds of generations old, still defies the latest . . .'[14]

They couldn't resist feeling that Smyth might have spent too much time 'above the clouds at Teneriffe'.

The Magnesium Metal Company of Manchester supplied Smyth with a large quantity of the magic metal before his departure. He demonstrated burning the wire very freely on board ship and in Alexandria and Cairo, and considering its still relatively high cost, the 'poor man' must have received it on very favourable terms.

This is reinforced in a letter he sent to the Company's Mr Mather from Egypt, in which he praised the wire that Mr Mather 'took so much interest in supplying me last November'[15].

Magnesium-light photography had virtually no precedents by the time Smyth departed. A few demonstration portraits had been taken under controlled conditions, and Alfred Brothers had tried, although apparently with little or no success, to take pictures in a mine comfortably near Manchester.

Smyth's first attempt at photographing the interior of the Pyramid was thwarted on 17th April 1865 by an unexpected swarm of tourists. The next morning at six the coffer in the King's chamber became the first subject attempted. Using Brother's suggestion of a flambeau of magnesium wire ignited by alcohol, Smyth initially tried burning 60 grains of the metal but got a weak picture. A hundred grains did no better, and the third attempt of a 120 grains was even weaker, The chamber, filling with smoke from the slowly burning magnesium, was getting increasingly opaque. Over a week was spent in experimentation with different methods of getting the magnesium to burn fast enough to effect the exposure before the combustion products masked the light. The successful interior photographs must have been taken during the last week of April, for by 29th April Smyth recorded that he was starting to pack.

One of the methods that he tried has been identified by Arthur T. Gill as the first use of flashpowder. Seeking to burn the magnesium as rapidly as possible, Smyth recorded on 28th April that he 'tried the explosion of 1 oz.

of magnesium mixed with a small powderhorn (¼ its bulk) of gunpowder, mealed'. The resulting picture, if any, has never been located, and Smyth's diary leaves considerable doubt as to its success. 'Picture shows little rockets coming over indicating that something else might have been used with adv[antage]!' This technique must have been planned before Smyth left England, for in February 1865 Joseph Sidebotham referred to Smyth (who was still then in Egypt) and the plan they had worked out for photographically recording the coffer. It included 'flashing off a mixture of magnesium filings and nitre'[16].

By 7th May, less than five months after they arrived at the Pyramid, the Smyths were back in Cairo and preparing to leave for Scotland. The magnesium wire, picked up only days before their departure for Egypt, was successfully employed only days before their return. Considering the extremely limited body of knowledge about the photographic effects of burning magnesium, the virtually total lack of field experience in its use, and the hostile, closed environment of the Pyramid, it is a testimony to Smyth's ingenuity that he managed to get such successful pictures with such a short trial period.

The Smyths' return was initially triumphant. The photographic community had seen an interim report published in March 1865, and was given its first indication of success in a letter from Smyth to the Magnesium Metal Company published in the photographic journals on 2nd June[17]. Piazzi Smyth had taken 12 boxes of negatives, about half on dry plate and half on the miniature wet-collodion ones, for a total recorded number of 166 images[18].

There is very little documentation in his writings about which images were taken on what plates and, in the absence of the original negatives, only a few can be so tagged. Smyth's first step was to make enlarged positives from the negatives, but not being content with mere full-frame enlargements, he further refined them in printing. He mocked the 'rich man' who had his servants carry home large glass plates to make unimaginative copies merely by superimposition. Instead, the

> poor man, with his little box of very little negatives brought home modestly in his waistcoat pocket . . . sits down at a table, having a compound achromatic microscope before him . . . and then . . . wanders at will, truly the monarch of all he surveys, over the various parts of each picture . . . discovers characteristic detail which he never dreamed of before . . . or [decides] whether some special scientific purpose may not be better served by extracting one little subject alone out of the whole scene . . .[19].

We are so accustomed today to enlarging and cropping that it is difficult to realize just how heretical Smyth's technique was. In his day, enlarging was for the most part employed to produce weak positive prints, to be used as the basis for paintings. Smyth eagerly shared his enlarged positives with his friends as soon as he returned, but the first public exhibition of them appears to have been at the September 1865 meeting of the British Association for the Advancement of Science, in Birmingham. The Magnesium Metal Company displayed 30 of them, and William White incorporated a prepared statement by Smyth into a presentation on magnesium[20].

Lantern slides were the easiest way of showing the pictures to groups, and there are a number of accounts that indicate that Smyth's 1 in. negatives bore enlargement to as much as 15 ft square in these shows. Ten years later, examining the grain structure of the negatives under a microscope, Smyth recorded that the 'highest power of the microsope shows only details . . . of the texture of the thing represented'[21]. Glass positives were displayed in Manchester in November and December, 1865, but got their biggest play in Edinburgh the following year. On 23rd April 1866, Smyth delivered a lecture to the Royal Scottish Society, exhibiting 36 lantern slides with the help of John Nicol, a member of the Edinburgh Photographic Society and probably one of Smyth's students at the University. A printed catalogue was prepared[22].

An 'overcrowded house was entranced for two hours' by the exhibition of these slides at the Edinburgh Photographic Society on 8th May[23]. John Nicol again made the presentation, since Smyth was fully engaged in preparing his 1867 *Life and Work at the Great Pyramid*. A week later Nicol made a detailed presentation on the miniature wet-plate camera that was employed. Exhibitions and lectures followed in Glasgow, London, and many other cities, often conducted by John Nicol, and often done for charitable purposes.

The public was awed and most scientists were offended. On the other hand, some scientists, like Piazzi Smyth's close friend James Nasmyth, were excited by the possibilities. Nasmyth, who had recently discussed Smyth's work with Sir John Herschel, wrote enthusiastically to Smyth that 'My dear friend Sidebotham has told me of the magnesium light inside the King's Chamber! What a scene it must have been to see the most ancient of man's great works brought again to light by the most modern of his scientific aids. Photography and Light-par magnesium, both well worthy of the place & occasion!'[24] Most commentators were decidedly less enthusiastic once the novelty of Smyth's innovations wore off and was replaced by his increasingly religious tone. In particular, the Royal Society of London was much less receptive to his work than the one in Edinburgh and would not allow Smyth's research to appear as a formal presentation.

The publication of Colonel Sir Henry James' *Notes on the Great Pyramid of Egypt and the Cubits used in its Design* in 1869[25], under the official auspices of the British Ordnance Department and the financial sponsorship of Miss Burdett-Coutts of London, triggered Smyth's wrath. Noting that the pictures, published by photo-zincography, were scientifically inadequate illustrations and inferior to his own, Smyth angrily denounced the fact that his work was omitted entirely from James' otherwise complete historical account of researches at the Pyramid. *A Poor Man's Photography*, based on an 1869 lecture given to the Edinburgh Photographic Society and published as a book in 1870, was less a description of his photographic work than a diatribe against that of James. More significant descriptions of his photography appear in his *Life and*


*Figure 15. Plate No. 36 from the 'Descriptive Album'. Another 1 in. negative, demonstrating Smyth's fascination with the possibilities of instantaneous and candid pictures. He expressed similar joy with his earlier candid pictures of Russia. 19·0×24·5 cm.*

*Work*. In fact, Smyth never referred to his efforts as that of a 'poor man' until he came up against Miss Burdett-Coutt's fortunes four years after his trip.

The Royal Society of London's acceptance of James' work and their rejection of Smyth's as unscientific culminated years of increasing tension between them. Smyth angrily resigned his fellowship and published his vindictive, but at least partly justified, *The Great Pyramid and the Royal Society* in 1874[26]. He retained much of his influence in Edinburgh after this point but lost virtually all his remaining support in the rest of the scientific world.

Lectures on his Pyramid theories were so popular with the general public, though, that as early as 1867 Smyth complained that his original set of lantern slides was probably no longer suitable for exhibiting to the public 'as some of the plates, from being exposed so frequently in close proximity to a powerful oxyhydrogen light, are now beginning to show symptoms of "roasting" '[27].

The publication of *A Poor Man's Photography* in 1870 was probably viewed by Smyth as the final public statement about this photographic work. His trip to Egypt had been outside his normal duties, and the pressures of returning to work would certainly have limited the time that he had to devote to this personal project. In a 12th July 1871 letter to an unidentified correspondent he lamented that 'both the Observatory & University here press me sorely both by day & by night . . .'[28]. By the start of 1872, Smyth loaned at least some of the original negatives to Joseph Sidebotham to make lantern slides from them.

It seems likely that Smyth met Sidebotham through their mutual close friend, James Nasmyth, an amateur astronomer and inventor of the steam hammer[29]. They also had common ties with other members of the Manchester Literary and Philosophical Society, such as J. B. Dancer, and both participated in the heated discussions about stereo separation that were going on at the time. However it evolved, Sidebotham, a Mancunian calico-printer, was close friends with Piazzi Smyth by the time of Smyth's trip to Egypt. It was Sidebotham who suggested that Smyth should photograph measuring rods in the pictures in order to provide an accurate scale for measurement[30]. These rods, at least one of which is still preserved in the Royal Scottish Museum, were supplied by Sidebotham, probably from the stock of warp-measuring rods used in his textile firm. A special master measuring rod, made from well-cured wood from an antique organ, was also supplied by Sidebotham, but unfortunately did not fare well in the dry Egyptian climate. His connection with this aspect of the endeavour led to a paper on the application of measuring rods in photographic pictures, illustrated with some of Smyth's Egyptian photographs, to the Manchester Literary and Philosophical Society later in 1865[31].

Sidebotham, who already had considerable experience in printing lantern slides[32], received the negatives on 30th January 1872, but by July of that year was apologizing for the various delays that had come up and prevented him from enlarging the originals[33]. Sidebotham expressed reluctance to entrust the fragile, unvarnished negatives to anyone else to print, but the serious illness of his partner and a flood that destroyed part of his factory made the difficult job of enlarging too time consuming for him to proceed. The larger dry plates presented no special difficulties, but in September he wrote that 'I have got on very poorly with the Egyptian photos. I had no lens suited for enlarging the inch ones so I sent to Dallmeyer for one specially. Now I find I have no camera quite long enough to enlarge them in one operation'[34]. A month later Sidebotham said that he was leaving the 'enlargement of the little ones' until he had time to make a suitable enlarging camera[35].

Smyth had frequent requests for lantern slides, and Sidebotham's troubles with time and technical problems were proving annoying. The only answer was to turn over the valuable original negatives to another party. Sidebotham suggested a younger friend, John Smith Pollitt, whom he had known since the lad assisted him in making an amateur telescope[36]. Pollitt had already been making experimental dry plates for Smyth, and had impressed him with his earnest endeavours and experimental spirit.

Pollitt's was typical of the many small dry-plate businesses that had sprung up in the decades of the 60s and 70s. The bulk of these early manufacturers were essentially kitchen operations rather than factories, working by trial and error. Pollitt's seems to have been no exception. He billed himself not only as a maker of sensitive dry plates but also as an architectural photographer and a photographic printer and publisher. He became more intimately acquainted with Smyth's Pyramid work as he developed new types of dry plates for the never-accomplished repeat journey to the Pyramid. Late in 1872 Smyth instructed Sidebotham to turn over some of the original negatives to Pollitt for printing, for on 19th November 1872 Pollitt wrote Smyth that

> I hope to make the transparencies during this week & will hand them over to Mr Sidebotham to send to you as soon as done. I am greatly obliged to you for a sight of these beautiful negatives fraught as they are with so much interest. I shall take the greatest possible pains to get good transparent prints from them & you may rest assured of their perfect safety as long as they remain in my hands[37].

By the end of the year Pollitt was successfully making lantern slides by enlarging the original negatives using wet collodion the 'same as done by Mr Sidebotham'[38]. Pollitt soon was capable of producing lantern slides in quantity and was able to start offering them for sale to the public at two shillings each by 1874[39]. Pollitt must have enjoyed a good sale of these slides for at least a decade. In his advertisements for dry plates he included a notice about the lantern slides, offering a set of 50 in a grooved box for £5. 5s., and around 1879 even issued a separate catalogue for them[43].

This same set of 50 selected images was used in the production of the *Descriptive Album*. Pollitt had been experimenting with producing prints rather than transparencies for some years. Accompanying a communication to the Manchester Photographic Society in 1874, 'Remarks on the Enlargement of Negatives by the Wet Process,' Pollitt showed a number of diapositives and albumen prints made from Smyth's Pyramid pictures but observed that he was sceptical of any results from magnifying more than four diameters[41]. Nine months later he was able to show a 15×12 in. picture from one of the dry plate negatives that was described as being 'an excellent specimen of enlarging, being very perfect and sharp'[42].

Pollitt gained confidence with experience and by 1879 was in a position to supply pictures for sale enlarged at least two or three times as much, either as individual unmounted prints at 2s 6d or as the *Descriptive Album* set for £5 5s. Some of these were on display at the Exhibition of the Manchester Photographic Society in 1881[43].

The only clues we have to the methods of production employed in the *Descriptive Album* are contained in the preface written by Pollitt, where it is implied that the plates are made from 1 in. negatives rather than from the larger dry plates.

> Some Dry Plates were also taken of the usual stereoscopic size, viz. 3 inches square, and acted well on stones standing immoveable in sunshine; but for the secrets of the Pyramid's gloomy, mysterious interior, and for incidents of life and motion, the small camera and its tiny wet-collodion plates were found sufficiently sensitive.

Very little is stated about the technical procedure: 'I have . . . now made enlarged negatives of them which, though in some cases giving rather rough and rude prints, will I have little doubt, be gladly received by many, on


*Figure 16. Plate No. 40 from the 'Descriptive Album'. showing Sidebotham's measuring rods, and Mr Inglis, another Scotsman and an engineer, who took additional measurements for Smyth after Smyth left. 20×25 cm.*

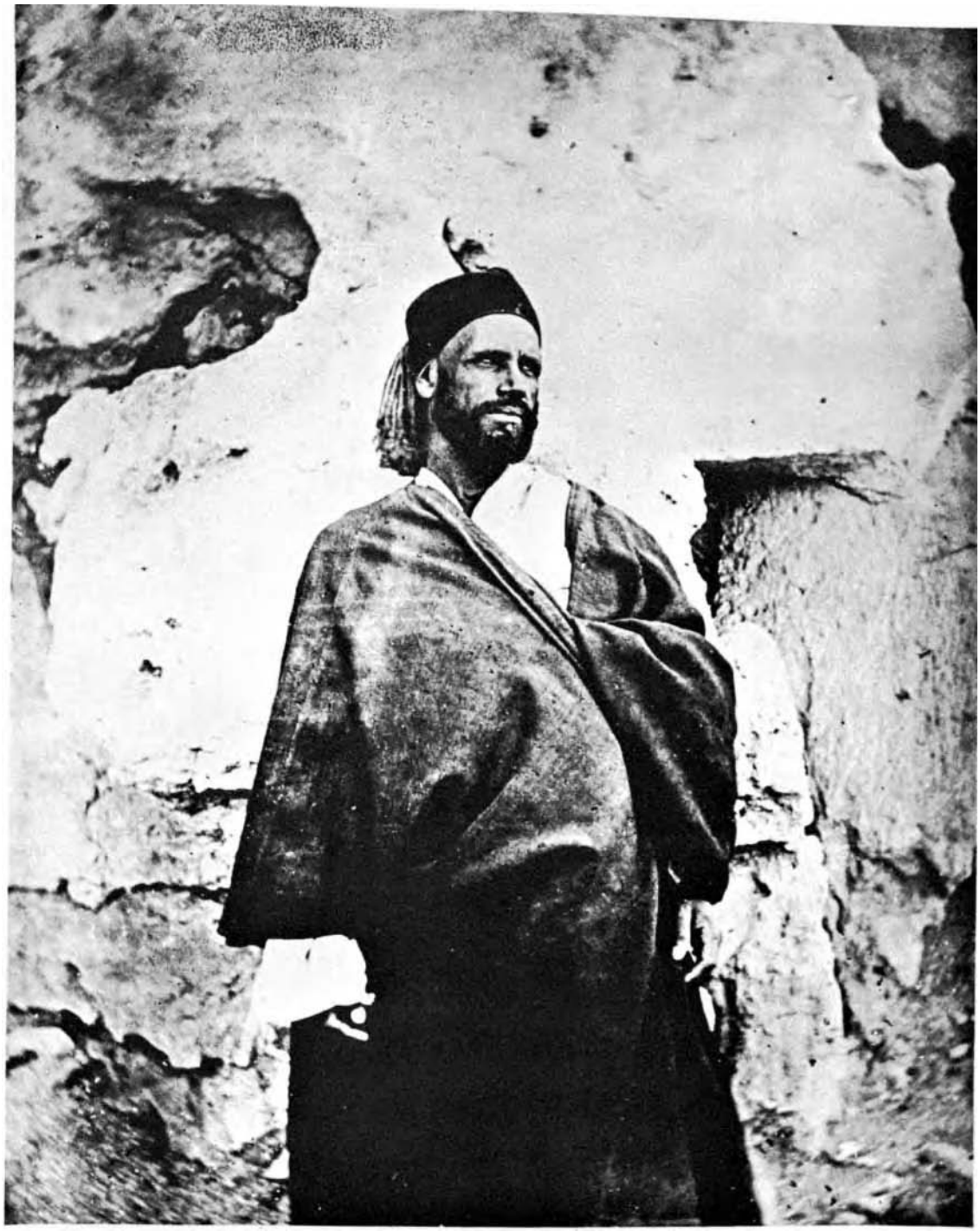
account of the subject they illustrate . . .'.

It might seem strange that these prints were not done by a photomechanical process. Smyth had, after all, been one of the most eager supporters of Talbot's photoglyphic engraving, and had had several of his pictures published experimentally in the new process, and had even visited Walter Woodbury's new factory. Pollitt would seem to have been just the type of experimentalist to be involved in one of the new processes that were starting to make heavy inroads into photographic publishing. Pollitt, however, was quite comfortable with the familiar albumen process. Praising the simplicity and fine tonal range of the albument print, Pollitt expressed his support for the more traditional method in 'A Plea for Silver Printing 'in 1882. He felt that proper processing, following the suggestions of Sir John Herschel, would overcome the main objection to silver prints, namely their lack of permanence[44].

How many copies of the *Descriptive Album* were issued? The nature of printing in silver defies any estimate since each set could have been printed individually. The copy at the Manchester Central Library, according to their records, was purchased direct from Pollitt for the full price and it is stamped 'rec'd 30 July 79'. It could very well be that this is the first copy that Pollitt sold. It may have been the only one sold but this seems unlikely. Smyth himself had at least one copy that he recorded on 17th January 1882: 'Sent this day, Pollitt's folio Pyramid vol. to Silvester Rollo, Hon. Sec. Photo Exhib., 2 India Buildings, Dundee'[45]. The exhibition of the Dundee and East of Scotland Photographic Association in 1882 was composed

*Figure 17. Plate No. 47 from the 'Descriptive Album'. Smyth's careful attention to detail enabled him to get extremely high resolution out of his miniature 'poor man's' negatives. It is impossible to determine the exact enlargement without knowing how much the original negative was cropped, but this is a minimum of 25× linear enlargement and still shows the fabric of the sheikh's outfit. 5×19 cm.*

NO. 47.—ABDUL SAMUD.



Pyramid Sheik of the Northern Pyramid Village: an honest and high-minded man; grandson of a nomade Sheik of the Desert, who entered Egypt and settled down on vacant land with his tribe, after the French wars and destructions under Napoleon Buonaparte.


*Figure 18. Concern over standardizing weights and measures prompted Herschel, Smyth, and many scientists to look at the system incorporated in the Great Pyramid. On this letterhead from an unidentified correspondent, Smyth is listed as a vice-president of an Ohio organization concerned with this issue. (Royal Observatory, Edinburgh.)*

of over 2000 pictures and was attended by 5500 visitors. This was one of the finest exhibitions of photographic work in the 19th century and Smyth's copy of Pollitt's album was displayed with the best items. It is specifically cited in the official report of the exhibition[46], and the reviewer for the *British Journal of Photography* noted that 'an interesting feature of the Exhibition is the folio containing photographs of the Great Pyramid by Professor C. Piazzi Smyth of Edinburgh'[47].

This author has so far been unable to trace Smyth's or any other copy than the Manchester Central's, but the facts of the case suggest that other copies certainly must have been produced. Given that the chief market for lantern slides and Holy Land Prints was religious and educational institutions, and especially taking into account the theories of Smyth, it is quite likely that copies would have been sold to institutions outside the mainstream of photo-history. Pollitt was still actively supplying Pyramid pictures three years after the initial publication of the folio, and the album was advertised by Smyth right up until 1890. This was not just an oversight on the part of Smyth's publisher for, in the corrected manuscript (in Smyth's hand) of the 1890 fifth edition of *Our Inheritance in the Great Pyramid*, he continued to devote Appendix V to an advertisement for this work[48]. It seems unlikely that Smyth and Pollitt would continue to advertise a special publication for 11 years if Pollitt had not sold at least an occasional copy. The expense of the letterpress text would have encouraged him to promote as many copies as possible.

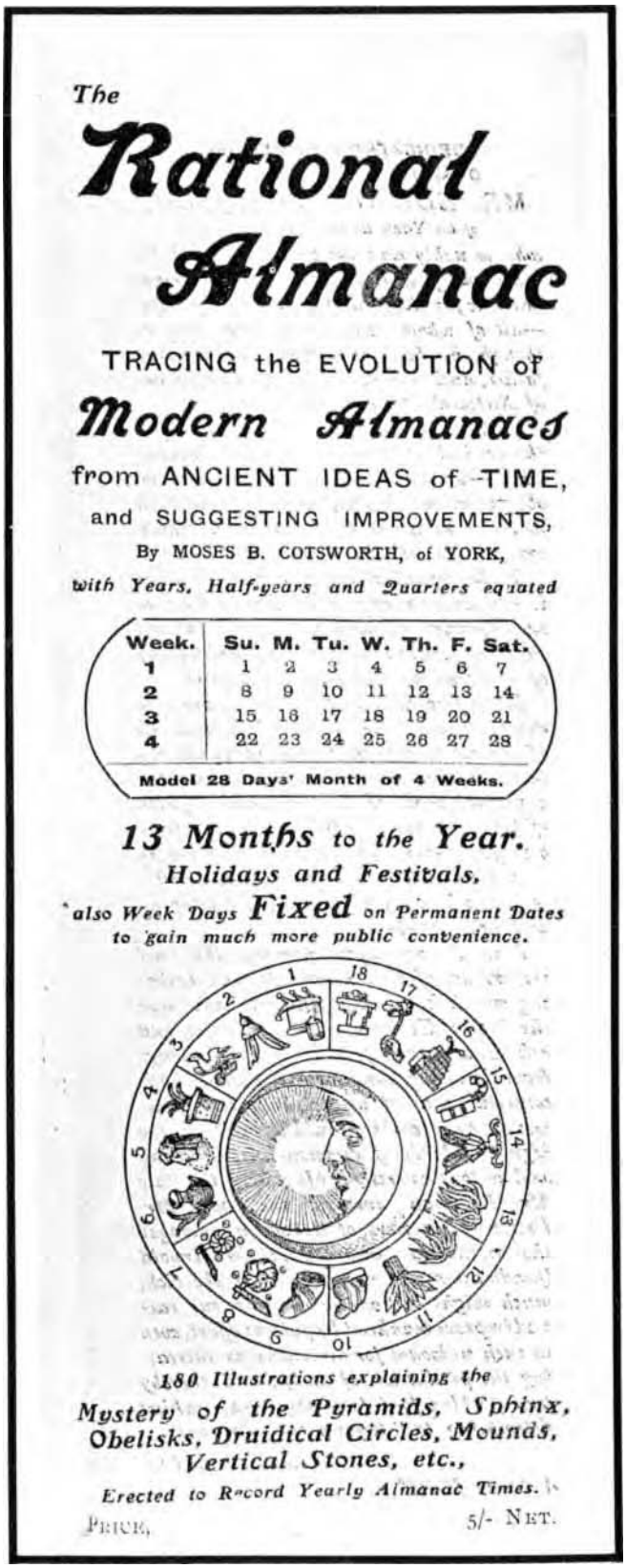
Very little else is known about Pollitt. He was president of the Manchester Photographic Society from 1884–1885, and was a fairly regular contributor to the photographic journals. The last meeting of the Manchester Photographic Society that he is recorded as having attended was 13th February 1890[49]. John Smith Pollitt died 'suddenly', at the age of 58, on 25th February 1890[50], but his death was not lamented officially in the Society reports until the 9th October 1890 meeting[51].

Perhaps it was Pollitt who was referred to in the minutes of the 28th August 1890 meeting of the Manchester Photographic Society when the secretary regretted to report the loss of the society's minute books from 1866–1884. It seems that 'an older member' of the society had taken them home to write a history, had recently died, and the books had been discarded with the rest of his effects[52].

Pollitt's business address was taken over by another individual who was to drop out of the city directory two years later. This entire area of Manchester was destroyed during the Second World War, along with the archives of the Manchester Literary and Philosophical Society, the only other likely repository for clues. It seems possible that Pollitt still held some of the negatives at his death, but it seems equally unlikely that any in his possession would have survived to this day. His will, probated on 11th April 1890, named his son John William Pollitt the executor, with his wife Eliza also mentioned. Unfortunately, the original negatives were not referred to. In the absence of any prominent designation, their appearance would have been simply that of small yellow stains in the middle of some microscope slides. Only an interested party would have recognized them for what they were. There were also pessimistic notes a century ago about their condition. Pollitt, in the preface, said that 'the original negatives were never expected to have lasted thus long'. In a presentation to his photographic society in 1874 he found it necessary to apologize for not showing Smyth's original negatives beside the enlargements, but explained that 'I cannot let you see the negatives themselves, even were I at liberty to do so, for they have never been varnished, and therefore would not be safe to handle'[53]. Smyth also observed that he had intensified some of the negatives with a uranium compound, and that they had begun to solarize and turn translucent by 1868, apparently without materially affecting their printing quality at that time[54].

Smyth retired from his post in Edinburgh and in 1886 moved to the smaller town of Ripon, near York. In a 'tall yellow-lid box' he recorded sending to his new coach house '4 microscope slide boxes of Egypt and clean glasses', indicating that at least some of the original negatives (perhaps one half of the stereo pairs?) were in his possession at that point[55]. Very little is known about Smyth after he moved to Ripon. The physical isolation from the scientific metropolis of Edinburgh was less devastating than the psychological isolation that Smyth created with his fervent and often blindly religious defence of his Pyramid theories. One by one his scientific friends dropped out of touch. There is compelling evidence to suggest that in his last years his wife Jessie was nearly his only close friend. She died in 1896, and he followed her in February 1900. They had no children.

Their will had been altered many times over the years in response to Piazzi Smyth's changing attitude towards his old friends and employees. Professor Alexander Herschel, a long-time friend, asked to be removed from the inheritance[56]. The final will left (with restrictions) the 'glass photographs' to the Royal Society of Edinburgh. This was apparently interpreted to mean only lantern slides and none of the Pyramid negatives was included in the original inventory of the material that was sent to them. The 'photographic albums' were left to Jessie's brother,



The

**Rational Almanac**

TRACING the EVOLUTION of

**Modern Almanacs**

from ANCIENT IDEAS of TIME,

and SUGGESTING IMPROVEMENTS,

By MOSES B. COTSWORTH, of YORK,

*with Years, Half-years and Quarters equated*

| Week. | Su. | M. | Tu. | W. | Th. | F. | Sat. |
|---|---|---|---|---|---|---|---|
| 1 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 2 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 3 | 15 | 16 | 17 | 18 | 19 | 20 | 21 |
| 4 | 22 | 23 | 24 | 25 | 26 | 27 | 28 |

Model 28 Days' Month of 4 Weeks.

***13 Months to the Year.***

***Holidays and Festivals,***

*also Week Days* ***Fixed*** *on Permanent Dates to gain much more public convenience.*

*180 Illustrations explaining the*

***Mystery of the Pyramids, Sphinx, Obelisks, Druidical Circles, Mounds, Vertical Stones, etc.,***

*Erected to Record Yearly Almanac Times.*

PRICE, 5/- NET.

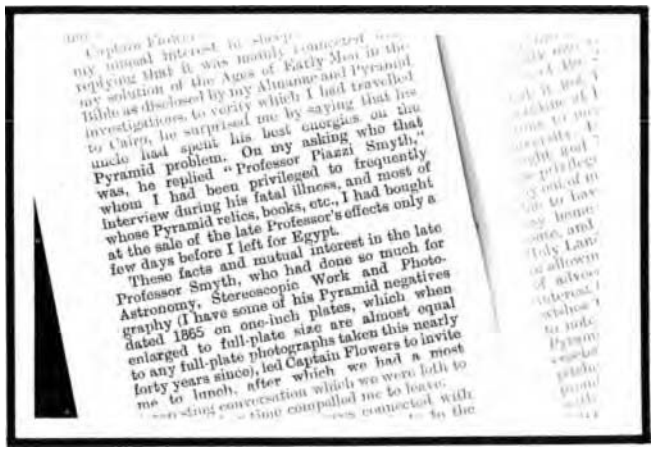


*Figure 19(a) and (b). A Yorkshire legislator, Moses B. Cotsworth, was heavily involved in a movement to standardize the calendar. In his 1904 'The Rational Almanac' he made several references to Smyth's work, and on p. 154d stated that he had purchased Smyth's Egyptian photographs at the estate sale. Thus, the originals left the Smyth family at this time, accounting for the fact that they have not been located by his surviving relatives.*

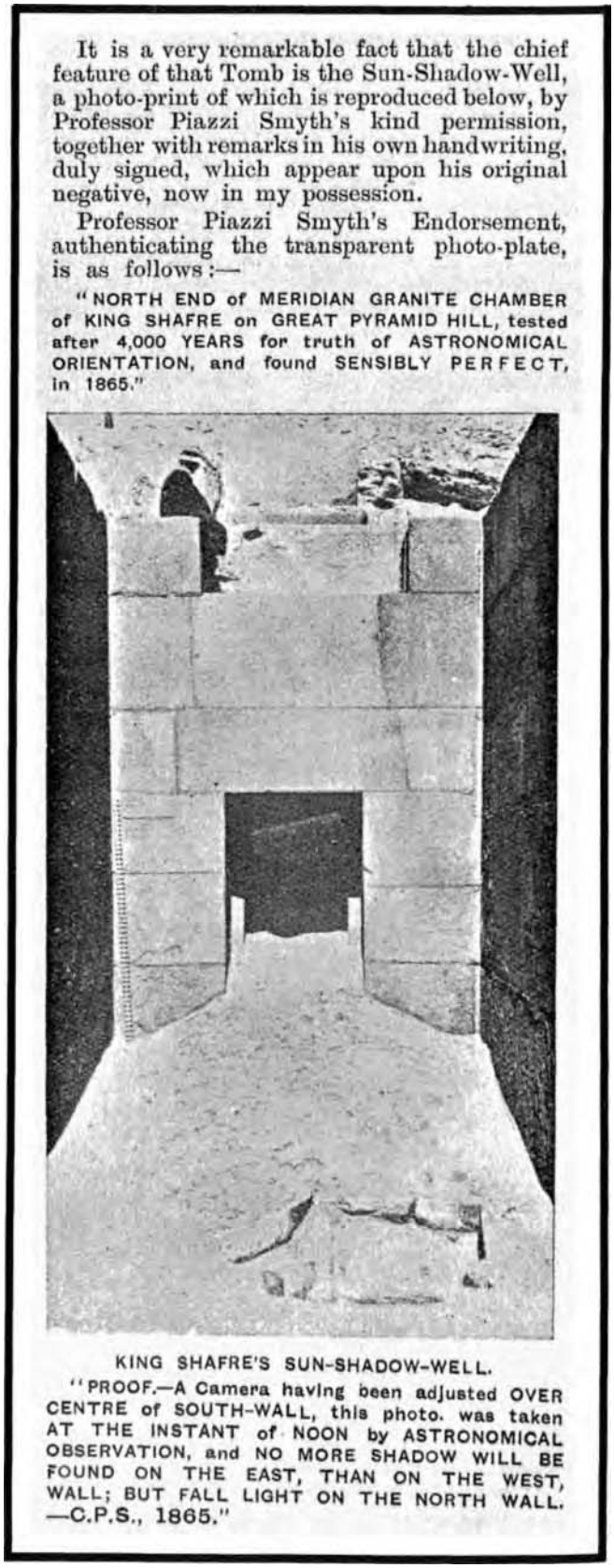
Thomas Duncan MacKenzie of Bombay. The MacKenzies and their immediate heirs were also given occupancy of the Smyth's house, 'Clova'. Sir Duncan George MacKenzie died in 1965, ending the occupation of this house, and it has since been converted to a nursing home. No trace of the albums has been found in wills, inventories, the existing buildings, or with the surviving MacKenzies.

From 2nd–5th October 1900, a country auction of the remaining effects was held by the firm of Richardson & Trotter (no longer in business) in Ripon. The catalogue[57] includes tempting mentions of lots labelled 'Photograms of the Great Pyramid'[58], 'Photo of Arab', 'Frame and photo of the Great Pyramid', a 'photograph microscope', and a number of other related items. It is likely that this remote auction was attended primarily by local people, more interested in purchasing furnishings than artefacts of history. Very little of this material has made its way into public collections in the Ripon/York area. One small lot of photographs by Smyth (not of Egypt) came through a friend and geologist, Dr Tempest Anderson[59].

It is still not known if Smyth recovered the negatives that he loaned to Pollitt, but at least a partial set of the original negatives did survive after Smyth's death and may survive yet today. Moses Bruine Cotsworth, a Yorkshire Railway employee at the time, wrote in his *The Rational Almanac* in 1904 that 'Professor Piazzi Smyth, whom I had been privileged to frequently interview during his fatal illness, and most of whose Pyramid relics, books, etc., I had bought at the sale of the late Professor's effects . . . I have some of his Pyramid negatives dated 1865 on one-inch plates, which when enlarged to full-plate size are almost equal to any full-plate photographs taken this nearly forty years since'[60]. One of Smyth's photographs is reproduced in *The Rational Almanac*, the first publication of these since Pollitt's album.

Cotsworth was a character in many ways as fascinating as Smyth himself. As a statistician for the railways he published a large number of 'direct calculators', small books of tables designed in the pre-computer age to simplify repetitive numerical operations in areas such as dividends, timber measures, and wages. *The Rational Almanac* was an expression of his greatest logical idea and burning passion.

*Figure 20. Page 176 of Cotsworth's 'The Rational Almanac'. This is the first publication of a Smyth Pyramid photograph that this author has been able to locate since the Pollitt album.*



It is a very remarkable fact that the chief feature of that Tomb is the Sun-Shadow-Well, a photo-print of which is reproduced below, by Professor Piazzi Smyth's kind permission, together with remarks in his own handwriting, duly signed, which appear upon his original negative, now in my possession.

Professor Piazzi Smyth's Endorsement, authenticating the transparent photo-plate, is as follows:—

"NORTH END of MERIDIAN GRANITE CHAMBER of KING SHAFRE on GREAT PYRAMID HILL, tested after 4,000 YEARS for truth of ASTRONOMICAL ORIENTATION, and found SENSIBLY PERFECT, in 1865."

KING SHAFRE'S SUN-SHADOW-WELL.

"PROOF.—A Camera having been adjusted OVER CENTRE of SOUTH-WALL, this photo. was taken AT THE INSTANT of NOON by ASTRONOMICAL OBSERVATION, and NO MORE SHADOW WILL BE FOUND ON THE EAST, THAN ON THE WEST, WALL; BUT FALL LIGHT ON THE NORTH WALL. —C.P.S., 1865."

It outlined and promoted a 13-month calendar designed so that the days of the week would always fall on the same date. He considered that in railroading alone this would save millions spent on printing new calendars each year and then in employee and customer time spent looking up dates. The historical basis for this change in the conventional calendar was supported in a number of areas, particularly in his interpretations of the meaning of the construction details and dimensions of the Great Pyramid. In this he found common ground with Piazzi Smyth and an appreciation of the scientifically valid photographic work that Smyth had done decades before in Egypt.

In 1907, Cotsworth was appointed by the British Columbian Government to reorganize their civil service[61]. By 1922, he had come to devote his full time to promoting his concept of the 13-month calendar. He was appointed the Expert to the League of Nations Committee on Calendar Reform from 1922–1931 and became the Director of the International Fixed Calendar League. In this capacity he visited over 60 countries and made a number of significant inroads into traditional calendar concepts. One of his supporters was George Eastman, who, according to Cotsworth's *New York Times* obituary, actually converted the Eastman Kodak factory to the new plan[62]. Since Cotsworth used photographic evidence (his own and others) in his calendar presentations, and since he owned and deeply appreciated Smyth's original negatives, it is certainly tempting to believe that he would have shown them to the great photographic pioneer. Eastman might even have acquired some of them as a curiosity.

At this point, it is not known how long Cotsworth kept the original Smyth negatives or what happened to them after he died in 1943. His son and daughter still live in the Vancouver area and were kind enough to check through family belongings in the hopes of finding the negatives still there. They were not located and there is no memory of these specific items.

Cotsworth willed his calendar materials to the Library at the University of British Columbia. There is no record of a detailed cataloguing and the collection has been split among various University departments. An investigation by Bjorn Simmonsen for the Museum of Anthropology in 1967 disclosed a large number of glass plates and photographic prints in the collection but these are not detailed in his report. There is one item still on file that points directly to the possibility that some Smyth material may be located at the University. In a folder marked 'Photo notes of Gt. Pyramid for Red Book of Smyth photos' is a typescript several pages long. It starts with an exact transcription of the Pollitt dedication. It is very likely that this was taken directly from Smyth's copy since the Pollitt album was not generally available.

There are two other possible explanations for the disposal of Smyth's material. Cotsworth's daughter remembers that some of her father's effects were lost at sea during the Second World War. Since Cotsworth maintained a London office, it is possible that the glass plates were left in England and not shipped until his death. Another interesting possibility turned up in 1970 when an album of Smyth's cloud photographs was sold in a Vic-

THE NEW YORK TIMES, SUNDAY, JUNE 6, 1943.

# COTSWORTH, MAKER OF NEW CALENDAR

**Sought Adoption of 13-Month Plan Before League in 1931 —Dies in Vancouver at 83**

**BACKED BY GEO. EASTMAN**

**He Expended Personal Fortune on Project—Traveled to All Sections of World**

VANCOUVER, B. C., June 5 (AP) —Moses B. Cotsworth, "father of he thirteen-month calendar," died here last night with the world still unsold on the project on which he expended his personal fortune and a lifetime of energy. His age was 83.

Mr. Cotsworth conceived an international fixed yearly calendar of thirteen months of twenty-eight days each, the thirteenth month to be named Sol and to come between June and July. He circled the world publicizing his proposal which he presented before the League of Nations in 1931. But it was tabled until 1935, by which time international affairs crowded it off the program.

**Worked With British Railways**

Special to THE NEW YORK TIMES.

ROCHESTER, N. Y., June 5— Mr. Cotsworth's calendar, with the backing of the late George Eastman of the Kodak Company, was installed for reasons of simplifica-

MOSES B. COTSWORTH
The New York Times, 1928

*Figure 21. Cotsworth became involved with the League of Nations in his efforts to standardize the calendar. One of his enthusiastic supporters was George Eastman and it is interesting to speculate that Cotsworth may have shared some of Smyth's pioneering miniature photographs with the man who introduced the Kodak. Cotsworth died in British Columbia. So far, it is not known if he had the original Smyth negatives with him when he died or what happened to them after his death. (Obituary and photograph copyright 'The New York Times' and used by kind permission.)*

toria bookstore. This was a personal collection and the most likely explanation for it coming from Ripon to Canada is via Cotsworth. This, of course, would indicate that he disposed of at least part of the collection.

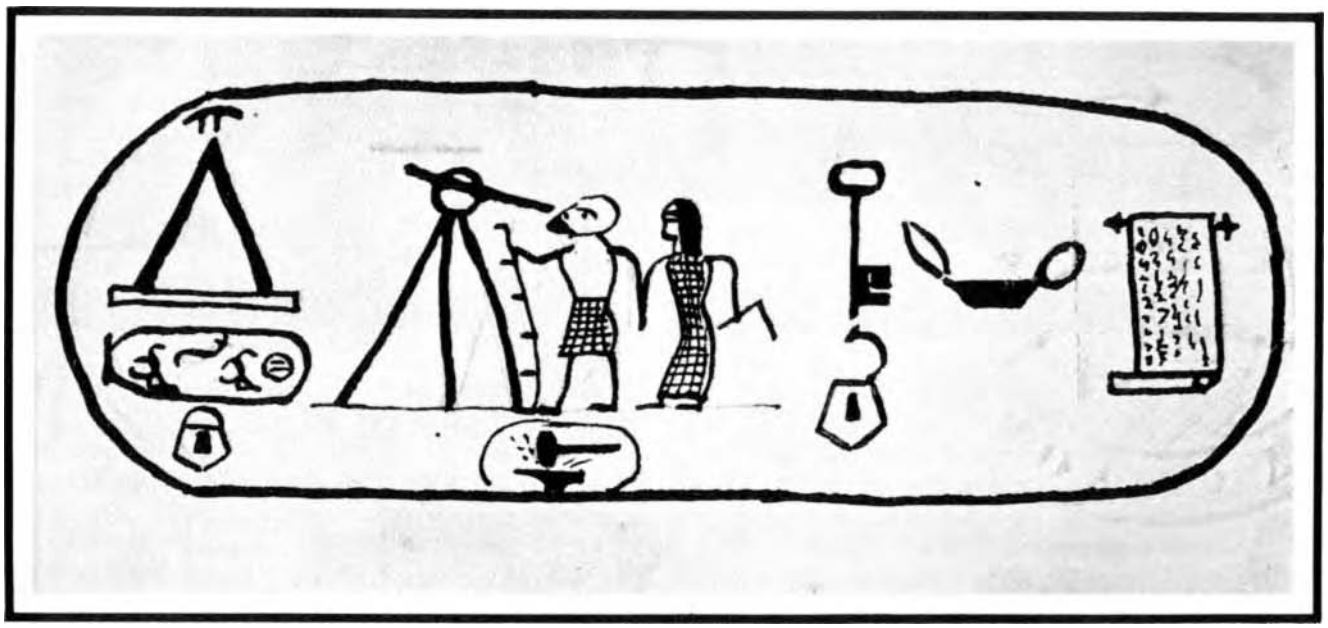
The story is told that Charles Piazzi Smyth had contracted with the Cooke firm of York to build him a camera so substantial that it might be buried with him so that he could photograph the Day of Judgement[63]. As it was, Piazzi Smyth was buried near his wife, under a tombstone shaped like a pyramid, but without the reinforced camera. However one views his beliefs about ancient divine guidance, Charles Piazzi Smith stands as one of the leaders in applying photographic technology to scientific documentation. His innovative 19th-century spirit took the curious results of the photographic experimenters and made them work for a purpose. Pollitt stated the case quite well.

> Let me urge on all who pursue the practice of photography either from love or necessity not to rest satisfied with the acquisition of just sufficient mechanical skill to repeat the results of other men's brains, but let each seek to unite with the most perfect manipulatory skill the profoundest scientific knowledge[64]. My object . . . has been to point out the usefullness of enlarged negatives for special purposes, and chiefly as aids to scientific research rather than beauty of result in an artistic sense; and the value of the method was so ably and practically illustrated by the learned Astronomer Royal for Scotland in his work at the Great Pyramid . . . although the smallest negatives taken there were but one inch square, and the largest not more than three, I have seen no lantern pictures which have answered their intended purpose more efficiently[65].

Even if Smyth's original negatives no longer survive, the legacies of the Royal Society of Edinburgh's lantern slides and the Manchester Central Library's copy of the *Descriptive Album*—both productions of John Smith Pollitt—stand as a testimony to one of the true pioneers of photography ●

*Figure 22. Piazzi Smyth's grave in Ripon, near York. Smyth did not get his wish of being buried with a camera strong enough to survive Judgement Day, but is at least buried under a pyramid-shaped tombstone. Jessie is buried next to him. (Photograph courtesy of Doug T. Atkinson, Ripon.)*

*Figure 23. A 'hieroglyphic' pasted in Jessie Piazzi Smyth's copy of 'Life and Work at the Great Pyramid', and presumably drawn by her. It shows the two Scots unlocking the secrets of the Great Pyramid using modern scientific instruments, after being given the Lamp of Truth with which to see God's message. Her copy of the book is now in the York Central Library. 3·5 × 9·0 cm.*



## ACKNOWLEDGEMENTS

The author is indebted to many individuals and institutions for their help. He would especially like the opportunity to thank the staffs of the following institutions: Central Library, Dundee; City of Vancouver Archives; Fox Talbot Museum, Lacock; History of Science Collection, University of Oklahoma; Humanities Research Center, University of Texas at Austin; Library, University of British Columbia; Manchester Central Library; Messrs. Peake & Company, London; National Library of Scotland; New York Times Picture Service; North Yorkshire County Archives; Public Trustee's Office London; Royal Observatory, Edinburgh; Royal Society of Edinburgh; Royal Society, London; Science Museum, London; Skellgarth's Library, Ripon; and the York City Archives. In addition the following individuals helped in many ways: Ms Elizabeth Airth, Mr Doug T. Atkinson, Mr J. B. Colson, Mr Frank B. Cotsworth, Mr Barney B. Hagar, Ms Valerie Lloyd, Lt. Col. Colin MacKenzie, Mr Harry Milligan, Mr John Muirhead, Lord Baden-Powell, Miss Barbara J. Pyrah, Dr Richard Rudishill, Mrs C. Ridley Scharff, Mrs Eileen Shorland, and Dr Dwight Teeter.

This research was supported in part by grants from the National Endowment for the Humanities and the University of Texas at Austin.

## REFERENCES AND NOTES

1. Charles Piazzi Smyth, *A Poor Man's Photography at the Great Pyramid in the Year 1865, compared with that of the Ordnance Survey Establishment, subsidized by London Wealth, and under the orders of Col. Sir Henry James . . . at the same place four years afterwards; a discourse delivered before the Edinburgh Photographic Society on December 1st, 1869*, Henry Greenwood, London (1870), pp. 12–13.
2. Arthur T. Gill, Photography at the Great Pyramid in 1865, *The Photographic Journal*, Vol. 105, No. 4 (April 1965), pp. 109–118.
3. Charles Piazzi Smyth, *Life and Work at the Great Pyramid during the months of January, February, March, and April, A.D. 1865; with a discussion of the facts ascertained* (Edmonston and Douglas, Edinburgh (1867), Vol. 2, p. 283.
4. An excellent survey of pyramidology is by Peter Tompkins, *Secrets of the Great Pyramid*, Harper and Row, New York (1971). Much of the background information on the Great Pyramid in this article is drawn from Tompkins' book.
5. John Taylor, *The Great Pyramid. Why was it Built? & Who Built it?* Longman, Green, Longman and Roberts, London (1859).
6. Smyth's manuscript notebook (6th June 1871), held by the Royal Society of Edinburgh.
7. Professor C. Piazzi Smyth, *Our Inheritance in the Great Pyramid* A. Strahan and Co., London (1864).
8. See Smyth's *Teneriffe: An Astronomer's Experiment*, Lovell Reeve, London (1858).
9. Most of the details about Smyth's trip are drawn from his manuscript notebooks held by the Royal Society of Edinburgh.
10. John Nicol, Photography in and about the Pyramids: how it was accomplished by Professor C. Piazzi Smyth, *British Journal of Photography*, Vol. 13, No. 318 (8th June 1866), pp. 268–270. This incorporates a very detailed description of the camera.
11. For example, 'The Magnesian [*sic*] light, *The Photographic News*, Vol. 4, No. 92 (8th June 1860), p. 70. A new manufacturing process for producing magnesium wire economically was started in Manchester in 1864.
12. Brewster letter to Talbot (8th March 1864), Science Museum Collection.
13. Photographic Society of Scotland, *The Photographic News*, Vol. 8, No. 299 (27th May 1864), p. 260.
14. Talk in the studio, *The Photographic News*, Vol. 8, No. 328 (16th December 1864), pp. 611–612.
15. Photographs of the pyramids by the magnesium light (10th May 1865 letter from Smyth to Mather), *The Photographic News*, Vol. 9, No. 352 (2nd June 1865), p. 258.
16. Joseph Sidebotham, On certain phenomena connected with the perspective and measurement of photographic pictures, *British Journal of Photography*, Vol. 12, No. 249 (10th February 1865), pp. 69–70.
17. *Ibid.*, and magnesium light at the pyramids, *The Photographic News*, Vol. 9, No. 339 (3rd March 1865), p. 107.
18. *Life and Work*, Vol. 2 (1867), pp. 279–292. (See Note 3).
19. *A Poor Man's Photography*, p. 15. (See Note 1.)
20. William White, Recent applications of magnesium, *British Journal of Photography*, Vol. 12, No. 280 (15th September 1865), p. 477; Chemistry Section, *British Association Report* (1865), p. 40.
21. Smyth's Manuscript notebook (23rd August 1875), Field photography 1874–5, held by the Royal Observatory, Edinburgh.
22. Professor C. Piazzi Smyth, *Exhibition of a Series of Photographs Illustrating The Land of Egypt, The Great Pyramid, The Second Pyramid, The Third Pyramid, The Sphinx, King Shafre's Tomb, Cliff Tombs, and Moving Figures* (extracted from the *Transactions of the Royal Scottish Society of Arts, 1865–6*), printed by Neill and Company, Edinburgh (1866).
23. Letter from the Society to Smyth (8th May 1866) held by the Royal Observatory, Edinburgh.
24. 30th September 1866, held by the Royal Observatory, Edinburgh. Herschel had earlier shown little enthusiasm for Smyth's theories, as evidenced in a 25th November 1864 letter to an editor: 'I could hardly, in any article I might write expressly on the Great Pyramid *avoid noticing* Prof Smyth's work—and with every disposition not to undervalue anything emanating from him, I *could not avoid* saying that everything *worth* noticing in it is contained either directly or implicitly in Mr. Taylor's book . . . a transformation of it for the worse . . . I had rather however not be the person to point out these things as I do not wish to annoy him—the more especially as I understand he is going to Egypt to measure the Pyramid himself and it is therefore most desirable that he should go to work with a mind undisturbed by controversy.' (Royal Society 24: 71).
25. Sir Henry James, *Notes on the Great Pyramid of Egypt and the cubits used in its design*, Thomas G. Gutch & Co., Southampton (1869).
26. Charles Piazzi Smyth, *The Great Pyramid and the Royal Society*, London (1874).
27. *Life and Work*, Vol. 2 (1867), p. 284. (See Note 3.)
28. Letter from Smyth to unknown correspondent (12th July 1871), Scottish National Library MS 1003 f. 150.
29. Nasmyth was deeply interested in photography and published his own photographically illustrated book with James Carpenter: *The Moon: considered as a planet, a world, and a satellite*, J. Murray, London (1874), 2nd edn.
30. 'The Secretary also read extracts from several letters from Professor C. Piazzi Smyth, approving of the suggestions made by Mr. Sidebotham, and of which he should certainly make use.' Literary and Philosophical Society of Manchester—Photographic Section, *British Journal of Photography*, Vol. 12, No. 249 (10th February 1865), pp. 76–77.
31. Joseph Sidebotham, On the application of measuring rods in Photographic pictures, *British Journal of Photography*, Vol. 12, No. 295 (29th December 1865), pp. 657 and 659. Also, Echoes of the month, *The Photographic News* (5th January 1866), p. 50. For an appreciation of Sidebotham see Harry Milligan's, Joseph Sidebotham: a victorian amateur photographer, *The Photographic Journal* (March/April 1978), pp. 83–87.

32. JOSEPH SIDEBOTHAM, on printing transparencies for the stereoscope and magic lantern, *British Journal of Photography*, Vol.11, No. 237 (18th November 1864), p. 460.
33. SIDEBOTHAM to Smyth (30th January 1872), held by the Royal Observatory, Edinburgh.
34. SIDEBOTHAM to Smyth (6th September 1872), held by the Royal Observatory, Edinburgh. This was apparently a Dallmeyer symmetrical doublet of 13.862 in. focal length, for in September 1892, Smyth wrote in his manuscript 'Museum copying camera' that 'said lens was kindly presented to me after the Egyptian expedition by the late Joseph Sidebotham Esq. of Manchester, as a copying lens . . .', Collection of the Royal Observatory, Edinburgh.
35. SIDEBOTHAM to Smyth (24th October 1872), held by the Royal Observatory, Edinburgh.
36. SIDEBOTHAM to Smyth (8th November 1872), held by the Royal Observatory, Edinburgh. In his later presidential address to the Manchester Photographic Society, Pollitt reminisced that 'I had begun in a small way, and with very mediocre appliances—including a cigar box and a lens of the spectacle glass family—to practise photography; but I was too young and inexperienced a student to aspire to the dignity of membership . . . my very kind friend, Mr. Joseph Sidebotham, one of its founders, gave me occasional invitations to these early meetings.' The time period referred to was the mid 1850s. On the attitude of our society—past, present, and future,' *British Journal ofPhotography*, Vol. 30, No. 1229 (23rd November 1883), pp. 713–714.
37. POLLITT to Smyth (19th November 1872), held by the Royal Observatory, Edinburgh. Smyth apparently was exploring other options, for an additional series of lantern slides was printed in France (by an unidentified photographer) and shown at a meeting of the Edinburgh Photographic Society on 27th November 1872. These were rated as inferior to Smyth's own productions. The under-exposure and harshness that they displayed was attributed to the fact that they were made from copy positives rather than from the originals. 'The series made in England were by Mr. Sidebotham, of Manchester, from the original negatives, and were very excellent, most of them almost if not quite, equal to those by Professor Smyth. It is understood that there is a probability of the negatives being entrusted to a Manchester firm for the production of lantern pictures for sale, and all who are interested in seeing what can be done in enlarging from inch negatives may have an opportunity of so doing.' It would appear from Sidebotham's letters that these were in fact Pollitt's early productions. (*British Journal of Photography*, Vol. 19, No. 658 (13th December 1872), p. 596.)
38. POLLITT to Smyth (2nd December 1872), held by the Royal Observatory, Edinburgh.
39. *Our Inheritance* (1874 New Edition), advertising page.
40. *Descriptive Catalogue of Photographs of the Great Pyramid Taken by Professor Piazzi Smyth*, J. S. Pollitt, Market Street, Barlows Court, Manchester. This catalogue (undated), inexplicably, lists only 48 pictures, but all of the titles and descriptions match those in the *Descriptive Album*. The two additional prints are photographic reproductions of drawings.
41. *British Journal of Photography*, Vol. 21, No. 724 (20th March 1874), pp. 135–136; *The Photographic News*, Vol. 18 (24th December 1874), p. 617.
42. *The Photographic News*, Vol. 18 (24th December 1874), p. 617.
43. The soirée and exhibition of the Manchester Photographic Society, *British Journal of Photography*, Vol. 28, No. 1125 (25th November 1881), p. 611.
44. J. S. POLLITT, A plea for silver printing, *British Journal Photographic Almanac* (1882), pp. 133–134. Pollitt adjusted rapidly to the influx of the new processes, however, and praised the Woodburytype before the Hyde Amateur Photographic Society just three years later: J. S. POLLITT, The influence of photography on popular taste and the graphic arts, *The Photographic News*, Vol. 29, No. 1391 (1st May 1885), pp. 285–286.
45. Smyth's manuscript notebook (17th January 1882), held by the Royal Society of Edinburgh.
46. *Honorary Secretary's Report: Dundee and East of Scotland Photographic Association Exhibition*, printed by John Durham & Son, Dundee (1882).
47. Exhibition of the Dundee and East of Scotland Photographic Association final notice, *British Journal of Photography*, Vol. 29, No. 1139 (3rd March 1882), p. 126.
48. Original manuscript in the Royal Society of Edinburgh.
49. Manuscript minutes of the Manchester Photographic Society in the Manchester Central Library.
50. *Manchester Guardian* (27th February 1890), 2nd edn., p. 8.
51. Manchester Photographic Society, *British Journal of Photography*, Vol. 37, No. 1589 (17th October 1890), p. 669.
52. Manuscript minutes of the Manchester Photographic Society in the Manchester Central Library.
53. J. S. POLLITT, Remarks on the enlargement of negatives by the wet process, *British Journal of Photography*, Vol. 21, No. 724 (20th March 1874), pp. 135–136.
54. Dr MANN, Professor Smyth's 'Great Pyramid' bath, *The Photographic News*, Vol. 12, No. 511 (19th June 1868), p. 297.
55. SMYTH's manuscript list 'Preparing furniture in Edinburgh for removal to Ripon', p. 7, held by the Royal Society of Edinburgh.
56. Copy held by the Royal Society of Edinburgh.
57. Catalogue of *Valuable Antique and Modern Furniture*, printed by Yorkshire Gazette, York (1900).
58. The term 'photograms' was being actively promoted at this time as a substitute for the word photographs. With this substitution, it is possible that this refers to Pollitt's album.
59. A copy of *Extracts from Cloud-Forms That Have Been* by C. PIAZZI SMYTH was given as part of the Tempest Anderson Bequest to the York Reference Library. Anderson received this copy from Smyth in 1895 and apparently remained friends with him until Smyth's death. The Yorkshire Museum also transferred three volumes of *Cloud-Forms* to the York City Archives in 1971. These were previously held by the Yorkshire Philosophical Society and may have come from the 1900 sale.
60. MOSES BRUINE COTSWORTH, *The Rational Almanac; Tracing the Evolution of Modern Almanacs from Ancient Ideas of Time, and Suggesting Improvements*, Moses B. Cotsworth, York (1904), p. 154d.
61. *Who Was Who 1941–1950*, Vol. IV, A. & C. Black, London (1951).
62. Cotsworth, Maker of New Calendar, *The New York Times* (Sunday, 6th June 1943), p. 42. George Eastman published and supported a number of articles and tracts on calendar reform, specifically mentioning Cotsworth. An example is his The Importance of Calendar Reform to the Business World, *The Nation's Business*, Vol. 14, No. 5 (May 1926), pp. 42 and 46. The Eastman Kodak Company officially adopted the thirteen month calendar on 1st January 1928, and still uses it internally today.
63. Quoted from Dr TEMPEST ANDERSON in 'Analecta', *British Journal of Photography* (15th July 1910), p. 539.
64. J. S. POLLITT, Photographic effeminacy, *British Journal Photographic Almanac* (1885), pp. 78–80.
65. J. S. POLLITT, On enlarged negatives, *British Journal Photographic Almanac* (1887), pp. 109–110.