



**The Story of Helium and the Birth of Astrophysics.** Biman B. Nath. Springer, New York, 2013. xi + 274 pp. Price: € 32.95.

A 300 or so page book on how helium was finally discovered – is it required? Certainly! and Biman Nath does a great job in telling us as to what purpose such a book serves. First, it is a wonderful lesson on how spectroscopy is at the heart of scientific discoveries; in fact, way back in the 1860s, right now and in the foreseeable future, spectroscopy is the one tool that can tell us about the composition of the distant nebulae as well as the motion of the valence electrons just before the reaction event. Secondly, it is inspiring and reassuring to know about the arduous path to great scientific discoveries and the tenacity of the scientists that undertake such arduous journeys. After all, from the eventual total solar eclipse of 1868 to Ramsay's identification of helium in the mineral cleveite found on earth, it took only 26 years! Thirdly, addressing the process of creating legends and heroes in any scientific endeavour, an inevitable romanticizing of science, resulting in a few unsung heroes to whom history shall always remain unfair. In short, this book reads like a whodunnit with twists and turns, in the fate of the main players as well, and highlights the above points in a wonderful way.

The author sets up the plot in the first few chapters with key roles being played by Fraunhofer, Foucault, Herschel, Talbot, Kirchoff, Bunsen, Huggins and many others. An exciting moment is captured in Bunsen asking himself 'If we could determine the nature of the substances burning in Mannheim then why should we not do the same with regard to the sun?' High-school students familiar with the so-called flame test will be amazed that it took Bunsen and Kirchoff a couple of years to actually understand the principles behind the test. Incidentally, the origins of the flame test go back to 1750s due to Thomas Melvill. It surely would

not hurt to know that Bunsen is not just the name of a company that manufactures Bunsen burners. The important point of all the collective effort was that every element has a unique spectrum and that one could now dream of uncovering the chemical composition of distant stars, nebulae, and our very own sun. What also comes across rather clearly in these first few chapters is the ingenuity of the scientists in making quality optical instruments – prisms, lenses, gratings, telescopes and spectroscopes.

The real drama unfolds in the eighth and ninth chapter of the book which describe the congregation of several brilliant astronomers at Guntur in India for the 1868 total solar eclipse. Janssen from France, Britishers Tennant (a soldier tuned astronomer) stationed in India and Pogson (government astronomer at the Madras observatory) had all set up their observation camps to take a peek at the solar atmosphere. The author provides a vivid description of the excitement of finally being able to reveal the solar secrets amidst uncertainty due to the monsoon season in India and last moment problems with the instruments. Although competitors in one sense, one cannot help but appreciate the camaraderie for the greater cause of science when Janssen assists in fixing the alignment problem of Tennant's spectroscope fitted on the telescope. Two things stood out for me in these chapters. First, the hand-painted diagram of the spectrum of solar prominence by Pogson (figure 9.3) – the care with which this figure is made is astounding, as is his observation that one of the bright lines was close to the sodium D-line. Second, the fact that Janssen continued to think about the bright lines and did several other measurements long after the eclipse was over. Others had packed up right afterwards and this just exemplified the level of intensity and passion of Janssen.

The tenth chapter is where we learn that it was Lockyer (a clerk turned



Lockyer's team at Bekul, India, during the total solar eclipse in 1871.

astronomer) who coined the name helium since it was first identified in the solar spectrum. The amazing coincidence of the time of arrival of Lockyer's and Janssen's letters to the royal society, the intensity of Lockyer, and his disputes with others due to excessive aggressiveness on his part are told with great fervor. The key aspect though is the unfortunate sequence of events that sidelined Pogson and his important contributions. Thus, although it is heartwarming to see the medal jointly awarded by the French academy to Janssen and Lockyer, one feels for Pogson. However, Pogson might be finally getting his due as one can find him on youtube under the 'my favourite scientist' category. Surely, such things happen even today and one just wonders as to how many Pogsons are out there. The story ends with Ramsay's brilliant experiments that finally identify helium on earth.

There is something for everyone in this book, from why cesium has its name to why even the great Mendeleev did not buy into the existence of a new element. For example, I was surprised to know that Mendeleev was one of the skeptics of the new element. I suppose it is hard to blame Mendeleev, since the whole story of helium hinges on one spectral line that is just a few nanometres close to the sodium D-line. It was also interesting to see many clever minds trying desperately to make sense of the spectral data and even suggesting the existence of an element lighter than hydrogen! The last chapter brings out certain aspects of science that may or may not be good – legends, myths, undue admiration, distortion of history and the resulting priority stories. Opinions may be divided on these issues, but I can say this much: sometimes a good story with a hero and all the romanticizing can inspire young students to pursue science. For starters, the young readers should read this story of helium for some inspiration and lessons. For those of us who think we are wiser, reading this book will at least make us look up at the stars afresh and stay excited about the fascinating field of spectroscopy. Perhaps, one of these days, another example of one single spectral line being out of place might challenge some of our cherished approximations or assumptions.

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