



Plaster Peaks, Photography, and the Spread of Scientific Knowledge: The Tale of Tenerife

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Upon his return from setting up an astronomical observatory on a mountain on Tenerife, Scottish Astronomer Royal Charles Piazzi Smyth sought a photographic image to help make his *Report on the Teneriffe Astronomical Experiment of 1856* more compelling to the Lords Commissioners of the Admiralty and to circles of professional and amateur astronomers. So he turned to James Nasmyth, a retired Scottish engineer and fellow astronomy enthusiast, to create a plaster model of the volcanic craters on the peak of Tenerife to be photographed and featured as the report's frontispiece. After the circulation of his study in this journal, which secured Smyth's reputation in scientific circles, he took the model and lantern slides of the plaster mountain peak on a popular lecture series. These images were later printed, along with his journey's stereo views, in a book for an audience that wanted a simulated three-dimensional 'armchair tourism' experience of the Tenerife mountain of its own. This article examines this early stereocard project, plaster models, and their scientific veracity as one way scientific ideas gained traction using a mass-friendly visual language.



The English mathematician, physicist, and astronomer Sir Isaac Newton postulated in his 1704 treatise *Opticks* that astronomy would be more efficient if only the Earth's own atmosphere were not so often in the way. He suggested viewing the sky with telescopes in the 'most serene and quiet air' that might be found 'on the tops of the highest Mountains above the grosser Clouds'.¹ To test Newton's suggestion, 152 years later in 1856, the Italian-born, British scientist, and Scottish Astronomer Royal Charles Piazzi Smyth — frustrated by the coal dust choking the cloudy Edinburgh skies — set up a mountaintop astronomical observatory on a peak of Tenerife, the largest of Spain's Canary Islands.² The volcanic island, Smyth argued, was a preferable location for the clearest views of celestial phenomena because 'of all high mountains the most quickly accessible from England, [it was] the most easily climbed, and [had] the very considerable elevation of 12,200 feet'.³

Smyth personally took stereo-photographic views of every step of this journey, including images of his crew, the boat trip, setting up camps, constructing an observatory, climbing mountains, the rugged terrain, and of the island's plants and rocks (*Figs. 1, 2*). He also kept a detailed meteorological journal. Smyth previously trained as a painter and was taught photography by pioneering British practitioners William Henry Fox Talbot and Sir John Herschel, but his interest in photography was solely in its value as a research tool. He was an occasional dabbler in the medium who nevertheless still preferred words, diagrams, and sketches to illustrate his astronomical theories.⁴ Smyth previously used photography as the basis for woodcut illustrations to include in the Royal Observatory of Edinburgh's reports and recognized its utility for rendering accurate likenesses — even though he felt the images needed some refinement for publication.⁵ Nevertheless, as Larry Schaaf suggests, Smyth's Tenerife photography helped establish the medium as a documentary tool (p. 290).

Stereo photography, born just five years before Smyth's Tenerife trip, consisted of viewing through a binocular-like device two nearly similar photographs made by a camera with two lenses spaced at a distance similar to that between our eyes. When re-viewed through a device that isolates the view of each eye, the images simulate real

¹ Sir Isaac Newton, *Opticks; or, A Treatise of the Reflections, Refractions, Inflections, and Colours of Light*, 4th edn, corrected (printed for William Innys, 1730), Prop. VIII, Prob. II, p. 98.

² The current preferred spelling for the island is 'Tenerife', although in the mid-nineteenth century, it was frequently spelled 'Teneriffe'. Smyth and his crew use the latter spelling. This article adopts today's standard spelling unless the older spelling was used in artwork and publication titles, direct quotes, and citations.

³ Larry Schaaf, 'Piazzi Smyth at Teneriffe: Part I The Expedition and the Resulting Book', *History of Photography*, 4.4 (1980), pp. 289–307 (p. 289).

⁴ *Ibid.*, p. 289.

⁵ *Ibid.*, p. 289.



Fig. 1: Charles Piazzi Smyth, *Culminating Point of the Peak of Teneriffe, 12,198 Feet High Showing the Interior of the Terminal Crater of the Mountain* (1856), albumen print, stereograph, 17.78 × 8.89 cm, in C. Piazzi Smyth, *Teneriffe – An Astronomer's Experiment* (Lowell Reeve, 1858). Public domain.



Fig. 2: Charles Piazzi Smyth, *Sheepshanks Telescope First Erected on Mount Guajara, the Peak of Teneriffe in the Distance* (1856), albumen print, stereograph, 17.78 × 8.89 cm, in C. Piazzi Smyth, *Teneriffe – An Astronomer's Experiment* (Lowell Reeve, 1858). Public domain.

life with three-dimensional effects, absorbing the viewer in a spectacular facsimile that differed from real-life views by breaking scenes into separate planes of receding flatness.⁶ The audiences for Smyth's work — scientists, stereography enthusiasts, and the general public — would have been familiar with the illusory effects of this type of photography. As Smyth wrote in the preface to his book of stereo views, this innovation best expressed the 'bewitching qualities' of the landscape of Tenerife using the recently introduced book stereoscope manufactured by the company Negretti and Zambra.⁷

Upon his return Smyth shared these stereo photographs and his travel and research accounts with scientific and stereo-photography journals read by amateur and professional astronomers alike, including the Lord Commissioners of the Admiralty and the Royal Society.⁸ Journals were the main means by which scientific societies and people newly fascinated with stereo photography communicated their discoveries, and by which these new ideas were debated and, hopefully, accepted as settled science. Smyth's research appeared in *Philosophical Transactions*, the *Transactions of the Royal Scottish Society of the Arts*, the *Notices of the Proceedings of the Royal Institute of Great Britain*, and in an official account titled *Report on the Teneriffe Astronomical Experiment of 1856*, which included an imagined aerial stereo view of James Nasmyth's plaster model of Tenerife's Great Crater (commissioned by Smyth) on its cover (Fig. 3). With this image, Nasmyth tantalized viewers with seductive three-dimensionality while also appealing to his readers' enthusiasm for seeing the crater from a then unprecedented photographic aerial viewpoint with ideal controlled lighting. Positioning such a composite view on the cover of a scientific report helped Nasmyth's stereo view — made by sculpturally aggregating dozens of drawings of Tenerife and Moon craters and from Smyth's notes and measurements — enjoy the status of scientific truth. Plaster models and stereo views highlighted a desire to understand a problem in a new way, in a new dimension, at a time when direct observation was not possible of — for example — a side view of one of the Moon's craters, or an aerial view of the peak of Teide (the mountain on Tenerife). Smyth's stereo views also circulated in early photography enthusiast circles, in the *Stereoscopic Magazine*, and other non-scientific publications. They were later printed in large quantity as the first known book of stereo views, *Teneriffe: An Astronomer's Experiment*, in 1858.⁹ In the preface Smyth recommends readers view the

⁶ The camera Smyth used likely featured a sliding lens that he moved between sequential exposures (Schaaf, p. 296).

⁷ Charles Piazzi Smyth, *Teneriffe, an Astronomer's Experiment; or, Specialities of a Residence above the Clouds* (Lovell Reeve, 1858), p. xi.

⁸ Schaaf suggests that Smyth did not take the photographs with an intent to reproduce them, even though that is exactly what he did fairly soon after he finished his trip (p. 296). For more discussion on the role of amateur astronomers during the nineteenth century, see Allan Chapman, *The Victorian Amateur Astronomer: Independent Astronomical Research in Britain, 1820–1920* (Wiley/Praxis Publishing, 1998).

⁹ About 1600 copies of the book sold initially. Schaaf notes that 'this was a very substantial sale for any book of this period,

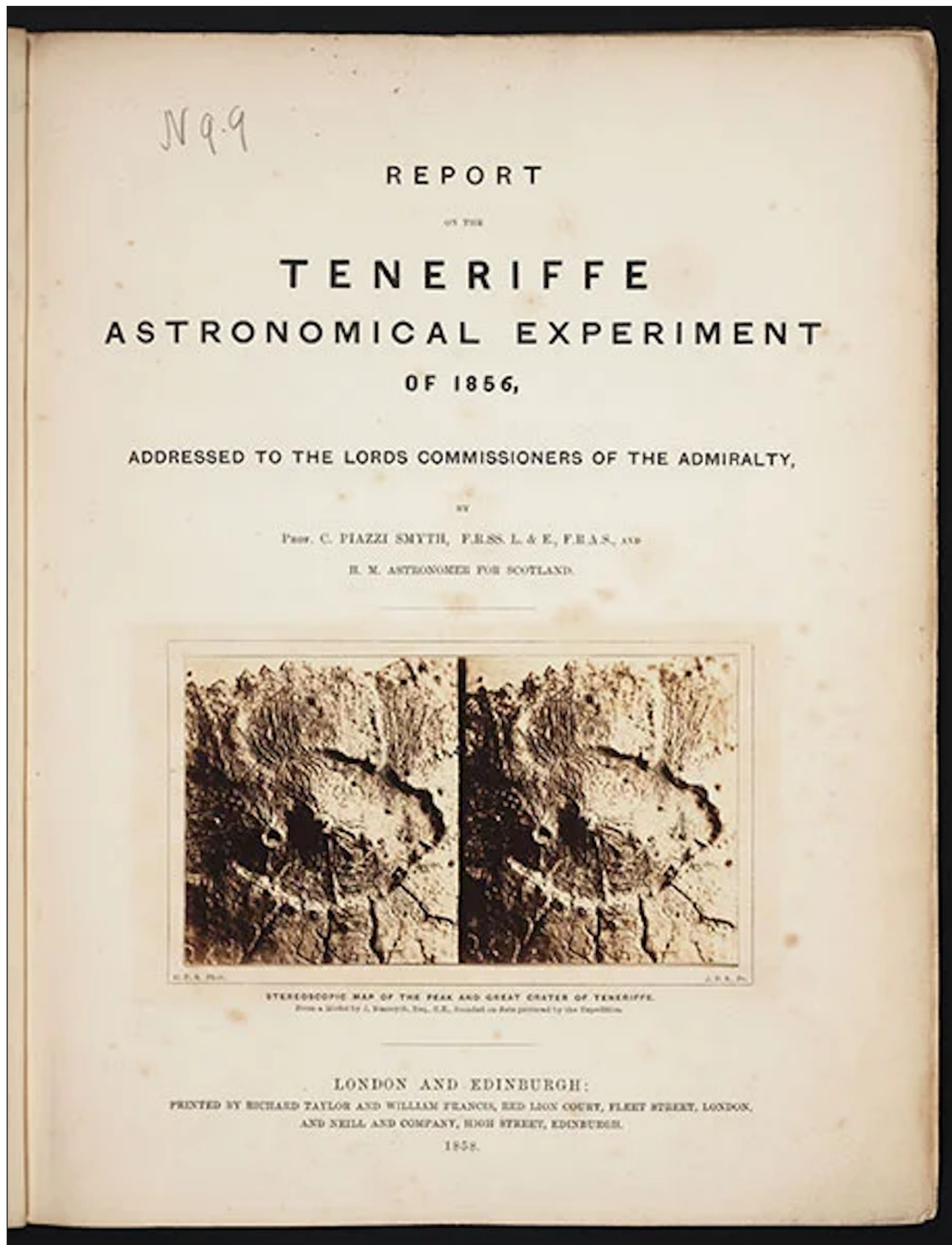


Fig. 3: J. Nasmyth, *Stereoscopic Map of the Peak and Great Crater of Teneriffe* (1858), photograph of plaster model, in C. Piazza Smyth, *Report of the Teneriffe Astronomical Experiment of 1856: Addressed to the Lords Commissioners of the Admiralty* (printed by Taylor and Francis, 1858), cover. Public domain.

individual pages with Negretti and Zambra's book stereoscope, which required viewers to rest the book on a flat horizontal surface and sit the viewer on top of the image without removing the stereo views from the page (Fig. 4).¹⁰ These publications and their related spin-off projects, such as slide shows and viewings of the plaster models, provided a way to share scientific advances and make knowledge accessible across both professional and amateur audiences, as well as for the general public.

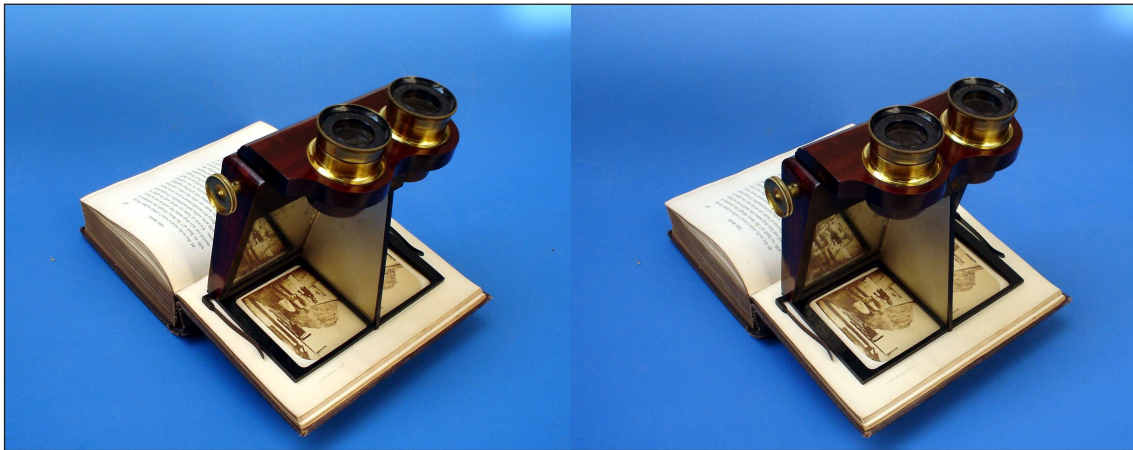


Fig. 4: David Starkman, Smith, Beck & Beck book stereoscope (1859). Smyth's Tenerife book was reproduced with the intent of being viewed by devices such as these. The stereo images remained in the book as the viewing device rested on top of the photographs and the viewer looked at a slightly different image with each eye. Courtesy of David Starkman, Stereo World.

This article considers the types of photographic, hand-drawn, or sculpted information reported from Smyth's Tenerife journey and the differing scientific truth issues these images conjured. It also considers how he used photographs to evoke three-dimensionality, such as via the stereo view and photographed plaster model, both of which drove home the 'reality factor' of celestial phenomena to his readers and viewers. Illustrated periodicals created an appetite for astronomy, while explaining and exciting a Victorian audience about scientific advances. Smyth's project was published a little over a decade after the first photograph appeared as an engraving in the *Illustrated London News* reporting Queen Victoria's attempted assassination in

particularly so for one of this novelty and high price' (p. 304, emphasis in original). As Smyth recounts, 'I commenced, with the assistance of Mr Lovell Reeve of London, the publication of a book on the results of my little astronomical experiment on the Peak of Teneriffe in 1856. Mr. Reeve, long known for his exertions in improving the illustrations of scientific works, jumped at the idea of availing himself of my stereoscopic photographs for the plates of the book, and opened a correspondence to that end with the company of the long name.' Charles Piazzi Smyth, 'On Photographic Illustrations for Books', *Transactions of the Scottish Society of Arts*, 5 (1861), pp. 87–92 (p. 88).

¹⁰ Smyth, *Teneriffe*, p. xi.

1842. The halftone process, which translated and reproduced photographs as a series of dots that represented varying grayscales when seen at arm's length, first appeared in daily newspapers on 4 March 1880, when the *Daily Graphic* published the first known news photograph, *A Scene in Shantytown, New York. Reproduction Direct from Nature*.

Despite a fervour for photography in some British scientific circles (and the enthusiasm of Smyth's friend and fellow astronomy enthusiast Herschel), the scientific utility of the medium (announced relatively recently in 1839) was not universally embraced — including by Smyth himself. For that reason, Smyth turned to illustration and hand-rendered images to explain and communicate celestial phenomena and to make tangible analogies to Earth's features, and he shared these with his peers. Smyth's landmark stereoscopic book — filled with many photographs initially printed by his wife Jessica Piazzzi Smyth — relies on photography as a means to document the scientific journey, rather than to verify or report his scientific discoveries.¹¹

Smyth's developments mark a milestone moment in the history of data visualization. Nasmyth's nimble movement from two to three dimensions, and back again, also offers a conceptual precursor to the processes of scientific information visualization using models to access new perspectives and scientific insights, and to explain ideas more persuasively. This play between scales and dimensions allowed Nasmyth to use photography to draw analogies between the geological processes on the Earth and those on the Moon, and between random everyday phenomena such as wrinkles on an ageing hand and the formation of mountains.¹² Nasmyth's process of moving between the human hand and the camera by drawing, modelling, and photographing his plaster models reflects the British scientific community's ambivalence about this new medium's promise as a method of communicating their discoveries. Removing the human hand from the subject-creation process and trusting photography was not a step either Smyth or Nasmyth were ready to take — yet. As a result, the project was chronicled and reported by a mix of plaster-crafted subjects that were photographed, stereographic documentary images of the scientific journey that simulated the three-dimensional experience, and illustrations of celestial phenomena.

¹¹ C. Piazzzi Smyth, *Report on the Teneriffe Astronomical Experiment of 1856, Addressed to the Lords Commissioners of the Admiralty* (printed by Taylor and Francis, 1858), p. 574. Rose Teanby notes that Jessica Piazzzi Smyth's role as an assistant in printing her husband's work was not unusual. Constance Talbot, for example, provided such assistance to husband William Henry Fox Talbot, too. For more on the position of early women photographers in the United Kingdom, see Rose Teanby, 'A Pioneering Legacy: Early Women Photographers of Great Britain and Ireland 1839–1861' (unpublished doctoral thesis, De Montfort University, 2024).

¹² James Nasmyth and James Carpenter, *The Moon Considered as a Planet, a World, and a Satellite*, 4th edn (Murray, 1903), Plate II, facing p. 48.

Chronicling the Tenerife journey, photographically, and in stereo views

When Smyth was the Astronomer Royal for Scotland, based in Edinburgh, he asked for and received a £500 grant — the equivalent of about £49,770 in 2024 — to take a telescope to the top of Mount Teide in Tenerife. His goal was to discover if Newton's idea of viewing the sky from above the clouds offered more accurate information than viewing it through clouds and smog in Edinburgh. This sum was only a portion of what he needed, so he secured additional donations and advice from the London-based fellow Astronomer Royal Sir George Airy and Herschel (an astronomer who suggested Smyth try hyposulfate of soda to stop photochemical reactions before an image became too dark, which worked).¹³ It was Herschel who encouraged Smyth to take stereo photographs to record the trip and to describe Tenerife's ecology and geology for the benefit of other scientists and the general public.¹⁴ Smyth hired a crew and was transported in the 140-ton yacht, *Titania* (owned by noted engineer Robert Stephenson) to Tenerife, with chemist and amateur astronomer Hugh Pattinson's borrowed equatorial refracting telescope on board.¹⁵ Being well connected in the United Kingdom in the polymathic Victorian era had its advantages.

They set sail at the end of June 1856. Smyth's account of the voyage was published in scientific and stereo-photography publications, and brought the adventure to life with stereo views and descriptions of how the ocean waves 'broke in a broad white sheet, like snow sparkling in the sun'.¹⁶ He noted the difficulties of navigating trade winds, the sightings of the foaming scum that reminded him of J. M. W. Turner's seascapes, and descriptions of various kinds of clouds (pp. 10–11). The trip, Smyth wrote, was an ever unfolding adventure in which 'something new or strange, was diversifying every hour' (p. 6). His travel narratives included observations germane to scientists in other fields as it took viewers on a vicarious tour of faraway lands. Upon the first sight of Tenerife, Smyth described the unmistakable view: 'The "Island of the Blessed", the site of the Elysian fields, according to poesy, the hot and sunburned African isle of travellers, beaconed with a cone 12,000 feet high, as a landmark for all wandering sailors!' (p. 21). The volcanic peak of Teide soon hosted an astronomy laboratory Smyth would build and name Alta Vista Observatory (See Fig. 1).

¹³ Schaaf notes that 'it was true that in the days when [Smyth] actively corresponded with Herschel he had practised the calotype quite successfully' (p. 290).

¹⁴ Ibid., p. 291.

¹⁵ Olin J. Eggen, 'Charles Piazzi Smyth', *Astronomical Society of the Pacific Leaflets*, 7.313 (1955), pp. 1–8 (p. 3) <<https://articles.adsabs.harvard.edu/pdf/1955ASPL....7...97E>> [accessed 11 July 2025].

¹⁶ Smyth, *Teneriffe*, p. 5.

Smyth's accounts — part armchair tourism and part travel log that contextualized the scientific project — also comment on how he felt as an 'English gentlem[a]n' among the women of Tenerife, who wore kerchiefs and shawls to protect the 'wearers from the hot and piercing rays of the sun', and whose 'olive-cheek[s] and dark beaded eyes' possessed 'mysteries'.¹⁷ (Never mind that Smyth was on this trip with his then new wife.) He goes on to discuss the landscape, Tenerife's other inhabitants (men and animals), architecture, the food, merchants, products they saw at the market, and the government officials who welcomed them. The stereo images combined with his written accounts recreated an immersive adventure yielding interdisciplinary knowledge, wonder, and cross-cultural encounters with the 'Other'.¹⁸

Smyth's accounts and images were hailed by readers as 'delightful reading to anyone interested in astronomical side-lights', as they fed the narrative of adventurous travel that was a popular theme in commercial stereocards.¹⁹ After setting the scene, Smyth's accounts and stereo photographs describe the challenges of setting up camp and hauling telescopes and other gear and supplies up the mountain to the crater. He copiously documented his journey with photographs to allow stereocard viewers to vicariously join his adventure but, like most professional astronomers, he preferred instead to draw diagrams and make naturalistic sketches of his telescope-bound celestial observations. As Alan Hirshfeld points out, 'Photography, as it was practiced then, was noxious, imprecise, and inefficient. Few astronomers envisioned the new technology's potential to surpass the capabilities of human sight at the eyepiece of the telescope.'²⁰ Smyth's stereographs reinforced his project's narrative while perhaps compensating for photography's shortcomings when it came to capturing views from suspended positions and angles for scientific use. But they also expanded stereography from the loose stereocard into a book format.

Astronomical discoveries and photography (or the lack thereof)

The group first set up a darkroom tent, as well as a temporary observatory atop Mount Guajara, a dormant volcano four miles south of Teide, and about 8900 feet above sea level.²¹ They made astronomical observations there for about a month. Smyth hailed

¹⁷ Ibid., pp. 32, 29, 34–35.

¹⁸ For more on the stereograph's connection to the phenomenon of 'armchair travel' and the creation of visual 'virtual realities', see Joan M. Schwartz, 'The Geography Lesson: Photographs and the Construction of Imaginary Geographies', *Journal of Historical Geography*, 22.1 (1996), pp. 16–45, doi:[10.1006/jhge.1996.0003](https://doi.org/10.1006/jhge.1996.0003).

¹⁹ Eggen, p. 3.

²⁰ Alan W. Hirshfeld, 'Picturing the Heavens: The Rise of Celestial Photography in the 19th Century', *Sky and Telescope*, 107.4 (2004), pp. 36–43 (p. 38).

²¹ Schaaf describes this step of the Tenerife story: 'On 14th July, more than 20 horses and mules, with their drivers, began the laborious process of carting the bulky Anglo-Saxon instruments up the steep and rough mountain. Starting

the clarity of the stars as he saw them through his Sheepshanks telescope (see *Fig. 2*).²² Here, he recorded the first known data of the Moon's temperature and documented the appearances of sunspots, planets, and hundreds of stars. Dust and sulphur fumes from the nearby active volcanos, however, irked Smyth and 'spoiled many of the photographic plates'.²³ Moreover, photographs were unable then to be taken from hot-air balloons to access aerial views from multiple angles, leaving Smyth to focus instead on sketching scientific phenomena and employing Nasmyth to create plaster models of the peak's Great Crater, for example.²⁴

They shortly moved camp in search of even clearer views at Alta Vista, but it was beyond the elevation that equipment-bearing mules could reach so the crew had to haul equipment by hand. Smyth again noted the amazing clarity of the telescope's views, but also that the light was twice as penetrating, prompting him to adjust his photographic exposures.²⁵ His time at Tenerife more than affirmed Newton's expectations that being above the clouds was far preferable for making astronomical observations, while also challenging Smyth's photography skills. He produced new information on the optical phenomenon of the 'Airy Disc' — a diffraction pattern of concentric circles formed by a light-reflecting object when light passes through an aperture (*Fig. 5*). He explained this phenomenon in drawings, which allowed him to avoid the challenges and trial and error of taking photographs through a telescope, a technique that John Adams Whipple had conquered only two years earlier, with much difficulty.²⁶ Smyth also described the appearances of binary and compound stars with added detail, commented on the appearances of Jupiter and lunar craters, and his body of research was the first to positively detect heat emanating from the Moon.

at sunrise and climbing all day, the party reached the 8700 feet high point of Guajara a few minutes after sunset. The native porters departed immediately, leaving the British party to fend for itself. Fortunately, Piazzini had begun his astronomical training at the Cape by making field surveys in rough country' (p. 295).

²² Smyth noted that the clarity was stunning from atop Mount Guajara: '[He] found the space-penetrating power extended from mag. 10 to mag. 14, and so great an improvement in definition, that a magnifying power of 240 could be used with more satisfaction on the mountain, than one of 60 in Edinburgh.' C. Piazzini Smyth, 'Report of Proceedings of the Astronomical Expedition to Teneriffe, in 1857', *Proceedings of the Royal Society of London*, 8 (1856–57), pp. 528–29 (p. 528) <<https://www.jstor.org/stable/111409>> [accessed 11 July 2025].

²³ Schaaf, p. 297.

²⁴ To date, the oldest surviving aerial photographs are James Wallace Black's 1860 views of Boston from a hot-air balloon. However, Gaspar Félix Tournachon (known as 'Nadar') photographed the French village of Petit-Bicêtre (now Petit-Clamart) from a hot-air balloon at a height of 262 feet, although none of these images have survived. Smyth's project predated these experiments.

²⁵ Schaaf, p. 297.

²⁶ Kris Belden-Adams, 'John Whipple, William Bond, and George Bond, *The Moon*, No. 37', *Smarthistory*, 30 June 2022 <<https://smarthistory.org/john-whipple-william-bond-and-george-bond-the-moon-no-37/>> [accessed 11 July 2025].

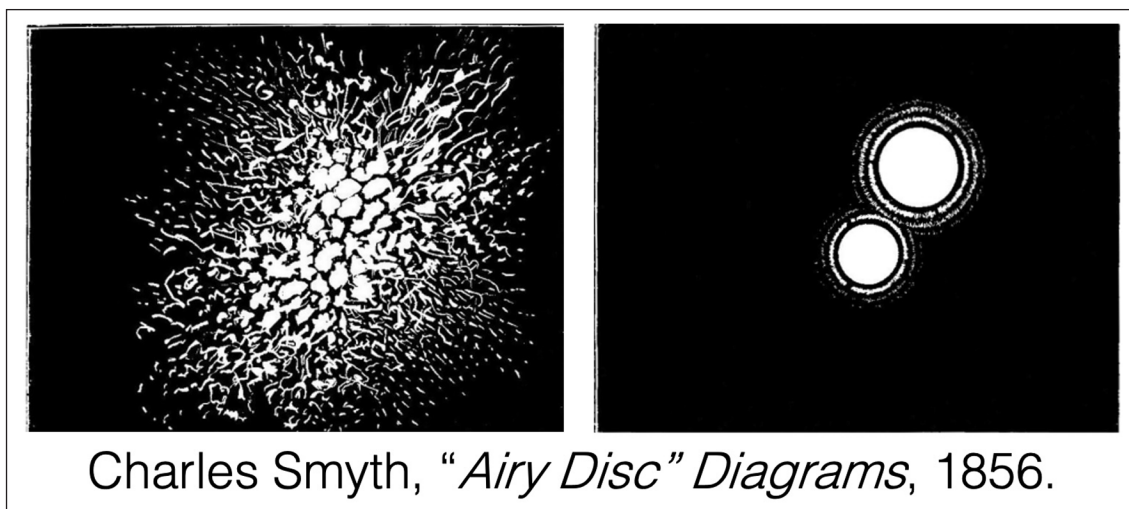


Fig. 5: Charles Piazzi Smyth, Airy disc diagrams (1856), engraving, in *Astronomical Observations Made at the Royal Observatory, Edinburgh*, 12 (1855–59), p. 513. Public domain.

Milestones in data visualization

In mid-nineteenth-century United Kingdom, journals were the primary means by which scientists spread word of and debated their observations and discoveries. Scientific circles were populated with professionals such as Smyth, as well as polymathic ‘able amateurs’ such as plaster-crater maker James Nasmyth, who made the plaster model for the frontispiece of the official report on Smyth’s journey that featured an imaginary aerial view of the peak and Great Crater of Tenerife based on Smyth’s measurements and observations (see Fig. 3). Photography’s presumed documentary truth value enhanced the credibility of Nasmyth’s plaster model based on Smyth’s accounts. Stereo views drove home the ‘reality factor’ of the journey, even though Smyth was at first sceptical about the medium’s ability to be a surrogate witness for his audience.²⁷ Smyth recognized what Herschel suggested: that photography would reinforce his written accounts and make them feel more tangible and ‘real’. He opted to document the journey with photographs, but preferred instead to draw diagrams and make naturalistic sketches of his telescopic celestial observations, even though John Whipple, William Bond, and George Bond successfully photographed the Moon in 1852, using the great refractor equatorial mount telescope at Harvard University, and John Willam Draper had photographed the Moon in 1840 — a mere year after the medium of photography was publicly announced. Smyth’s scientific readers would also have been accustomed to seeing astronomical advances illustrated by drawings, no matter how excited they were to see his stereo photographs bring the Tenerife trip back to three-dimensional

²⁷ Schaaf, p. 299.

life. However, the narrative of Smyth's stereographic views hint at photography's limitations in the late 1850s for documenting astronomical and geological phenomena, shortcomings that aerial travel photography from hot-air balloons would soon render moot (in 1858–60). Smyth's stereographs also unveil a conscious preference and habit within scientific circles to turn to the human hand to render scientific advances visible.

Smyth's motivations for using photography to document the Tenerife trip differed from those that moved him to commission retired Scottish engineer and inventor Nasmyth to make a plaster model of the volcanic peak of Teide on a 1/30,000th scale for his *Report on the Teneriffe Astronomical Experiment*. Nasmyth's telescopes and astronomical observations — including the ones illustrated by the plaster models — were so well regarded by amateurs and professional scientists that he was welcomed into the inner circle of the United Kingdom scientific intelligentsia, such as by Herschel, whose pioneering contributions to the medium of photography included the invention of the cyanotype, or blueprint process. Nasmyth's model showed a view of the volcanic peak of Teide that was not yet accessible to humans, given that air travel by plane would not be possible for another five decades.²⁸

Nasmyth's plaster model was carefully and dramatically lit from the side, as Louise Devoy notes, to accentuate 'the variations of form', and then photographed, circumventing the impossibility of capturing such a photograph without a model.²⁹ The model was based on Smyth's notes, dozens of sketches by Nasmyth, and on his lunar observations, published in 1855.³⁰ As effigies, nevertheless, they were well received by readers as truthful representations of their subjects:

No more truthful or striking representations of natural objects than those here presented have ever been laid before his readers by any student of Science; and I may add that, rarely if ever, have equal pains been taken to insure such truthfulness.³¹

²⁸ Smyth, in a lecture in 1858, described Nasmyth's crater model of Tenerife: 'while employing upon it all that artistic skill for which he is so well known to all present, [Nasmyth] has yet conformed most faithfully and conscientiously to all the measurement particulars of length, breadth, and height, that I could furnish him with.' C. Piazzzi Smyth, 'On Certain Connecting Points between Lunar and Terrestrial Volcanoes', *Monthly Notices of the Royal Astronomical Society*, 18.5 (1858), pp. 156–62 (p. 158), doi:[10.1093/mnras/18.5.156](https://doi.org/10.1093/mnras/18.5.156).

²⁹ Louise E. Devoy, 'Lunar Crater Models: Tools of Persuasion, Popularization and Shared Knowledge', *Nuncius*, 35.2 (2020), pp. 300–32, doi:[10.1163/18253911-03502006](https://doi.org/10.1163/18253911-03502006). Smyth describes the illumination of the photographs: 'This was done at the lecture by means of a Drummond lime ball light, which was afterwards employed in magnifying and exhibiting, by optical pictures, a series of thirty-six photographs of volcanic features, at from 7,000 to 12,200 feet above the sea-level. Mr. Nasmyth had also very kindly allowed six of his large and unequalled drawings of the moon's surface to be suspended in the room, for the purpose of contrast and comparison.' Smyth, 'On Certain Connecting Points', p. 158.

³⁰ Devoy, p. 300; James Nasmyth, 'The Moon and its Surface Inequalities', *Strines Journal*, 4 (1855), pp. 110–15.

³¹ J. Norman Lockyer, review of James Nasmyth and James Carpenter, *The Moon Considered as a Planet, a World, and a Satellite* (1874), *Nature*, 12 March 1874, pp. 358–61.

Three-dimensional models made scientific phenomena and information tactile, textural, volumetric, and grounded in ‘tangibility and actuality, making the work [...] legitimate’.³² Nevertheless, when Nasmyth’s craters from the official report cover were viewed through a stereographic viewer, the relatively flat tonal value range and shallow depth of field of both images minimized the three-dimensional illusion. While they may have disappointed habitual stereo-image viewers with less seductive illusions of depth than other images, the plaster-model stereo photographs added legitimacy to the scientific observations on which the images were based by granting them visual tangible form. The staging of stereographic illusion itself was seductive to an audience that enjoyed such images as modes of entertainment that reconstituted space and time.³³ Smyth’s stereo views transported viewers to faraway places and offered them scenes aggregated from data, drawings, and Nasmyth’s imagination that appear ‘real’. The images and corresponding narratives could be re-viewed, reread, and recontextualized by readers across multiple points in time.

Plaster moonscape craze

From the early 1850s plaster models of Moon craters and mountaintops led Smyth and Nasmyth to realize that this modelling technique could help them study and understand Tenerife’s volcanic crater more effectively. The Tenerife crater model reminded viewers that many astronomical phenomena were explainable by analogy to our own planet.³⁴ Nasmyth had started making his own plaster models of Moon craters ‘as a means of overcoming the challenge of trying to photograph the Moon directly in the 1850s’.³⁵ His models began as dozens of **drawings**, which Nasmyth continually refined and translated into a three-dimensional plaster model. He then photographed the model

³² Omar Nasim, ‘James Nasmyth on the Moon; or, On Becoming a Lunar Being, without the Lunacy’, in *Selene’s Two Faces: From 17th Century Drawings to Spacecraft Imaging*, ed. by Carmen Pérez González (Brill, 2018), pp. 147–87 (p. 184), doi:[10.1163/9789004298873_007](https://doi.org/10.1163/9789004298873_007). Nasim further notes: ‘As we have already seen, geology was surely another science where the use of physical models was prevalent. Indeed, it has been argued that physical, geological models were used as forms of experiment — that they were even “technologies of the imagination”’ (p. 184); Thomas Brandstetter, ‘Time Machines: Model Experiments in Geology’, *Centaurus*, 53.2 (2011), pp. 135–45, doi:[10.1111/j.1600-0498.2011.00216.x](https://doi.org/10.1111/j.1600-0498.2011.00216.x); and Naomi Oreskes, ‘From Scaling to Simulation: Changing Meanings and Ambitions of Models in Geology’, in *Science without Laws: Model Systems, Cases, Exemplary Narratives*, ed. by Angela N. H. Creager, Elizabeth Lunbeck, and M. Norton Wise (Duke University Press, 2007), pp. 93–124, doi:[10.1215/9780822390244](https://doi.org/10.1215/9780822390244). For another take on the productive side of models, see Natasha Myers, *Rendering Life Molecular: Models, Modelers, and Excitable Matter* (Duke University Press, 2015), doi:[10.1215/9780822375630](https://doi.org/10.1215/9780822375630).

³³ Kris Belden-Adams, *Time Warped: Photography, Temporality, Modernity* (Routledge, 2020), pp. 1–6.

³⁴ Devoy, p. 312.

³⁵ Devoy, p. 314. Henry Blunt’s model of the Eratosthenes crater was finished in electrotype frosted silver, and won a prize in 1852. See *Exhibition of the Works of Industry of All Nations: Reports by the Juries on the Subjects in the Thirty Classes into which the Exhibition was Divided*, Presentation Copy (Clowes, 1852), Class X, p. 312.

to transport the information back into two dimensions — for easy portability and sharing in publications. Functionally, this process of reconstituting and sharing visual representation fluidly from one dimension to another encouraged viewers to imagine new possibilities, perspectives, and worlds, while moving from drawing to sculpture, and then, to photography.³⁶

As an amateur astronomer, Nasmyth had been content with drawing what he saw in the telescope, a process that he felt made him look more carefully at his subjects.³⁷ But by the 1850s, plaster models of the Moon's craters gained widespread popularity in European astronomy circles, especially models that illustrated similarities between the Moon's geographical features and the Earth's (*Figs. 6, 7*). Nasmyth and Smyth knew of the then well-known plaster models by English chemist Henry Blunt, who used the emerging technology of electrotyping to reproduce and distribute his plaster model of the Moon's Eratosthenes crater. In addition to bringing it to astronomy group meetings and at meetings of the British Association for the Advancement of Science, Blunt's model of Eratosthenes, the deep lunar impact crater, reappeared in 1851 at the Great Exhibition and was exhibited within the broad category of 'Class 10: Philosophical, Musical, Horological, and Surgical Instruments'.³⁸ Blunt won a prize for this model, with judges noting that it was 'beautifully executed, representing very accurately this part of the moon'.³⁹ Charlotte Readhouse's detailed relief model of the full Moon as a lunar globe also appeared in the same galleries at the Crystal Palace exhibition, and an early daguerreotype photograph of the Moon was exhibited by John Whipple, William Bond, and George Bond to enthusiastic crowds.⁴⁰

This fervour for plaster models and visualizing the Moon and the Earth's landscape was further kindled by the 1854 publication of photographs of plaster models of the Alpine mountains Monte Rosa and the Zugspitze by German brothers Adolph and

³⁶ For more on the role of the plaster model in early photography, see Geoffrey Batchen, 'An Almost Unlimited Variety: Photography and Sculpture in the Nineteenth Century', in Roxana Marcoci, Geoffrey Batchen, and Tobia Bezzola, *The Original Copy: Photography of Sculpture, 1839 to Today* (Museum of Modern Art, 2010), pp. 20–26.

³⁷ John Adams Whipple described the difficulties of making a 'well defined, beautiful daguerreotype of the Moon', noting that 'nothing could be more interesting than its appearance through that *magnificent* instrument, but to transfer it to the silver plate, to make something tangible of it was quite a different thing.' John A. Whipple, letter, *Photographic Art-Journal*, July 1853, p. 66, emphasis in original.

³⁸ *Exhibition of the Works of Industry of All Nations: Reports by the Juries*, p. 312.

³⁹ *Ibid.*, p. 312; 'Messrs. Marshall's Great Exhibition Medal', *Shrewsbury Chronicle*, 6 February 1852.

⁴⁰ '1851 Great Exhibition: Official Catalogue: Class X: Charlotte Readhouse', entry 677, Grace's Guide to British Industrial History <https://www.gracesguide.co.uk/1851_Great_Exhibition:_Official_Catalogue:_Class_X.:_Charlotte_Readhouse> [accessed 12 July 2025]. It is interesting to note that these other Moon effigies won awards, but one made by a female creator did not. That topic is beyond the purview of this article, but merits further study.

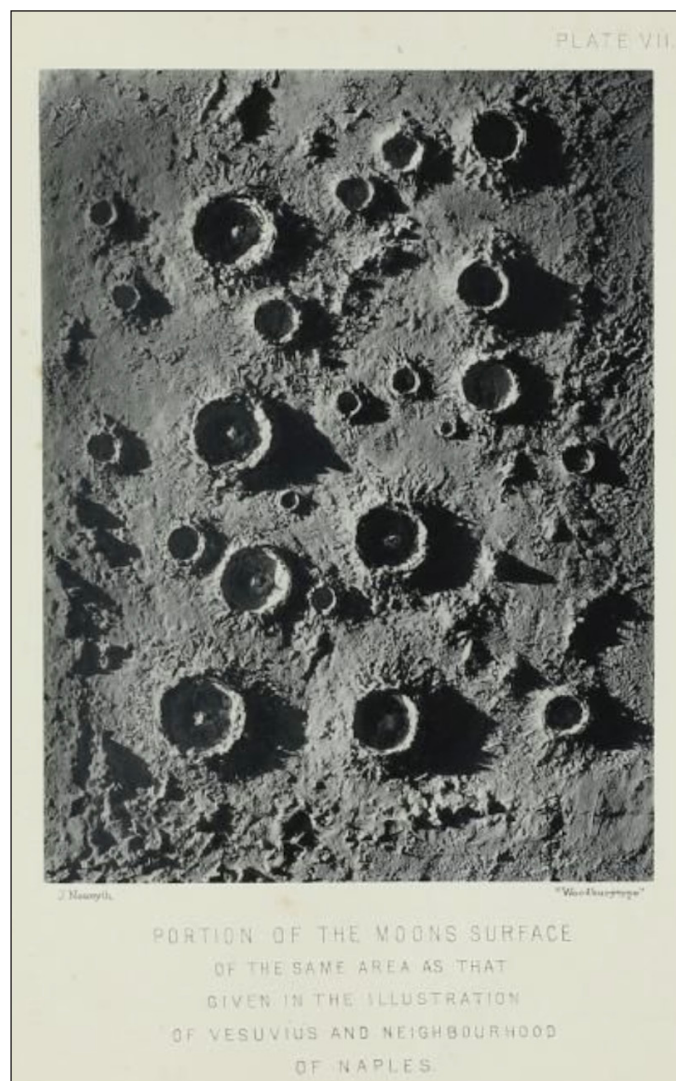


Fig. 6: James Nasmyth, *Portion of the Moon's Surface of the Same Area as that Given in the Illustration of Vesuvius and Neighbourhood of Naples* (c. 1885), woodburytype based on plaster model, 12.7 × 9.2 cm, in James Nasmyth and James Carpenter, *The Moon: Considered as a Planet, a World an a Satellite* (Murray, 1885), Plate VII. Public domain.

Hermann Schlagintweit.⁴¹ Photographs of plaster models that visualized scientific data also reassured readers that phenomena such as Moon craters were not terribly unlike Tenerife's craters, or Arthur's Seat, the dormant volcano on which the historical centre of Smyth's then hometown of Edinburgh was perched. Many of Nasmyth's models of craters were also displayed at science museums and at learned societies such as the

⁴¹ Sigrid Schulze, 'Seen from Above: Wilhelm Halffter's Photographs of 1854, Depicting the Terrain Models of Hermann and Adolph Schlagintweit', *Ebrary* <https://ebrary.net/143049/travel/from_wilhelm_halffter_s_photographs_1854_depicting_terrain_models_hermann_adolph_schlagintweit> [accessed 12 July 2025].

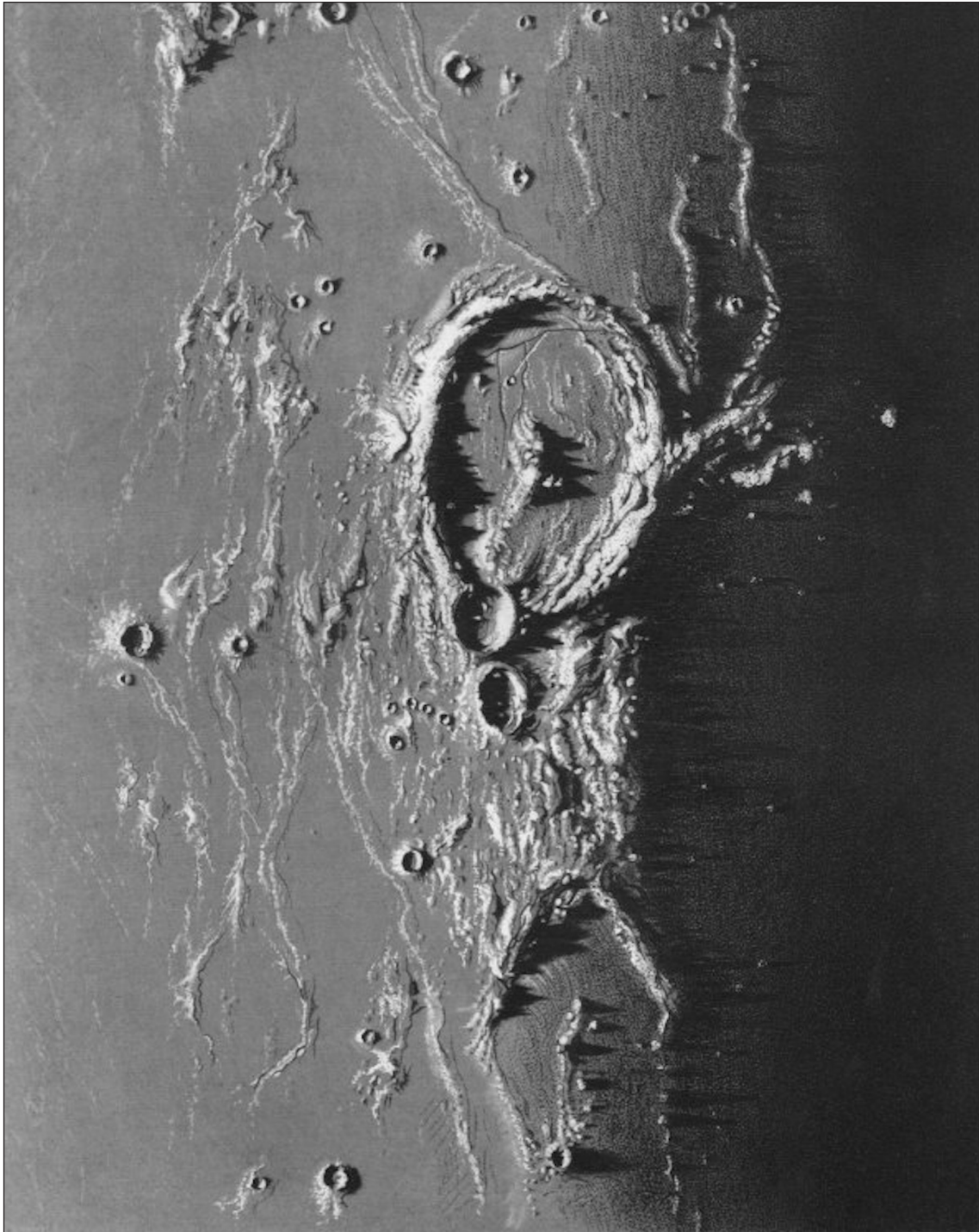


Fig. 7: James Nasmyth, *Gassendi*, Nov 7, 1867. 10 p.m, woodburytype of plaster model, 21 × 28 cm, in James Nasmyth and James Carpenter, *The Moon: Considered as a Planet, a World, and a Satellite* (Murray, 1874), frontispiece. Public domain.

Royal Astronomical Society, and were featured at public-focused events at the British Association for the Advancement of Science, which sought ‘to promote the intercourse of the cultivators of science with one another’.⁴² The printed photographs helped the plaster models circulate more widely. The models’ performative presence at these spin-off events and exhibitions helped secure the public’s fascination while making science more accessible, understandable, and wondrous. These hypothetical images kept with the astronomical tradition of privileging handmade images to make theories visible and discursive.

An analogical understanding of the Moon

In 1874 Nasmyth collaborated with the former Royal Observatory astronomer James Carpenter to publish *The Moon, Considered a Planet, a World, and a Satellite*, a generously illustrated book involving multiple plaster models that was well received by critics.⁴³ Furthermore, these models were regarded as tangible scientific documents that enjoyed a privileged relationship to three-dimensional reality in a way that a **two-dimensional sketch of a photograph** never could. As such, they were viewed as sculptures that ‘straddle science and art’, rendering the photographic and/or the drawing ‘actual’, even though they were handmade plaster models.⁴⁴

In one photograph Nasmyth presented his own wrinkled hand, along with that of a shrivelling apple, as visual, geological, and physiological analogies to the Moon’s surface phenomena (Fig. 8). These analogies, ‘grounded in forms or materials familiar, tangible, and actual, which include not just relief maps, terrestrial mountains, and old apples’, explained the surface appearances of the Earth and Moon to a Victorian audience.⁴⁵ As Omar Nasim argues, this helped Nasmyth make phenomena that had been

inaccessible or unfamiliar into the mundane, accessible, and wholly familiar; and that the causes which give rise to specific forms at the level of the mundane might be similar to those unfolding at the level of the grand, sublime and distant.⁴⁶

⁴² ‘First Report — 1831’, in *Report of the First and Second Meetings of the British Association for the Advancement of Science*, 2nd edn (Murray, 1835), pp. 7–91 (p. 22).

⁴³ R. Angus Buchanan, ‘Nasmyth, James Hall (1808–1890), Mechanical Engineer’, *Dictionary of National Biography* (Oxford University Press, entry dated 2004), doi:[10.1093/ref:odnb/19801](https://doi.org/10.1093/ref:odnb/19801).

⁴⁴ Nasim, p. 147.

⁴⁵ James Nasmyth and James Carpenter, *The Moon Considered as a Planet, a World, and a Satellite* (Murray, 1874), Plate II, heliotype, facing p. 30; Nasim, p. 178.

⁴⁶ Nasim, p. 176.

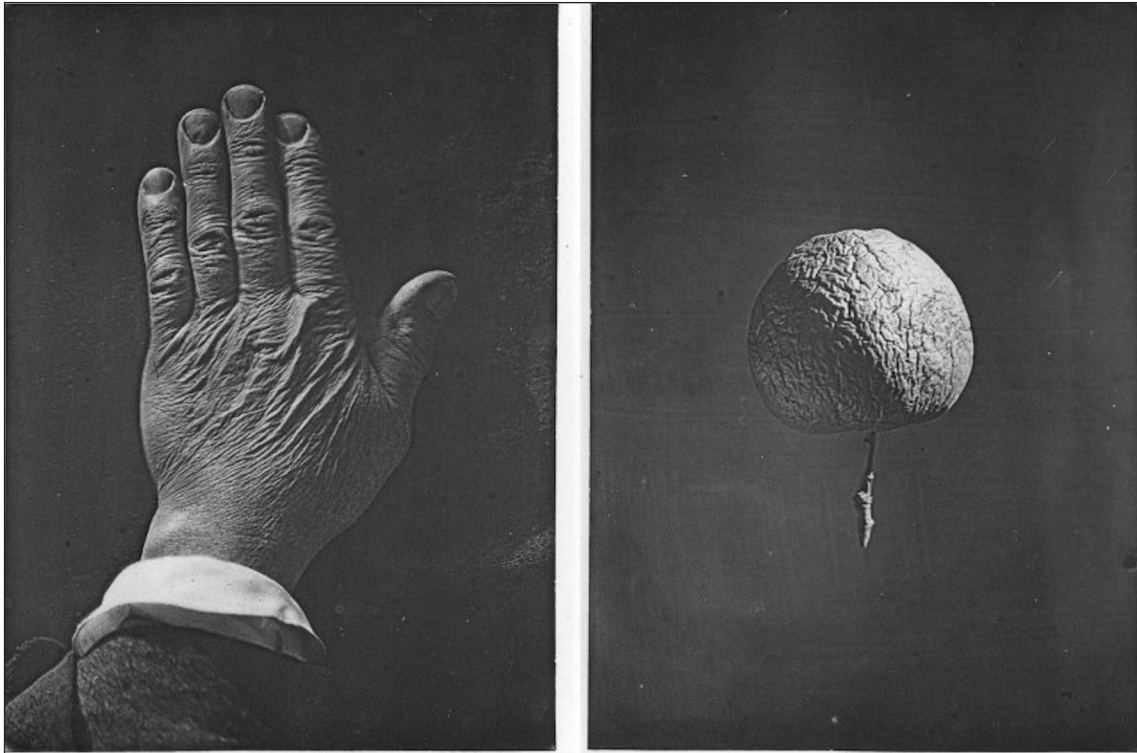


Fig. 8: James Nasmyth and James Carpenter, *Back of Hand & Shrivelled Apple to Illustrate the Origin of Certain Mountain Ranges by Shrinkage of the Globe* (1874), 11.5 × 8 cm each, in James Nasmyth and James Carpenter, *The Moon: Considered as a Planet, a World, and a Satellite* (Murray, 1874), Plate II. Public domain.

Grounding this information in the operative logic of accessible objects removes the Moon from the narrative realm of folklore or fantasy and firmly places it in the explainable realism of everyday life. As such, Nasmyth's work gave astronomy the credibility of operating not in speculation but tangible reality. This was a particularly daunting task for the study of phenomena that could only be accessed distantly, via telescopes. Likewise, Smyth's photographs of Tenerife made this faraway land and its features — human, cultural, and geological — accessible and real to a Victorian audience, while introducing readers to scientific discoveries that are represented in handmade imagery, introduced without pretence, in the familiar, entertainment-associated genre of stereography.

Conclusions

Publication made all of the Tenerife photographs discursive, entertaining as accounts of travel to a place full of wonder that satiated a desire for 'armchair travel'. These images became accessible to non-specialist audiences, as well as to amateur

and professional scientists, and their publication helped establish their theories as knowledge among the British public. Nevertheless, Smyth insisted on continuing to record his astronomical observations by hand as drawings, and enlisted Nasmyth to provide plaster models based on Smyth's measurements that could be photographed and thus enjoy the presumed documentary truth value of photography. Making plaster models and viewing them as three-dimensional-simulating stereo photographs makes unprecedented, impossible views possible, believable, and portable. By moving between dimensions, Smyth and Nasmyth gained an understanding of these geological features mechanically, in a new way, in new dimensions, when the limits of knowledge, photography, and invention did not permit direct observation of the peak of Teide from above.

Victorian conceptions of knowledge privileged not only sight, but a speculative tactility that was grounded in everyday objects, such as, for example, looking to the human hand and an apple to understand the surface operations of craters on the Moon and Earth. This approach to scientific visualization ignored any absolute barriers between science and art, the amateur and professional, and engineering and astronomy. Smyth and Nasmyth saw these endeavours as necessarily intertwined, and felt that artistic drawing was valuable for understanding the world and creating new knowledge. As Nasmyth wrote,

The truth is that the eyes and the fingers — *the bare fingers* — are the two principled inlets to sound practical instruction. They are the chief sources of trustworthy knowledge as to all the materials and operations which the engineer has to deal with [...].

The nature and properties of the materials must come in through the finger ends.⁴⁷

But it also aptly encapsulated the scientific community's ambivalent feelings about introducing photography to its practice of making hand-drawn diagrams and images and of sculpting models of astronomy observations.

⁴⁷ James Nasmyth, *Engineer: An Autobiography*, ed. by Samuel Smiles (Murray, 1905), p. 95, emphasis in original.

Competing Interests

The author has no competing interests to declare.

