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Review: *Observing by Hand: Sketching the Nebulae in the Nineteenth Century*, by Omar W Nasim

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This article was written by David Hughes

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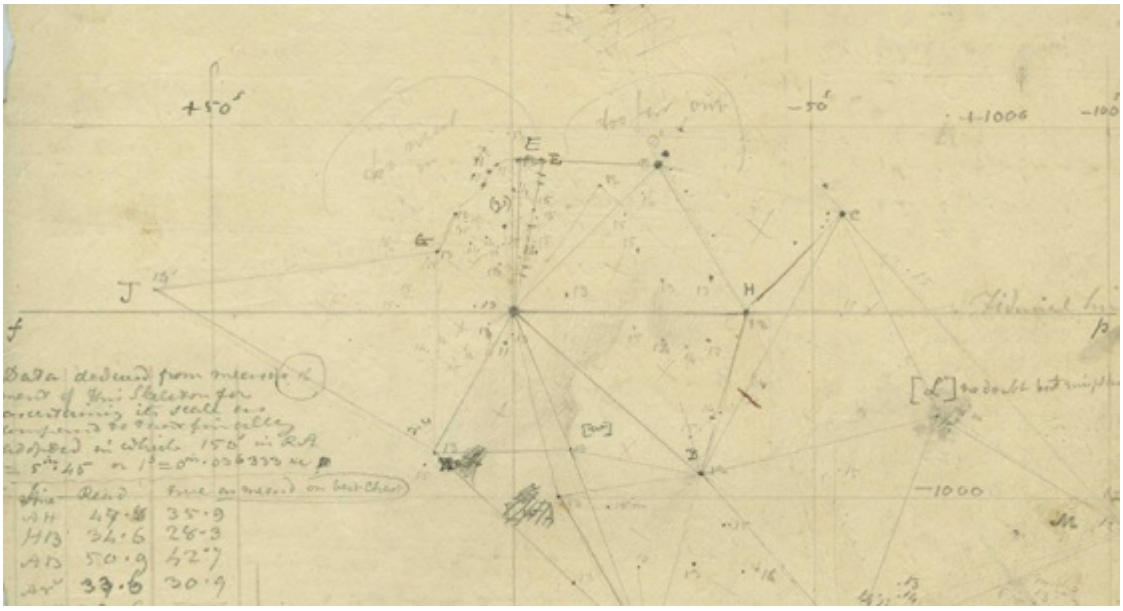

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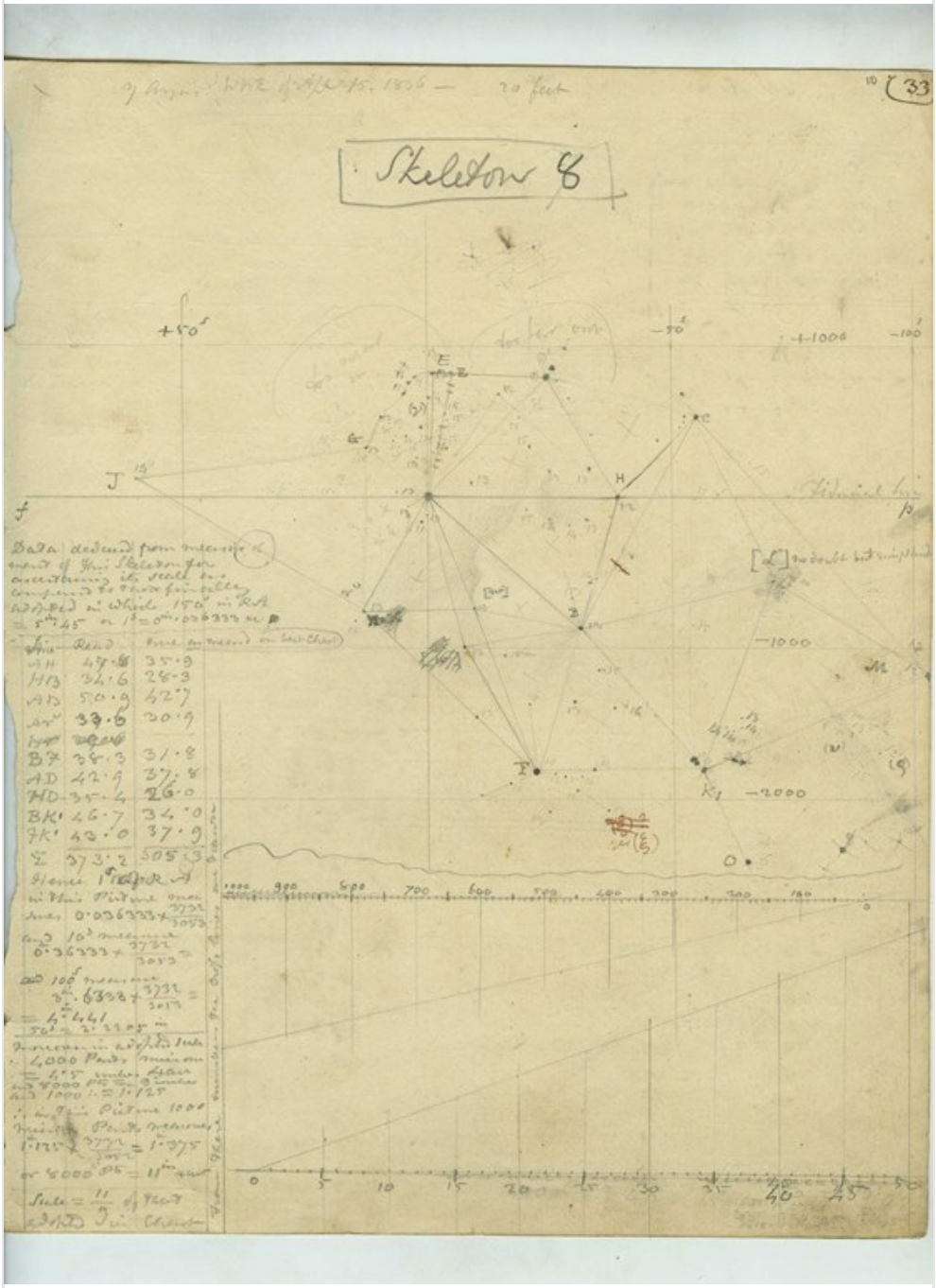
Review: Observing by Hand: Sketching the Nebulae in the Nineteenth Century, by Omar W Nasim

'Gone observing' is a common answer to a query about the whereabouts of a professional astronomer. But oh what a huge difference a hundred or so years have made. Today's astronomer will have an airline ticket to some exotic spot – Hawaii, Chile, Australia, La Palma – and when there will spend time huddled in an air-conditioned control room letting the computers take the strain of pointing the observatory telescope, and the focal-plane charge-coupled device do the job of assimilating the incoming photons and then passing this data onto some pocket-sized storage device. Little has to be looked at. Subjectivity is at a minimum.

But let us follow Omar W Nasim, an academic historian of science, back to the 19th century. I was tempted to say 'back to the good old days', but this is far from the truth. In the 19th century if you wanted to record what a nebula, comet or planet looked like you had to get out there in the cold, quiet and dark and physically clamber up to the eyepiece of the telescope, observe the object with care, and then draw what you saw. Nasim is fascinated by the process that converts the telescopic image to the drawing on a piece of paper. Imagine that you are precariously balanced on your observing platform, adjusting the telescope focus, choosing the magnification of a suitable eyepiece, struggling to keep the astronomical object in the field of view of a cumbersome altazimuth instrument, whilst simultaneously juggling with a pad of art paper and a collection of pencils of different hardness, and then having to draw a picture. You could not get away with just words. Drawing was essential. To quote

John Herschel, when viewing Eta Carinae, 'it would be manifestly impossible by verbal description to give any just idea of the capricious forms and irregular gradations of light affected by the different branches and appendages of this nebula.'

Figure 1



John Herschel produced this pencil drawing of the nebulosity in the Eta Argus region of the southern sky on April 15, 1836 using his 6.4-m focal length reflector at Feldhausen, Cape Town, South Africa. Notice how a triangular skeleton of field stars are used to help position the nebulosity. (Monograph on Argus, John Herschel Papers, RAS: JH 3/1.8, p.10)

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The aim of the drawing process is accuracy and truth. What you draw should be the same as what you see. To quote Robert

Hooke in his preface to *Micrographia* (1665), what is needed is 'a sincere hand, and a faithful eye, to examine, and record, the things themselves as they appear'. It should not matter if the person carrying out the observing task is an artist, who knows how to draw, or a scientist who is trying to understand what is being looked at, or a draughtsman/copyist who is indifferent to both attractiveness and knowledge. Ideally the transference of what is seen to what is drawn should not depend on the responsible human. But it inevitably does to some extent. You might expect the artist to improve on the beauty. And the scientist comes with the baggage of a smidgen of supposed understanding of what is actually novel, mysterious and enigmatic. Thinking you might know what the object actually is (a spinning cloud of gas and dust condensing in a Laplacian fashion into a series of planets, for example) might easily bias one's approach. And, needless to say, as time passes and the more you practise, the better you should get with your pencil and paper.

And there is another problem. It is no use just leaving behind a series of drawings taken by different observers on different nights, in a collection of notebooks. We are talking about professional astronomy here. Results have to be disseminated. Publication is important. The multitude of drawings have to be assimilated and then converted into pictures in books or in research papers using engraving or lithographic techniques. Running through Nasim's book is the feeling that the old process is 'good for you'. If you are forced to draw something accurately, surely you are then forced to look at it in detail and this time-consuming introspection helps you understand the reality. This is far better than the modern-day habit of just pressing a button and recording a photographic 'snap'. Being forced to draw something makes you look harder.

Observing by Hand delves into a minor byway of the history of astronomical science, but I finished the book feeling that only half the story had been told. Nasim revels in the details in the observer's notebooks, but he underplays the science. The host of astronomers that he mentions were all scientists at heart, and there was a very strong scientific motivation behind their endeavours.

Only a handful of nebulae can be picked up by the naked eye, among which are the Andromeda Nebula (which turned out to be a huge stellar galaxy beyond our Milky Way system), the Orion Nebula (which was gaseous, and in parts condensing to form stars), the large and small Magellanic Clouds and the Coal Sack (but here you have to travel to the southern hemisphere). Nebulae are so faint that they really need telescopes, and the first major step in nebula research was made by the French astronomer Charles Messier, who published his first list of 'fuzzy celestial objects' in 1747. Messier was at heart a comet hunter and he longed to be the first to pick up Halley's Comet at its first predicted return in 1758/59. He listed nebulae so that he would not mistake them for a cometary apparition. But soon nebulae become objects of fascination in their own right. What were they? A cloud of gas and dust was one possibility. Or they might be a cluster of stars, this later possibility only being revealed as the size of telescopic objectives increased and telescopic resolution and light-gathering power improved. As in many new sciences, cataloguing and sorting was the first priority. Remember that the distances to the nebulae were unknown, the first measurement of these quantities only becoming possible in the 1920s. The second priority was the search for change. Were nebulae expanding or contracting, or obviously spinning? Here the subject hit a major snag. Imagine studying a series of drawings of, say, the Orion or the Andromeda Nebula. These drawings would have been produced at different times, using different instruments, at different observing sites on the Earth, and by different people, with different and varying competences. It is obvious that the images would not all be the same. But were they changing because the object itself was varying, or was the change just a function of improvements in the telescopes being used, or in the skills of the person responsible for making the drawings?

There were certain key landmarks in the development of the physical understanding of nebulae. Large telescopes resolved many of the nearby nebulae, showing that they were collections of stars. The herd reaction, that is far too common among scientists, then rushed to the conclusion that this new fact applied to *all* nebulae. Another breakthrough occurred when Lord Rosse, around 1845, turned his new six-foot telescope onto the object M51 and realised that it had a spiral form. As far as discoveries go Dionysius Lardner regarded this as 'the most extraordinary and unexpected which modern research has yet disclosed in stellar astronomy'. By the 1850s, true to form, scientists were concluding that *all* nebulae were spirals. But in 1864 Sir William Huggins, the spectroscopic pioneer, realised that the nebula in Draco (the Cat's Eye, NGC 6543) was gaseous and radiating a line spectrum. Clearly there was no single answer to the nebula form.

It was only after 1880, when the American astronomer Henry Draper started to take the first successful photographs of nebulae, that this dichotomy problem started to drift away.

Nasim concentrates on the work of great nebula astronomers. The pioneer was William Herschel, who, having built himself the largest telescope in the world in the early 1770s, saw nebulae as no-one else had done before. He also published a plate of engraved figures showing his results. His son John Herschel followed in his footsteps, and well into the 1840s the Herschels had the monopoly in the subject.

Figure 2

Another John Herschel drawing, this time of the Orion nebula. Notice the tight open cluster of stars in the heart of the region – known as the Trapezium. (Monograph ϑ Orionis, John Herschel Papers, RAS: JH 3/2, p. 41)

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In a successful attempt to break this dominance William Parsons (the 3rd Earl of Rosse) built the Leviathan of Parsonstown. This 1.8-metre aperture reflector was first used in 1845. Rosse and his assistants produced a host of drawings, their mezzotint of the Whirlpool Galaxy being revolutionary. Taking up the American baton we have Ebenezer Porter Mason, who changed the Herschelian approach of triangulating the nebula details using a grid made up of lines joining the field stars, by introducing the concept of isophotes – contour lines of equal brightness. In 1844 William Lassell, a Liverpudlian gentleman astronomer, built a 0.61-metre aperture reflector that was equatorially mounted. Now instead of the nebula being visible for only a few minutes per night, as was the case with the previous altazimuth giants, it could be smoothly tracked for a few hours per night, and thus drawn more accurately. Lassell went so far as to produce three oil paintings of nebulae and he presented these to the Royal Astronomical Society. Mindful of their importance in the heritage of this subject the society subsequently 'lost' them. The next nebula specialist was the German astronomer Wilhelm Tempel, who had the added advantage of being a trained lithographer. He did most of his important work at the Arcetri Observatory in Florence. Over in America, William Cranch Bond and his son George used the Harvard telescopes to investigate the Orion Nebula. Much effort was expended in trying to decide whether it was either a gaseous cloud or a spiral galaxy.

A lot of astronomical endeavour in the 19th century was expended on observing and drawing nebulae. These drawings were

then carefully assimilated into end-product engravings and lithographs that featured prominently in a host of scientific articles and textbooks. But to what avail? Maybe Owen Gingerich, the Harvard historian of astronomy, was right in dismissing these images as being of 'mere antiquarian interest'. When it comes to understanding nebulae the 19th-century astronomer just did not have the kit. The telescopes were too small, the image recording process too inefficient and the spectroscopic understanding too crude. The breakthrough started much later, around November 1917, when first light hit the mirror of the 2.5-metre Hooker telescope at Mount Wilson, California. Add to this the insight of Edwin Hubble, and the ability to measure astronomical distances, and soon the curtain was drawn back on the mysterious nature of nebulae.

Observing by Hand is a beautifully produced book and the images are stunning. Hidden in the text is a fascinating story trying hard to escape, a break-out which is somewhat masked by the excessive verbosity of the text, and the downplaying of the scientific motivation behind the whole endeavour.

Observing by Hand: Sketching the Nebulae in the Nineteenth Century *by Omar W Nasim is published by The University of Chicago Press, 2014. The images that appear here are selected from the large number of drawings published in the book.*

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Tags

- History of science
- History of astronomy
- Science and images

Author information

David Hughes

Professor

Contact this author >

David W. Hughes was a professor of astronomy at the University of Sheffield and has published over 200 research papers on asteroids, comets, meteorites and meteoroids. He has also written on the history of astronomy, the origin of the solar system and the impact threat to planet Earth.