



### Chintamani Ragoonatha Charry and Contemporary Indian Astronomy.

B. S. Shylaja. Navakarnataka Publications Private Limited, Embassy Centre, Crescent Road, Bangalore 560 001 in association with Bangalore Association for Science Education, Jawaharlal Nehru Planetarium, High Grounds, Bangalore 560 001. 2012. 96 pp. Price: Rs 75.

The 19th century witnessed a great resurgence of scientific activity throughout the civilized world. Venus transit (1874) triggered hectic activities in astronomical observations in India as much as in the rest of the world. Against this backdrop of tremendous astronomical activity, there appears on the scene the hero of the book under review, Chintamani Ragoonatha Charry (anglicized form of Raghunatha Acharya), referred to hereafter as CR. CR (1828–1880) was the first Indian to study and practise the European procedures of observational astronomy. He worked at the Madras Observatory in different capacities. He was one of the very few Indians (natives) to be nominated to the Royal Astronomical Society (RAS).

CR was experienced in classical Indian as well as modern astronomy. The transit of Venus in 1874 provided an opportunity to CR in reaching out to common people with the interesting phenomena like transits, occultations and eclipses. Three versions of a monograph related to the 1874 Venus transit, solar eclipse of 1868 and an occultation were published by CR in three different languages – English, Kannada and Urdu.

The book under review is in Kannada as well as in English, which is a comparative study of the above cited three monographs. The author has highlighted

(i) CR's significant contribution as a practical astronomer and effective communicator, and (ii) his contemporary milieu of astronomical development in India and Europe.

The three monographs by CR presented discussions on Venus transit and related topics, addressed to different categories of readership. He was keen that the traditional Indian astronomers take up observations and try to take advantage of the flow of knowledge from the West.

CR was not successful in preparing a treatise on the solar eclipse of 1868, which is historically important, because the spectral lines of helium in the Sun were first discovered during this eclipse. He was successful in observing the next solar eclipse in 1871 from Coimbatore. He observed the extent and structure of the corona and the prominences. He was also successful in observing the annular solar eclipse of 1872 from Madras.

CR prepared a monograph on the transit of Venus in the early part of 1874. Both the English and Kannada versions are available in the Archives of the Indian Institute of Astrophysics (IIA), Bangalore. The obituary note from RAS, on the death of CR, states that their library has copies of the Hindusthani and Telugu versions of CR's monograph.

According to the author of the book under review, B. S. Shylaja, a comparative study of the different versions throws new light on the status of contemporary Indian astronomy. Johannes Kepler (1571–1630) had predicted the future transits of Mercury and Venus occurring in 1631. Unfortunately, Kepler did not live to observe the two important events. He died just the previous year! The French astronomer Pierre Gassendi, who was confident of observing both the transits of 1631, did succeed in respect of Mercury's transit on 7 November 1631. Despite Gassendi's meticulous preparations for three days to observe the transit of Venus, he did not meet with success. The event took place, as if to tease him in the night between 6 and 7 December when the Sun was below the horizon in France!

In the 18th century the 8-year pair of Venus transit was to occur in 1761 and 1769. These events were greatly publicized by Edmund Halley of the 'Halley's comet' fame and a close friend of Newton. He requested for an international campaign for the observations of these

two events and insisted that this was the only technique to determine the distance between the Sun and the Earth precisely. Le Gentil's expedition to India met with unfortunate misadventure – that too during two episodes – since he failed in his venture on both occasions, 1761 and 1769.

Appreciating greatly the competence and dedication of CR, N. R. Pogson, Director, Madras Observatory wrote: '...he has sufficient skill and energy to make additional observations worthy of reputation and beneficial to science'. CR published three significant papers in the *Monthly Notices of the Royal Astronomical Society (MNRAS)*: (i) 'On the determination of personal equation by observations of the projected image of the Sun' (*MNRAS*, **xix**, 337); (ii) 'Occultations visible in the month of August 1868 at Madras and along the shadow-path of the total eclipse of the Sun in India' (*MNRAS*, **xxiii**, 193); (iii) 'On the total eclipse of the Sun on December 11th 1873, as visible in Madras Presidency' (*MNRAS*, **xxxi**, 137). His contributions brought him the honour of 'Membership' of RAS.

CR was critical about the attitude of the local traditional pundits towards actual observations made by European astronomers. He wrote about three celestial events and requested his readers to take up observations of (i) the solar eclipse of 6 April 1875, (ii) Venus occultation of 12 November and (iii) conjunction of Jupiter and Mars in December. In his Urdu monograph he writes: 'Is it not strange that Europeans with their patience are progressing so much and ... do our Indian kings show keen interest? Are there any amongst us who with their all wealth will spend the whole of their life in the pursuit of progress of man's intelligence?' As positive answer to this question, there was the dedicated observational astronomer, Ankitam Venkata Nursinga Row, who functioned from his private observatory in Vishakapatnam. CR was keen on setting up an observatory for the benefit of the local populace and also wanted to donate his own instruments to this proposed private observatory. He insisted on traditional 'siddhantins' taking up actual observations in order to make their computations 'driktulya', tally with observations.

Shylaja has done a good job in providing explanatory notes and commentary in English on CR's Kannada text. Appendix

## BOOK REVIEWS

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2 gives the English version of CR's explanation of the simple technique of measuring the Sun's parallax, during the transit of Venus, and thus estimating the Earth-Sun distance. Shylaja has also taken lot of pains in providing the corrected versions of the Sanskrit *shlokas* quoted by CR, often misspelt, from several original Sanskrit texts. Thus Shylaja's contribution to our understanding CR's eminence as a dedicated astronomer, an effective communicator and also an achiever in contemporary Indian astronomy in his time, can hardly be exaggerated. She richly deserves our gratitude and congratulations.

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This volume contains 23 review chapters covering diverse aspects and recent advancement in plant pathology. The remarkable progress in molecular methods and genomics has greatly contributed to our understanding of plant diseases. This knowledge has led to innovative methods of disease control. The volume provides updated in-depth analysis on various fascinating topics of plant-pathogen interactions, including biology of plant pathogens and their mechanism of pathogenesis, molecular basis of plant-microbe interactions, signalling involved in plant immunity, microbial ecology and epidemiology, plant disease management and other important topics.

The preface chapter opens with personal history Kurt J. Leonard (University of Minnesota, St Paul, USA) reflecting his outstanding career as an eminent plant pathologist and his important work on epidemiology and genetics of disease resistance in plants. This article is a treat

to read for budding scientists and science graduates as it describes how dedication, right decision, timely advice, hard work and suggestions from colleagues can help develop a fruitful career. The following chapter is a tribute to a distinguished plant pathologist Kelman, intelligently compiled by Luis Sequeira. Kelman was one of the influential scientists and an extraordinary leader of his era, who made significant contributions in the areas of bacterial plant pathogenesis and ecology.

The recent rapid development of genomics has significantly helped in understanding of plant diseases by providing new information about the virulence mechanisms employed by successful pathogens. In this context, the chapter by Lindeberg elaborates that genome sequence data have revealed several novel and critical molecular determinants of pathogenicity, not only in the better characterized bacterial pathogens such as *Xylella*, *Xanthomonas* spp., *Ralstonia solanacearum*, *Pectobacterium*, *Pseudomonas syringae*, etc. but also from less characterized pathogens such as phytoplasmas and *Candidatus* spp. Genomic comparisons provide further insights into the evolution of pathogens and their adaptation to various niches. Moreover, information generated from genome-scale sequencing will be useful in devising new methods in disease control.

In a separate chapter, Genin and Denny describe the molecular determinants responsible for virulence and host-range species of *R. solanacearum*. A detailed account on the regulatory networks important for pathogenesis has been presented. The authors discuss that genome sequencing of several strains of *R. solanacearum* has provided insight into speciation and evolution of this pathogen, and recent progress in identifying new virulence factors. The article by Malnoy *et al.* focuses on another bacterial phytopathogen *Erwinia amylovora*, a causal agent of fire blight in members of Rosaceae family, such as apple, pear, etc. This chapter offers insights on current understanding of fire blight host-pathogen interactions; recent advances in the genomics of *E. amylovora* and one of its hosts (apple), and improving management of fire blight disease using genomics approaches. Chorkowski *et al.* have comprehensively reviewed the role of protein secretion systems (types I-VI) and multiple types of small molecules in pathogenesis of soft-rot Enterobacteri-

aceae (SRE), including genera *Pectobacterium* and *Dickeya*, the causal agents of wilt, rot and blackleg disease on a wide range of plants.

Barak and Schroeder have reviewed the emerging discipline of plant pathology aiming at detailed study of association between human enteric bacterial pathogens and plants. The authors have covered various modes of contamination of agricultural produce with bacterial food borne human pathogens such as *Salmonella*, pathogenic *Escherichia coli*, etc. Recent research progress revealing plant colonization mechanism used by human pathogens has been compiled. Presence of other phytopathogens increases the risk of contamination of agricultural produce with these pathogens. The authors have summarized few applications that could decrease the risk of human illness via reducing contamination of fresh agriculture produce by human pathogens.

The comparative genomics of obligate, nonobligate fungal pathogens (ascomycetes and basidiomycetes) and oomycetes has been described by Spanu. Comparative genome analysis of sequenced biotrophic pathogens has indicated loss of genes that encode proteins participating in inorganic nitrogen and sulphur metabolic pathways, thiamine metabolism, carbohydrate active enzymes and secondary metabolic enzymes. Additionally, these studies highlight that in some biotrophs, overall genome size has increased due to active proliferation of retrotransposon. Overall, the mechanisms underpinning obligate biotrophy have been well presented in this chapter. Jiang and Tyler focus on virulence mechanisms, pathogenicity factors, genomic properties and genomics led insights into evolution and host specificity of plant oomycetes group of pathogens. Oliver *et al.* provide a well-compiled review on a wheat pathogen *Stagonospora nodorum*, a model for necrotrophic pleosporales group of pathogens. The authors have emphasized that various tools such as functional genomics, genome sequencing, proteomics, metabolomics and source of large number of isolates have helped in identifying the key pathways important for its pathogenesis.

Understanding the variability of pathogens belonging to order Uredinales (commonly known as rust fungi) has provided ways of development of new plant cultivars with genetic resistance