Sketching the Moon:
crater drawings by Samuel Wilfrid Russell (1895–1965)

Louise E. Devoy

In 2013 the National Maritime Museum, Greenwich, was given a set of ten pencil drawings of lunar craters by Dr Samuel Wilfred Russell (1895–1965) and a portrait photograph of Russell himself. Completed during the interwar period, these drawings give us a glimpse into the skills and interests of amateur astronomers during the first half of the twentieth century. Russell was a general practitioner and surgeon by profession who seemingly enjoyed devoting his powers of observation to creating these richly detailed crater drawings. This article summarizes Russell's life and work, and describes the conservation work on the drawings undertaken at Greenwich.

1. A brief biography

Samuel Wilfrid Russell was born in Dublin on 1895 October 25,[1] the son of a mathematics lecturer at Trinity College Dublin. Educated in Ireland and Germany, he became fluent in several European languages including Russian.[2] It is believed that he served in the army during the First World War before returning to Ireland after demobilization[3] where he enrolled at Trinity College Dublin to read medicine. His name first appears in *The Medical Register* for 1923 with a registration date of 1922 July 13.[4]

For the following few years Russell remained in Dublin as a lecturer at the University before coming to England to work as a general practitioner (GP), first in Bolton, Lancashire, and then settling in Bromyard, Herefordshire, by 1927.[5] Upon arrival in this small country town he lived at Nunwell House before moving a few years later to Bank House on New Road, just a short walk away.[6]

From the outset, Russell became involved in local organizations within Bromyard, especially those with a public health function. Once a month, on a Thursday morning, he met with the Bromyard Guardians Committee, on which he served as Medical Officer and Public Vaccinator. He was also responsible for Bromyard Institution, a Workhouse in the neighbouring village of Linton, 'a building of stone to hold 100 inmates', which was served by a master, a chaplain, and a medical officer (Russell).[7]

After his retirement in 1960,[8] Russell was able to continue living at his home for a few years before yielding to his increasing infirmity and registering as a resident at Linton House, the former Bromyard Institution which had since been converted into a residential home. He was admitted in 1963 July and remained there until his death on 1965 August 26.[9]

1.1. *Russell the man*

Given the plethora of obituaries published in the local newspapers shortly after Russell's death, it is clear that he was a well-known local personality who made an indelible impression on all those who met him:

> Loved by some for his determination to tell his patients the truth; considered by some to be too blunt or even rude; admired by some for the way in which he showed sympathy and patience to those he felt were truly very ill; feared by some whom he exposed to be themselves malingerers. Nobody coming into professional, or even into everyday contact with him could but have definite views on Dr. Sammy. He was a character.[10]

During the Second World War Russell took charge of teaching first aid in the local area and it was through this work that he met members of the 42nd Field Hospital of the United States Army, some of whom remained lifelong friends.[11]

1.2. *Russell's Will*

At his death, Russell's estate of £58,395 (gross) was divided among family and friends both at home and abroad.[12] Russell seemingly remained a bachelor throughout his life, with no children mentioned in the Will as direct beneficiaries.

Fig. 1: *Dr Samuel Wilfrid Russell pictured sometime in the 1950s. (National Maritime Museum, ZBA5780).*

No telescopes or observatory items are mentioned in the Will, although any such items may have been sold at the onset of Russell's declining health.[13] His books were sold to his friend Dr Harry Pitt, a history lecturer at Worcester College Oxford,[14] who subsequently bequeathed his books to the College library. However, only part of Pitt's collection was acquired by the College, with the remaining items sold off. Given that no astronomy books associated with Pitt exist in the College's collection today, we must assume that any astronomical books he inherited from Russell were part of the sold items.[15]

2. Russell the amateur astronomer

Little is known about the emergence of Russell's interest in astronomy – whether it stemmed from his childhood or an episode during his early career – but our first formal evidence of his hobby comes from the records of the British Astronomical Association (BAA), which show that Russell was elected a member on 1949 May 25.

Russell's membership seems to have been rather passive, given that he did not submit any articles to the Journal,[16] nor is he listed as an active member in any particular section, even the lunar section.[17] Nonetheless, his country practice and rural location gave him the leisure time and dark skies to indulge in his passion for astronomy.

A large house and garden gave him ample space to install several telescopes and it was from here that he produced his beautiful drawings. On cloudy nights when observations were impossible he reverted to his other hobby of playing the piano, often until the early hours of the morning.[18] He resigned from the BAA over 14 years later on 1963 August 2,[19] about a month after his admittance to Linton House.

According to the donor, Russell discussed his drawings with Patrick Moore, but enquiries among the biographers and executors of Moore's estate have yielded no evidence of such correspondence. However, given that Moore typically received 100–200 letters a week regarding the Moon during the 1950s, it is not inconceivable that Russell's letters were once part of Moore's papers.[20]

There is also the question of Russell's interest in astrology, which is mentioned both by the original donor and in one of the newspaper biographies.[21] No additional material relating to Russell's assumed interest in astrology has come to light; it is possible that this association may simply have been an error caused by the newspaper journalist's own confusion between astronomy and astrology. Given his enquiring and rigorous scientific mind, combined with a forthright and blunt character, Russell seems to be an unlikely person to have taken much interest in the subject, apart from an antiquarian interest within the wider context of the history of astronomy. Enquiries made with the donor were unable to shed any further light on this issue.[22]

3. The lunar crater drawings

With no detailed information available about Russell's observations and equipment, we can only rely on the drawings themselves to provide us with clues about his astronomical endeavours. Surprisingly, Russell did not annotate his drawings with the expected observational data such as time, date, seeing conditions, or selenographic coordinates of the selected crater.[23]

To help us understand the drawings further, William Leatherbarrow, Director of the BAA's Lunar Section, kindly provided this analysis of Russell's work:

> 'It is difficult to be certain, but I would guess that the drawings were made using pencil/charcoal or pastel. They are certainly not ink. I would imagine that Russell made rough drafts at the telescope and then a fair copy later indoors. Judging by the amount of detail recorded, he was using a decent sized amateur telescope (I would guess a reflector between 200 mm to 300 mm aperture). He shows the small craterlets on the floor of Plato quite clearly, and these can be elusive. The drawings are highly competent, and he was clearly a careful observer. He would have tried to complete the rough draft at the telescope

within half an hour or so – otherwise, the shadow lengths change with changes in the angle of incident solar illumination. He could then take as long as he wanted to make the final version.' [24]

With this overview of Russell's likely method of working, we can now take a closer look at his drawings and assess his work in comparison with well-known lunar observers such as Peter T. Wlasuk whose book *Observing the Moon* forms the basis of the following discussion.[25]

Archimedes

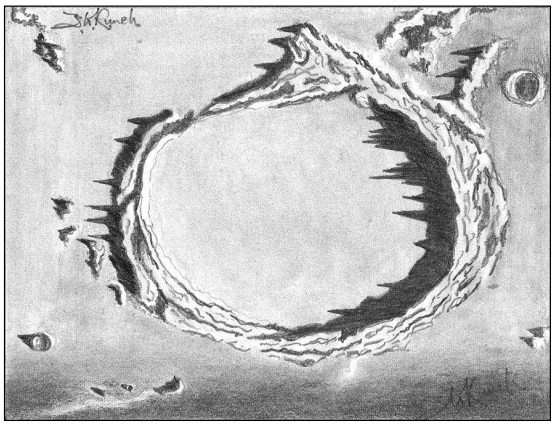


Fig. 2: Archimedes. (National Maritime Museum ZBA5770)

Here (Fig. 2) we can see the terraced walls and smooth, mirror-like appearance of the crater floor with shadows cast by the western walls. Russell has also captured the smaller crater of Archimedes A in the top-right section and an isolated mountain mass in the top left.

Eratosthenes

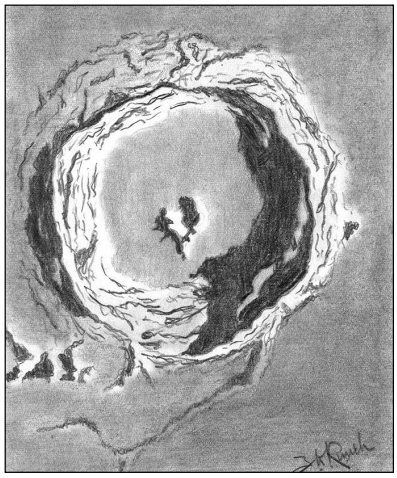


Fig. 3: Eratosthenes. (National Maritime Museum ZBA5771)

This impressive 61-km-diameter crater has a wealth of detail, which Russell has successfully captured on paper (Fig. 3). Described by the lunar observers Hugh Percy Wilkins and Patrick Moore as 'a striking telescopic object under a low sun',[26] this crater would have required many hours of study by Russell. The resulting drawing clearly shows the terraced walls, triangular central peaks and the long rille (sinuous depression) extending away from the crater walls.

Plato

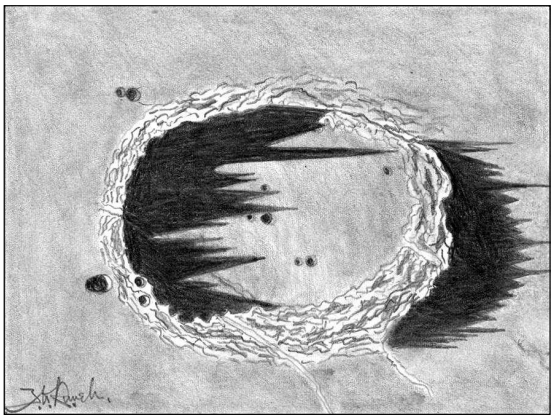


Fig. 4: Plato. (National Maritime Museum ZBA5772)

The long finger-like shadows in this drawing (Fig. 4) indicate that Russell observed Plato as the sun rose over the eastern mountains along the rim of this 100-km crater. The presence of the smaller craterlets in the interior suggests that Russell was using a high telescopic power in good seeing conditions.

Tycho

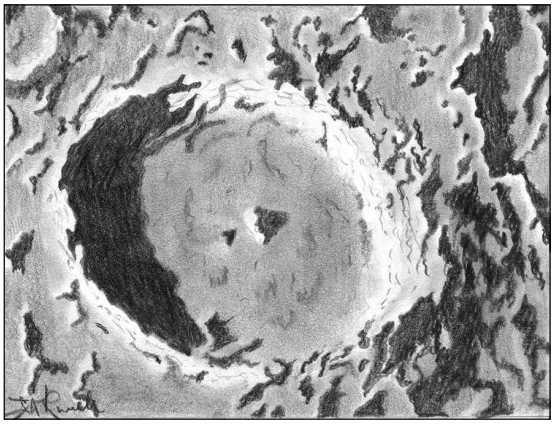


Fig. 5: Tycho. (National Maritime Museum ZBA5773)

Clearly visible to the naked eye at full Moon, this impressive 90-km-diameter crater was sketched by Russell shortly before it was fully illuminated by the Sun (Fig. 5). Shadows generated by the mountains on the eastern rim are just still visible, while the eye is drawn to the central mountain peaks. The irregular sections in the crater walls and series of undulating features on the crater floor are the remnants of landslides.

Theophilus

The large cluster of central mountains has created dramatic shadows in Russell's drawing (Fig. 6), with smaller craterlets depicted on the crater floor. The western walls, shown here in shadow, have become terraced after multiple landslides.

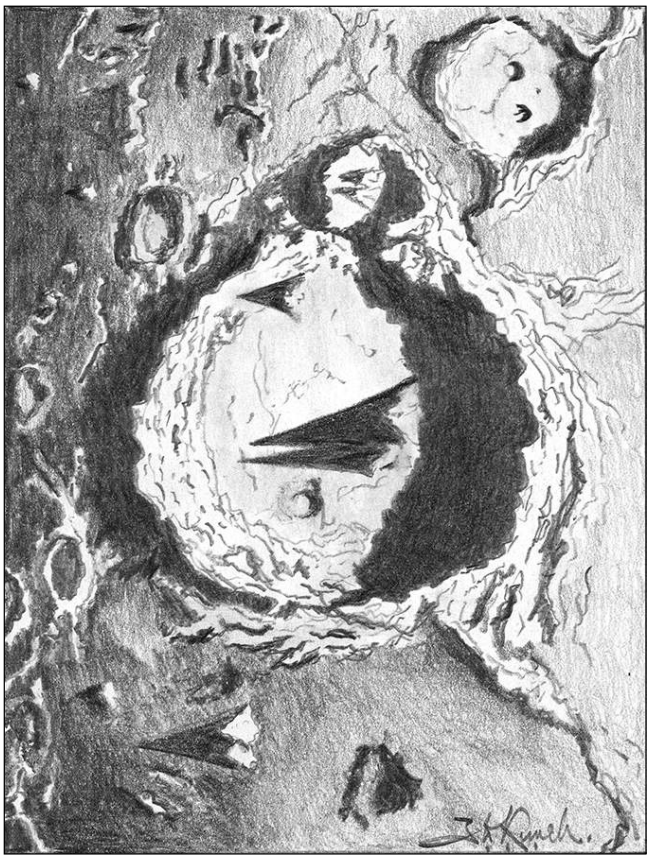


Fig. 6: Theophilus. (National Maritime Museum ZBA5774)

Arzachel

Drawn as the Sun rose over the eastern mountains, this sketch (Fig. 7) shows the shadows cast by the central rugged mountain peaks, complete with smaller craterlets across the crater floor. Russell has also captured the faint outline of the rille which extends along the shadow line.

Gassendi

Given the complexity of its features, Russell must have spent a great deal of time in capturing the detail in this sketch (Fig. 8). The crater is surrounded by a jagged wall, while the floor is criss-crossed by rilles, craterlets, and irregular mountains. Wlasuk advises sketching the rilles when the Moon is 11 days old, commenting that 'mapping these rilles is great sport, and a good way of testing your skills as an observer and artist'.[27] Russell has clearly demonstrated his skills here, both within and beyond the crater's walls.

Fig. 7 (above): Arzachel. (National Maritime Museum ZBA5775)

Fig. 8 (below): Gassendi. (National Maritime Museum ZBA5776)

Albategnius

This crater (Fig. 9) is best observed at first quarter. Wlasuk comments that the craterlets in the interior are generally visible in telescopes with an aperture of 250 mm (10 inches) or above,[28] which corroborates Leatherbarrow's assumptions about Russell's equipment mentioned earlier.

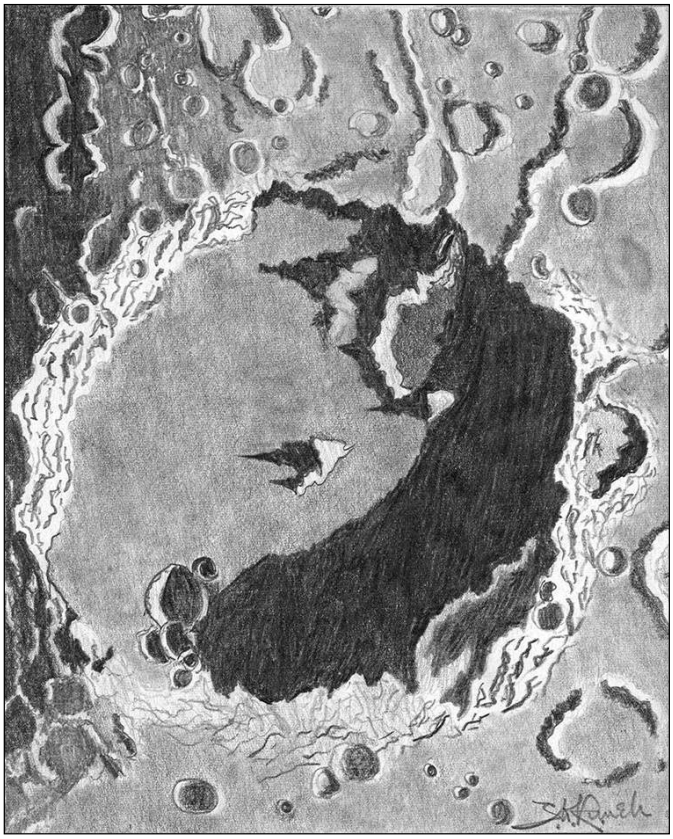


Fig. 9: Albategnius. (National Maritime Museum ZBA5777)

Vitello

Wlasuk does not describe detailed observations of Vitello (Fig. 10), which suggests that it is an unusual choice for Russell, unless he was particularly interested in capturing the external long rille which snakes along the eastern rim. Russell has also focused his attention on the thick walls and triangular central peak.

Cleomedes

This elongated walled plain has many different features, some of which are visible only at certain illuminations; hence we may presume that Russell built up this sketch (Fig. 11) over several nights to complete the details.

The complete set of drawings can be viewed on the Royal Museums Greenwich collections website. Search for 'Samuel Wilfrid Russell' or use the individual object reference numbers (ZBA5770, ZBA5771, etc.): http://collections.rmg.co.uk/

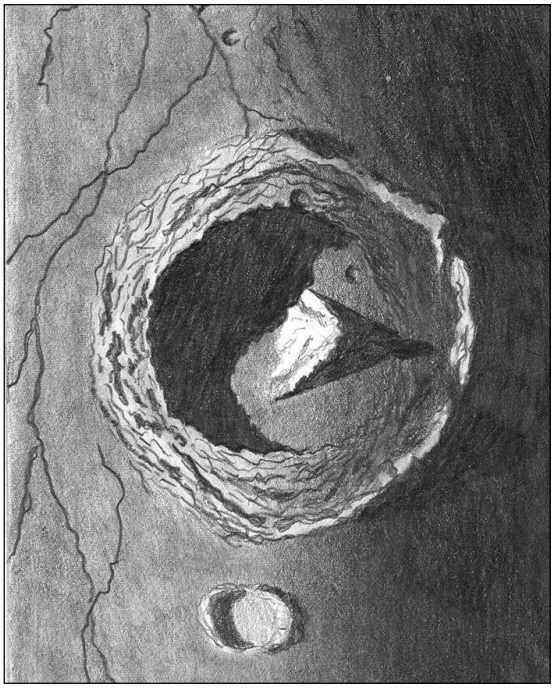
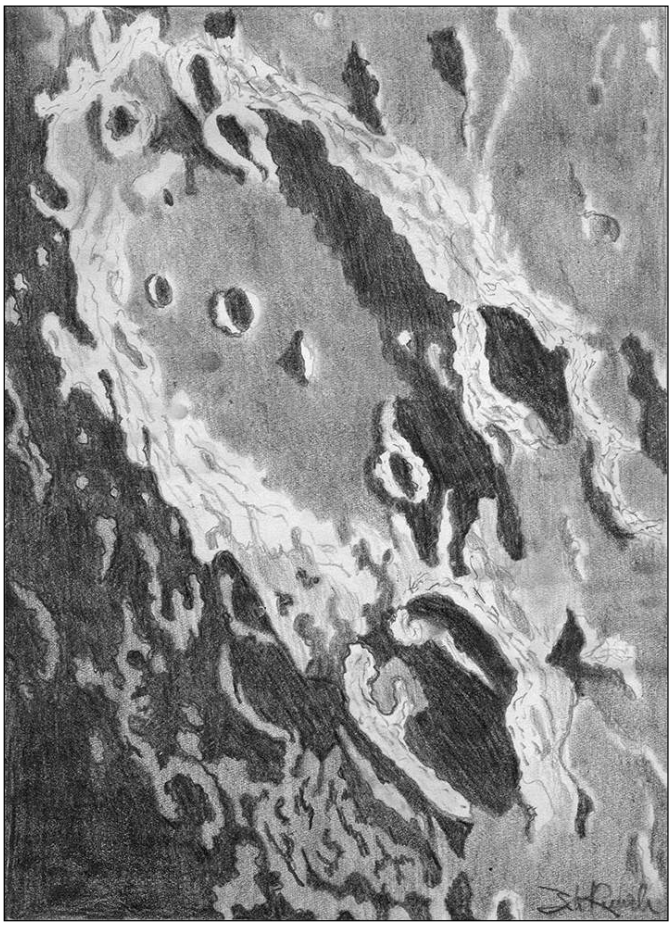


Fig. 10 (above): Vitello (National Maritime Museum ZBA5778)

Fig. 11 (below): Cleomedes. (National Maritime Museum ZBA5779)



Preserving the drawings for future study

Agathe Daronnat

Upon arrival at the paper conservation studio of Royal Museums Greenwich, Russell's drawings were assessed by conservators in terms of long-term storage and potential display. Unfortunately, the objects showed signs of deterioration, as the poor-quality mounting and mould growth on the paper rendered them unavailable for immediate use. It was clear that remedial work was necessary to stabilize and conserve the drawings for future use.

In this section I will explain how our identification of the materials used by Russell gave us an insight into the type of artists' materials he used and, by inference, other amateur astronomers of the period. I will then outline the treatment applied to the drawings to lessen the effects of ageing and then finally I will provide some advice on how best to preserve astronomical drawings for future generations.

A. Materials and technique of Russell's drawings

An important component of the conservation process is the identification of the materials and techniques used to create the object. The information thus gathered guides the conservator in the choice of appropriate treatments. Additionally, examination provides useful information on the choice and availability of materials used by the amateur artist.

A.1. *The paper*

The paper used by Russell for his drawings does not appear to be specialist artists' material. It is an ordinary machine-made wove paper of medium thickness with a smooth surface, which had probably been produced at the same period as the drawings. Its present beige colour is likely due to the ageing of an average quality woodpulp-based paper. In fact, since 1870, wood has been the main material used for papermaking, replacing cotton. Papers produced with wood pulp over the first half of the twentieth century tend to be acidic and deteriorate more quickly.

No watermark could be observed on any of the drawings. It was therefore not possible to identify precisely where the paper used by Russell had been produced. However, its appearance gave us clues about its manufacture: its smooth surface suggests that the paper had been subjected to surface treatment, such as hot pressing, at the end of the papermaking process. This surface treatment could also partially explain the response of the paper to changes in environmental conditions. In fact, even over the relatively short duration of the treatment, we observed a tendency of the drawings to distort easily in response to variations in relative humidity within the conservation studio. The exposure to high temperatures at the end of its production may have had an impact on the hygroscopicity of the material.

A.2. *The medium*

All the drawings were completed using graphite pencil. Graphite is characterized by its metallic sheen and grey-to-black tones, which can vary depending on factors such as hardness and composition of the lead, or the application of the medium to the paper.

Graphite pencil is a very precise medium, which allows the artist to capture very fine details. It is therefore not surprising that Russell chose this technique to capture the detailed lunar features. Moreover, graphite does not necessarily have to be used in one sitting – such as ink or watercolour might. This property of the medium allowed Russell to make his initial drawing at the telescope and rework the details later, a sequence of events that corroborates with Leatherbarrow's analysis of Russell's technique.

Despite its powdery nature – graphite leads do not contain any liquid carrier – graphite pencil tends to create fairly stable drawings. It is in fact composed of carbon, which is very stable to light, and bonds well with paper. Therefore, despite poor storage conditions, all the drawings have kept their subtle tone and shades over the years.

A.3. *The original mounting*

Every drawing had been individually attached to made-to-measure glass plates using gummed paper tape all around the edges, as a makeshift framing solution. This 'framing' was most probably done by Russell himself as a simple form of protection and storage to prevent smudging. There is no evidence that these drawings were once displayed; they were discovered in Russell's attic shortly after his death. ►

The nature of the tape used – a thin translucent gummed paper tape – suggests that the drawings had probably been mounted shortly after they were produced. When the objects reached the Museum's conservation studio, nine were still attached to their original mounts. However, most of them were partially detached as the adhesive had dried, while the surrounding tape had become brittle through age.

B. Condition of the drawings and aims of the conservation treatment

The drawings have been affected by various types of damage, the most obvious being the cracked and broken glass plates. Dark brown tidelines and grey stains were also present on most of the drawings. The light-brown stains with darker edges were identified as water damage, while the greyish stains indicated mould growth between the paper and the glass.

Fortunately, the medium had not been affected by micro-organisms but the presence of mould constituted a potential source of further degradation of the paper – making it porous and weaker – and posed a health hazard for users. Finally, the drawings presented other signs of deterioration such as small tears, local skinning of the paper, and inappropriate repairs completed with modern pressure-sensitive tape.

C. Conservation treatment

The primary focus of the conservation treatment was to stabilize the drawings with minimum intervention so as to maintain the original integrity. The first step was the removal of the drawings from their poor-quality glass plate mounts for surface cleaning. After being detached from their glass plates, the drawings were immediately isolated in polyester sleeves to avoid spreading the spores in the air and contaminating other objects.

Each drawing was treated individually in a fume cupboard while the spores were carefully brushed off and the whole surface was vacuumed, except from the more delicate drawing area. Finally, a solution of water and alcohol was applied locally to further 'deactivate' any spores still present in the paper.

The second step of the treatment was to remove the strips of tape still present on the back of the objects which was causing distortions in the paper. Thankfully the tape had a water-soluble adhesive which could be easily softened and removed with a water-based gel.

Despite the presence of old water stains on most of the drawings, we decided not to wash the whole series. In most cases, the stains mainly affected the margins and only had a moderate impact on the perception of the pictures.

The drawing of Cleomedes (Fig. 11, ZBA 5778) was unusual in that its paper support was more discoloured and the water stains were particularly disfiguring. As a consequence, this drawing was subjected to aqueous washing on wet blotters to reduce these effects. During this treatment, large areas, mainly on the drawn part of the object, absorbed water less quickly the margins, which suggests that a fixative of some sort could have been applied on the graphite to protect the drawing.

The tears and weak areas were consolidated with materials commonly used in paper conservation and the objects were pressed before museum-quality boards were applied to create suitable mounts for storage.

D. Simple steps to preserve astronomical drawings today

Paper is an organic material mainly composed of cellulose. Both internal and external factors take part in its degradation. Although it can be difficult for a non-conservator to intervene on the internal factors of degradation, simple measures can be taken to limit the impact of the external ones.

The possible use of a fixative on the graphite and the original mounting under glass plates show Russell's desire to preserve and protect these objects. However, despite all his care the drawings were damaged due to poor storage conditions. The choice of storage materials is especially important. Russell's drawings were previously stored in an attic, in a wooden box which may have contributed to their degradation, particularly the yellowing of paper.

Folders and boxes made of acid-free paper or cardboard are a cheap and more effective way of protecting paper-based objects from dust, light, and off-gassing of poor-quality materials. The storage environment should be stable, with moderate temperature and low humidity levels. This way the paper will be less vulnerable to mould development, planar distortions, humidity-induced oxidation of cellulose, etc. To avoid damaging the support, one should not use tape or glue to repair tears. It is safer to ask a conservator for advice on the most appropriate methods and materials.

Conclusion

Living and working in a rural location, Russell was an active member of his local community who seemingly enjoyed observing and sketching lunar features, perhaps as a welcome relief from the demands of his professional role. Without documentary evidence of his observing equipment, we can only assess the drawings themselves, which suggest that Russell used a reflecting telescope of 200–300 mm aperture. The lack of associated observational details with each drawing (time, date, seeing conditions, etc.) suggests that the drawings were not intended as serious astronomical records but were perhaps undertaken for the sheer enjoyment of the task itself.

Russell was clearly a patient observer and highly competent artist with a keen eye for detail but it appears to have been a solitary, personal pursuit with no wider agenda. This elusive amateur astronomer made little effort to engage with the astronomical community, despite being a member of the BAA and reputedly exchanging letters with Patrick Moore.

The examination and conservation of Russell's drawings gave us an interesting insight into the type of materials that could be used by amateur artists in the first half of the twentieth century. Russell appears to have used readily available paper and graphite pencils for his lunar drawings, and despite the less-than-ideal storage conditions, the artworks have survived and will now be stabilized for the future. In this age of instant digital media, these drawings are a worthy reminder of the patience and skill demonstrated by early twentieth century amateur astronomers who captured a wealth of information for future generations to admire.

Acknowledgements

I am immensely grateful to members of the British Astronomical Association, who generously provided me with much information, comments, and suggestions for additional research, most notably Anthony Kinder, Mike Frost, William Leatherbarrow, and John Mason. I would also like to thank Brian Rollings (Bromyard and District Local History Society), Joanna Parker (Worcester College, Oxford), and Martin Mobberley. Within the National Maritime Museum I would like to thank my colleagues in various departments who made it possible to prepare the drawings for display and publication. Finally, I would like to thank the anonymous reviewers who provided further comments and suggestions.

References and notes

1. Admissions Register, Bromyard Workhouse, Herefordshire, 1963 July 7. Information kindly provided by Brian Rollings of the Bromyard and District Local History Society, personal communication via Anthony Kinder, 2015 May 16.
2. Biographical information provided by the donor in a letter dated 2013 March 27. National Maritime Museum Registration records, ref. REG13/000221.
3. There are no specific details of Russell's military service within the various obituaries but there is an entry for a Samuel Wilfrid Russell listed as Second Lieutenant within the 7th (Cyclist) Battalion, The Welsh Regiment, *The London Gazette*, 1914 September 1, p. 6912.
4. *The Medical Register* for 1923, p. 971.
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9. Admissions Register, Bromyard Workhouse, Herefordshire, 1963 July 7. Brian Rollings of the Bromyard and District Local History Society, personal communication via Anthony Kinder, 2015 May 16.
10. 'Death of a great character', *The Bromyard News and Record*, 1965 September 2.
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14. Information from the donor in a letter dated 2013 June 7. National Maritime Museum registration records, ref. REG13/000221.
15. Dr Joanna Parker, Librarian, Worcester College Oxford, personal communication, 2015 June 1.
16. Anthony Kinder, personal communication, 2015 April 29, and Mike Frost, personal communication, 2015 June 1.
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20. Martin Mobberley, personal communication, 2015 May 29.

21. National Maritime Museum records, REG13/000221and 'Dr. S. W. Russell, of Bromyard', *The Hereford Times*, 1965 September 3.

22. Information from the donor of the drawings, personal communication, 2015 July 15.

23. For an example of how lunar observers should record their work, see 'Chapter 9: Drawing Lunar Features' in Wlasuk, Peter T., *Observing the Moon*, (London: Springer-Verlag, 2000).

24. William Leatherbarrow, Director of the BAA Lunar Section, personal communication, 2015 July 2.

25. Wlasuk, Peter T., *Observing the Moon* (London: Springer-Verlag, 2000).

26. Wilkins, H. P., and Moore, Patrick, *The Moon* (London: Faber and Faber, 1955).

27. Wlasuk (2000), p. 100.

28. Wlasuk (2000), p. 55.

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Errata

The Antiquarian Astronomer Issue 8, April 2014

On page 5 of *The Antiquarian Astronomer* no. 8 ('Some matters relating to the documentary evidence of the discovery of Neptune' by Norma Foster), the line

Mean sidereal motion in 365.25 days 1° 30′ 9″

should read

Mean sidereal motion in 365.25 days 1° 30′.9

On page 13, the phrase in column 2 '(from Adams' result of 1° 30′ 9″ in one year)' should read '(from Adams' result of 1° 30′.9 in one year)'.

On page 20 of the same article, reference 23 should read:

Sampson, R. A., 'A Description of Adams' Manuscripts on the Perturbations of Uranus', *Memoirs RAS*, 54 (1904), 43–170 (received 1901 December 13).

References 24 and 25 should read:

Sampson (1904), p. 167.
Sampson (1904), p. 168.