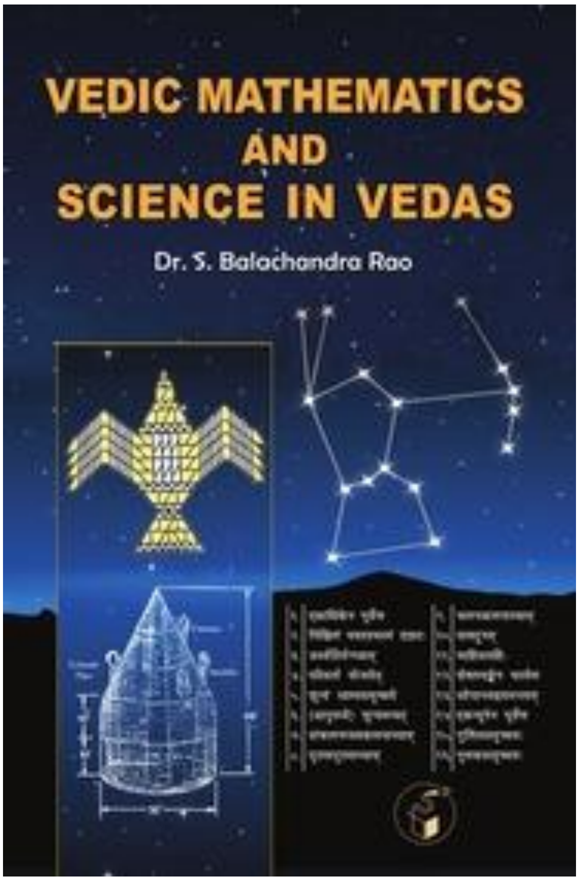
BOOK REVIEWS

Vedic Mathematics and Science in Vedas, by S. Balachandra Rao (Bengalaru, Navakarnataka Publications Pvt Ltd., 2019). Pp. [iv] + 172, ISBN 978-93-89308-01-3 (paperback), 140 × 212 mm, 200 rupees (available online from Flipkart.com and www.navakarnatakaonline.com).

Vedic science is much maligned in India today. A lot of real and imaginary ideas are associated with the Vedas and a lot of false claims are being made in the name of Vedic science. The claims can go so far as to include the invention of flying machines and interplanetary travel.

There is therefore a need for a good, reliable, book that accurately discusses Vedic science in proper context, and Balachandra Rao's *Vedic Mathematics and Science in Vedas* fulfils this crucial need.



Normally the Vedas refer to the four earliest books of Vedic literature dated to around 1200 to 1800 BCE. They are the original treatise that forms the foundational principles of Hinduism. The two earliest Vedas, the *Rig Veda* and the *Yajur Veda*, both have an addendum called the *Vedanga Jyotisha*, which loosely translates as "… a branch of the Veda dealing with stars". These books are the earliest references to the struggle of the Vedic people to reconcile solar and lunar calendars and talk about the need to reconcile the two by adding an intercalary month. They mention a few stars and also Bruhaspati—the Indian name for Jupiter.

However, those who trumpet the greatness of Vedic science include everything that is claimed to have been written in Sanskrit, freely mixing later ideas and even non-existent ideas, forgeries and pure imagination, to create an illusion of great knowledge of modern science in ancient times, even though it is easy to show that this is impossible.

Balachandra Rao has assembled all of these claims and taken them up one by one, explaining what knowledge exists and what is fictional, and taking care to define and explain the ideas systematically. He has also included the false claims of Vedic mathematics. Professor Balachandra Rao deserves to be complimented for creating this compilation, and making it available at reasonable cost to all interested readers.

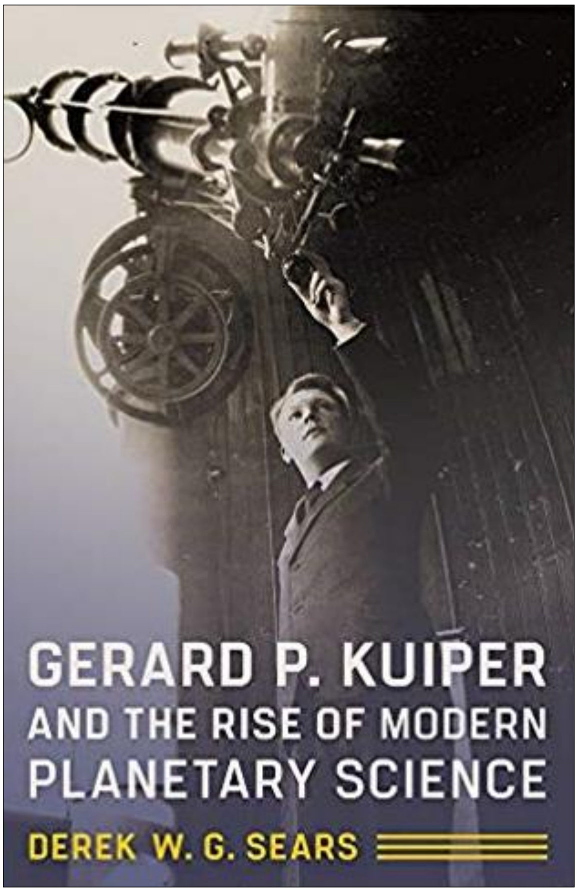
The book therefore serves the purpose it is supposed to, for any honest student of the subject. It also shows that rather than individual scientists like Balachandra Rao fighting the battle for rationality on their own, the time may have come to create a formal body in India that can authoritatively evaluate the various claims of ancient Indian science.

Professor Mayank Vahia,
Narsee Monjee Institute of Management Studies, Mumbai, India.
Email: mnvahia@gmail.com

***Gerard P. Kuiper and the Rise of Modern Planetary Science*, by Derek W.G. Sears (Tucson, University of Arizona, 2019). Pp. xiii + 350. ISBN 978-0-8165-3900-0 (hardback), 155 × 235 mm, US $45.**

This book is a key reference for anyone interested in the origins of modern planetary science. Derek Sears (a Senior Research Scientist at NASA), citing exhaustive interactions with archives of the personal papers of Kuiper (and other scientists of that era), as well as with Kuiper family members, traces the life of Kuiper (1905–1973) from his beginnings as a classical astronomer interested in the origin of binary stars through his key role in the establishment of modern planetary science. A first step was Kuiper's conversion of the binary star work to an important theoretical scenario of the origin of the Solar System in the 1950s. By that time he was at Yerkes Observatory, operated by the University of Chicago, but his move toward planetary work, plus criticisms that he tended not adequately to cite earlier work, led to discord in the Chicago Astronomy Department.

After the Soviet Union's 1957 launch of Sputnik I, the first artificial satellite, a 'golden age' of funding for planetary exploration began in the United States, including an effort to upgrade 'grade B' universities to 'grade A' research institutions. Kuiper chose that time to move from Chicago to the University of Arizona, in Tucson, one of upgraded institutions. Skilfully interacting with fledgling NASA, he obtained funding for an entire, new, four-storey campus building devoted to planetary science—the Lunar and Planetary Laboratory.



At the same time, during that early period, Kuiper had realized the potential of infrared detectors developed in World War II. These detectors opened a window into a part of the spectrum that included absorption bands diagnostic of planetary atmospheres and the mineralogy of rocky planetary surfaces. As a result, Kuiper embarked on a campaign to establish new observatories at altitudes above most of the infrared-absorbing water vapor in Earth's lower atmosphere—a campaign that led ultimately, in the 1960s, to Mauna Kea Observatory in Hawaii, as well as several smaller telescopes in the mountains around Tucson (not counting Kitt Peak National Observatory, which had already been established near Tucson).

As a graduate student of Kuiper in the 1960s, I can affirm Sears' account of that period, as I was one of those sent to do site testing at 14,000 feet on Mauna Kea (operating alone out of a cabin at 9200 feet at the present observatory dormitory level). I recall Kuiper's frequent discussions of what he called 'Big Science', which meant trips to Washington D.C. for direct face-to-face program planning with NASA officials (without today's complex process of multiple proposal submissions). 'Big Science' also meant support for Kuiper's series of lunar photo-atlases, the building of infrared spectrometers, vigorous lunar research including Kuiper's work on the Ranger probes (first close-up photos of the lunar surface), and his establishment of the *Communications of the Lunar and Planetary Laboratory*, in which various of us published early papers.

As Sears describes with entertaining documentation, this energetic 'Big Science' approach led to substantial criticism from some other scientists, especially Nobel Prize winner Harold Urey. For example, the *Communications* … series were validly criticized by Urey and others as publications without proper peer review—which GPK, as we called him, probably felt he did not need. In fairness to GPK, many major astronomical observatories maintained their own series of occasional 'Contributions', often tabulations of multi-year surveys too lengthy for publications in journals. Urey and Kuiper had a famous feud for some years, partly because of very different opinions about the lunar surface, Urey favoring a cold history (like ordinary chondrites) and GPK favoring volcanic activity producing the lunar *mare* plains. The feud spilled into my own mailbox after GPK graciously allowed me to be first author on our 1962 paper in the *Communication* series about the discovery of the giant Orientale multi-ring impact basin. Some weeks later, as Sears describes, I received a less-than encouraging letter from Urey, disbelieving that multi-ring structures had "any real meaning", complaining about our lack of references to his work and our publishing without peer review, and advising me that this was a poor way to start my career.

In 1960, when Kuiper founded the Lunar and Planetary Laboratory, there were no planetary science departments in the U.S. Our first generation of his graduate students got our PhD's in the Astronomy and/or Geosciences Departments. Sears details Kuiper's key role in the emergence of University of Arizona's Department of Planetary Sciences and graduate degree program, which was not formally established until 1972, and has produced many leading planetary researchers.

In short, Sears' important book describes how, from theory to observatories to academic departments, Gerard Kuiper was a pioneer in shaping the modern blend of astronomy, physics and geology, called planetary science.

Dr William K. Hartmann
Planetary Science Institute
Tucson, Arizona
Email: hartmann@psi.edu

***Conference Dedicated to the 100th Anniversary of the Death of Dr. Nicolaus Thege-Konkoly, and 145th Anniversary of the Founding of the Hurbanovo Observatory*, edited by Eduard Koči (Hurbanovo, Slovenská ústredná hvezdáreň, [2016]). Pp. 115. ISBN 978-80-85221-91-6 (paperback), 165 × 235 mm, €10.**

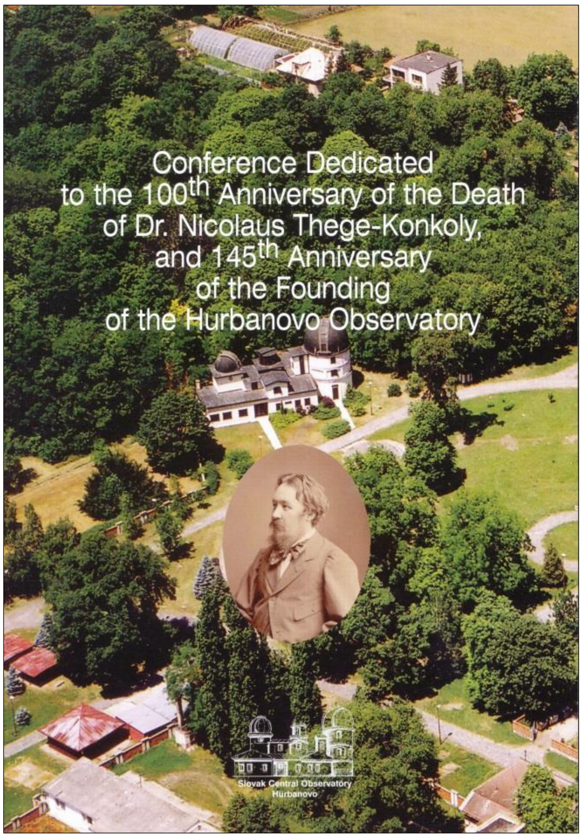
In 2016, one hundred years have passed since the death of Dr Nicolaus Thege-Konkoly (1842–1916), one of the founders of astrophysics in Kingdom of Hungary. Nicolaus Thege-Konkoly studied physics at the University in Pest (now Budapest). Then he enrolled to study law at the University in Berlin. He had a keen interest in natural sciences and in his spare time he attended lectures held by the famous German astronomer Johann Franz Encke and physicist and chemist Heinrich Gustav Magnus. In his adult years, Konkoly was also active in the fields of meteorology and geomagnetism. In 1871 he founded his private observatory in Ógyalla (Slovak: Stará Ďala, renamed Hurbanovo in 1948), i.e. 145 years before 2016.

A conference commemorating both anniversaries was held in the Slovak Central Observatory in Hurbanovo, Slovakia, on 18–20 May 2016. Experts from various fields and three countries (Slovakia, Hungary, and the Czech Republic) gathered there to present papers related to Konkoly or the Observatory in various ways. The Slovak Central Observatory published a collection of papers in Slovak and English languages containing thirteen papers altogether. A version in the Hungarian language is planned as well.

The first paper focuses on the private observatory 'Júlia' located in Zvolenská Slatina (a village in Central Slovakia). The owner of the observatory, Vladimír Bahýl, describes the scientific program of the observatory (mostly observations of photometric measurements of meteors and eclipsing binaries). At the end of the paper, he also opens a discussion about who can be considered an amateur or a professional observer. He considers Nicolaus Konkoly a professional, even though he 'only' used a private observatory. As an owner of a private observatory, V. Bahýl declares that he is the scientific heir to Konkoly in the field of astronomy.

In the next paper Lajos G. Balázs deals with the scientific life, instrumentation and scientific results of Nicolaus Thege-Konkoly in the era of the rise of astrophysics. Konkoly's observation program consisted of solar physics, observing interplanetary matter, planetary research (particularly Jupiter and Mars), stellar spectroscopy and stellar photometry. Balázs also sheds some light on collaborations between the staff (Radó von Kövesligethy, Antal Tass, Béla Harkányi and others). He writes briefly on the institutional development of the Observatory, its donation to the Hungarian state in 1899, and hard times both after the death of Konkoly in 1916 and after the dissolution of the Kingdom of Hungary in 1918.

Three authors from the solar observatory in Debrecen (Tünde Baranyi, Lajos Győri and András Ludmány) write about the photoheliographic



program and sunspot database produced by their Observatory since 1958. The instruments used to obtain these results were originally housed in Konkoly's private observatory in Stará Ďala/Ógyalla. They briefly outline the development of solar physics and Konkoly's own contribution in this field.

The fourth paper, by Lajos Bartha, focuses on Nicolaus Thege-Konkoly as an engineer, an organizer and a cultural politician. Bartha illustrates that Konkoly was not only an engineer or a politician but a true 'renaissance' man: he was, among other things, a pianist, a composer, an excellent shooter, a fencer, a locomotive driver, and a river-boat captain. Konkoly was a very influential man in his circles.

In the fifth paper, Ladislav Druga summarizes the history of the Observatory from its be-