

A CYCLE OF CELESTIAL OBJECTS, THE FIRST BOOK

WRITTEN EXPRESSLY FOR THE AMATEUR ASTRONOMER

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The *Cycle of Celestial Objects* published in 1844 is considered the first book to be written with the amateur astronomer in mind. It's author, Captain William Henry Smyth was born on January 21, 1788.

Smyth spent an entire career in the Royal Navy, enlisting as a seaman, serving in the Napoleonic Wars, distinguishing himself by his accurate coast surveys of the Mediterranean, and rising all the way up to Admiral. In 1813, while mapping the port of Palermo in Sicily, he chanced to meet Giuseppe Piazzi, the Italian astronomer who had discovered the first asteroid, Ceres, in 1801, and who at the time of Smyth's visit was publishing his great Palermo star catalogue. This encounter convinced Smyth that he should turn from seafaring to astronomy, and eventually he acquired a well-made 5.9" refracting telescope, returned to his home in Bedford, built an observatory, and began to observe the heavens.

In 1844 Smyth published a two-volume observing guide for amateurs' astronomers: *A Cycle of Celestial Objects*, also referred to as the *Bedford Catalogue*.

All observations were made with a 5.9-inch refractor made by Charles Tully¹. Designed by Reverend R. Sheepshanks and made by Dollond of London, this was the first equatorially mounted telescope in England to be driven by clockwork. The refracting telescope with a 5.9-inch (150mm) lens was initially installed at Captain William Smyth's observatory in Bedford in 1827. Smyth used it to survey the sky for his book, 'A Cycle of Celestial Objects' (1844). Smyth sold the telescope to his good friend Dr Lee, who had an observatory at Hartwell near Aylesbury, Buckinghamshire. It was subsequently purchased by the British government who sent it on the 1874 transit of Venus expedition to Egypt. It was donated to the Science Museum, London in 1929 (Figure 1, 2 and 3).

Smyth used this instrument to observe a variety of deep sky objects over the course of the 1830s, including double stars, star clusters and nebulae. These observations were published in 1844 which earned him the Gold Medal of the Royal Astronomical Society in 1845 and the presidency of the society. The first volume of this work was on general astronomy, but the second volume became known as the Bedford Catalogue and contained Smyth's observations of 1,604 double stars and nebulae. It served as a standard reference work for many years afterward; no astronomer had previously made as extensive a catalogue of dim objects such as this. It was reprinted in 1986, and in the Foreword to that edition George Lovi writes, "*What makes it so special is that it is the first true celestial Baedeker and not just another cold catalogue of mere numbers and data*". Like the original Baedeker travel guidebooks of the last century, this work is full of colourful commentary on the highlights of the heavenly scene and heavily influenced several subsequent works of its type, even to the present day. It is in the descriptive material that Smyth is a delight. He not only describes what the

¹ Charles Tulley was a London optician of the first half of the 19th century that played a small but effective part in the development of the achromatic telescope. Tulley's 5.9-inch objective 8 ½ feet focus was mounted on a brass polar axis, provided with a 3-foot brass declination and hour circles taken from Sisson's equatorial sector at Greenwich. Smyth bought this telescope for £200 and remounted it by George Dollond on a large polar axis driven by a Sheepshanks clock-drive (Figures 1 to 3).

user of a small telescope will see, but also includes much fascinating astronomical, mythological, and historical lore. A good example is the description of Messier 31 (see below).



Figure 1 - Smyth equatorial refracting telescope, 1829 (Science Museum London).

XXIV 31 M. ANDROMEDA (pages 14/17 – Bedford Catalogue)

An overpowering nebula, with a companion about 25' in the south vertical. It is of an oval shape, light, brightening towards the sf edge of the general mass, and of a milky irresolvable nebulosity; but though described "*in cingulo Andromedae*," is between the robes and left arm of the Lady, and certainly below the girdle. There are numerous telescopic stars around; and three minute ones are involved in the glow, but which can have no connection with it, and are doubtless between our system and the nebulosity. The axis of direction trends *sp* and *nf*; and it may be caught by a good eye, on a very fine night, by running a fancied line from Alamak to Mirak, and from thence carrying a rectangular glance to a distance of about $6\frac{1}{2}^{\circ}$. It can also be struck upon by a ray from γ in the mouth of Cetus, over Sheratan in the head of Aries and through Mirak, or β Andromedae, to $6\frac{1}{2}^{\circ}$ beyond.

This is the oldest known nebula ; for though it attracted but little notice till the seventeen century, it was seen, at least, as far back as 905 A.D. Simon Marius re-discovered it, if such a term can be applied to an object seen with the naked eye: in his rare work- *De Mundo Joviali* - that astronomer acquaints us, that he first examined it with a telescope on the 15th Dec. 1612; he was astonished at the singularity

of the phenomenon, but expressly says that he leaves to others to judge whether it was a new discovery or not. It was therefore by an oversight that Halley ascribes the discovery, in 1661, to Bulialdus (Ismael Bulialdus); who himself mentions its being known as *Nebulosa in cingulo Andromedae*, and that it had been noticed 150 years before by an expert though anonymous astronomer. The tenuity of its boundary offering no definition for exact comparison, has made the several attempts to figure it so conflicting as to mislead. Marius describes it as resembling the diluted light of the flame of a candle seen through horn. Halley mentions that it emits a radiant beam. Cassini calls it - *à peu-près triangulaire*. Le Gentil considered it round for some years, then oval, but always of a uniform light in all its parts, while Messier represents it as resembling two cones, or pyramids of light, opposed by their bases.

From such statements, Boulliaud and Kircher thought this wonderful object appeared and disappeared, like Mira; and Le Gentil had no doubt of its undergoing changes in form. But probably this discordance is a consequence of the means employed. Le Gentil, by his paper of 1749, seems to have used telescopes of various sizes, in order to see it very clearly "*non seulement pour servir a la reconnaître, mais encore pour voir si dans la suite elle ne seroit point sujette à quelque variation, soit dans la figure, soit dans la position*"; yet 15 years afterwards Messier differs from him, by assigning a greater brilliancy to the centre than to the edges, which latter accords better with my views of it, than do our apparent mean places. It is, however, remarkable that Messier examined this giant nebula with a 4½ Newtonian, and then turned the instrument upon γ Andromedae "*qui en étoit fort près*" to compare its light with that of the star, on a beautiful night of August 1764; but he makes no mention of the duplicity, or contrasted colours, of that lovely star.

Sir William Herschel gave this a rigid scrutiny and concluded it to be the nearest of all the great nebulae. "The brightest part of it," he says, "approaches to the resolvable nebosity, and begins to show a faint red colour; which, from many observations on the magnitude and colour of nebulae, I believe to be an indication that its distance in the coloured part does not exceed 2000 times the distance of Sirius." Does not exceed that distance! That is so far from us, that light, which is endowed with the swiftest degree of motion yet known, flying along at the rate of 186,660 miles in a second of time, or about it millions of miles in a minute, would require upwards of 6000 years to traverse the awful interval : as to that type of terrestrial velocity, so often cited, the cannon- ball, with its 500-miles-an-hour pace, it would have no chance of passing the same space under nine or ten thousand millions of years. What an overwhelming idea does such an astonishing conclusion give of the All- wise and Omnipotent Intelligence.

The companion was discovered in November 1749, by Le Gentil, and was described by him as being about an eighth of the size of the principal one; he adds, "*elle m'a paru exactement de la meme densité que l'ancienne*" The light is certainly feebler than here assigned. Messier whose No. 32 it is observed it closely in 1764 and remarked that no change had taken place since the time of its being first recorded. In form it is nearly circular.

The powerful telescope of Lord Rosse has been applied to this, after finding that no actual resolution in the large nebulae could be seen, though its edge had stellar symptoms; and it proved to be clearly resolvable into stars – the which directly interferes with Le Gentil's remark.

REFERENCES

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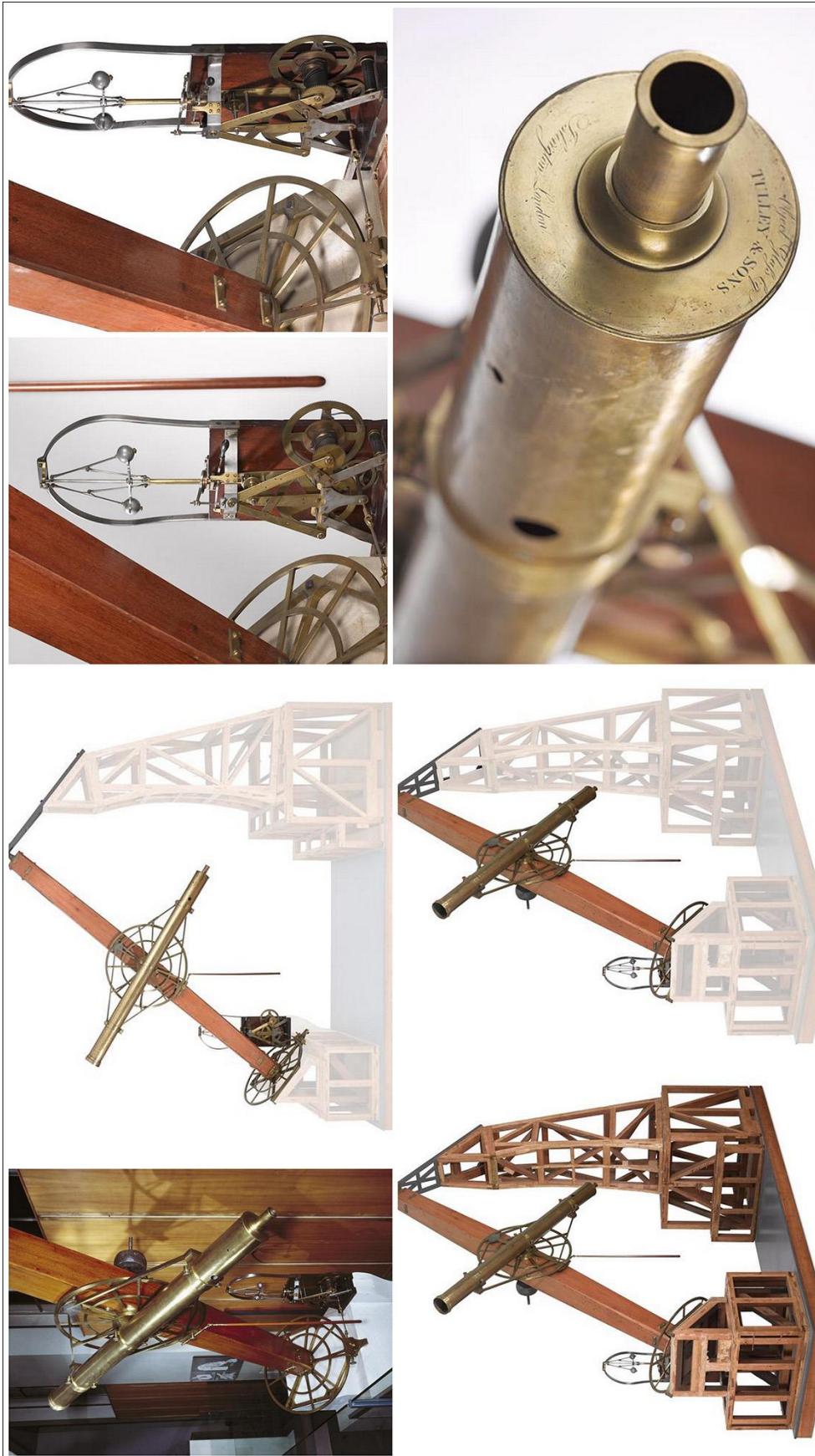


Figure 2 - Smyth equatorial refracting telescope, 1829 (Science Museum London).

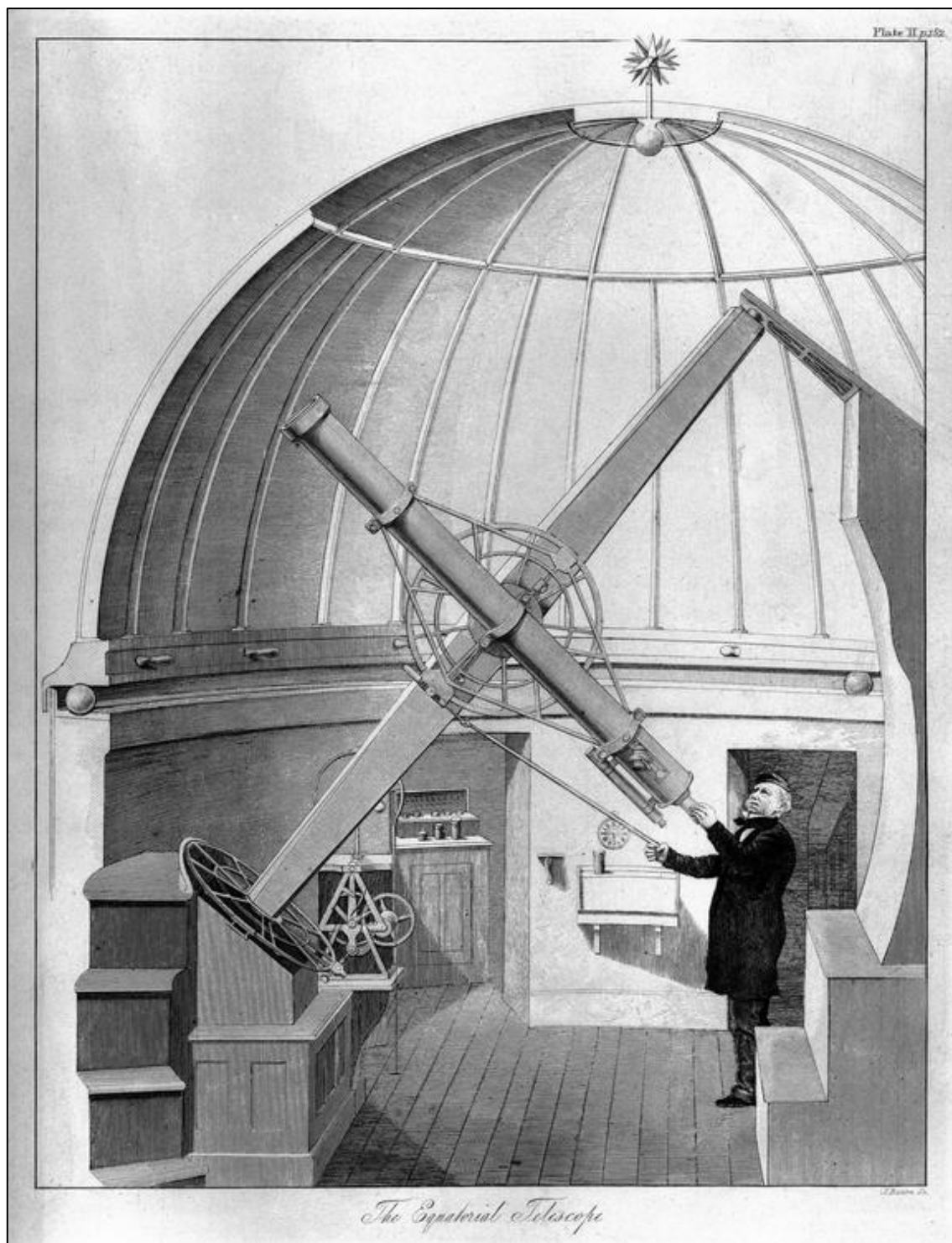


Figure 3- The Smith equatorial telescope (*Cycle of Celestial Objects*).

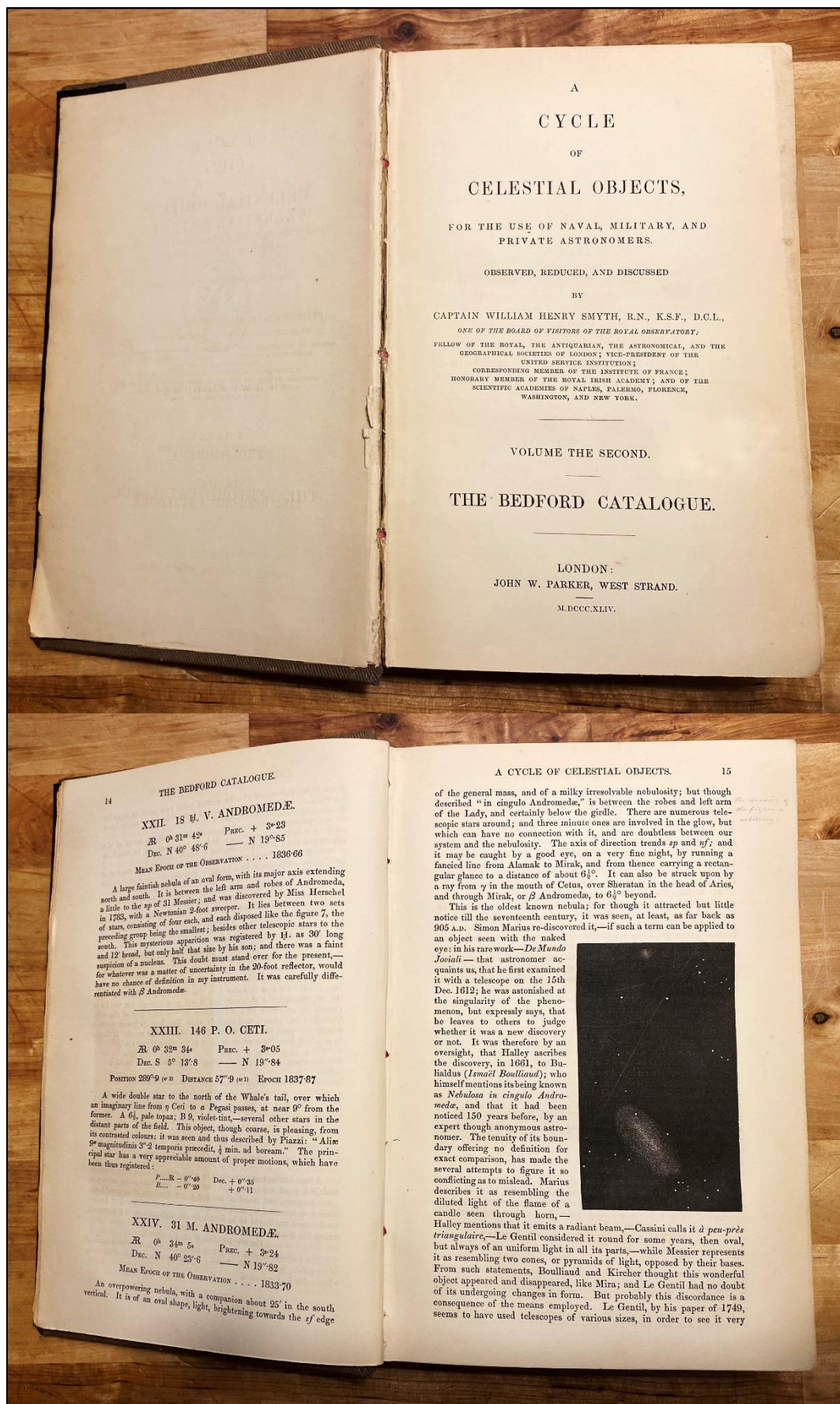


Figure 4- A Cycle of Celestial Objects. The Bedford Catalogue (Vol II). Author's copy.