Astrophysics and Space Science Proceedings

Wayne Orchiston
Tsuko Nakamura
Richard Strom *Editors*

Highlighting the History of Astronomy in the Asia-Pacific Region

Proceedings of the ICOA-6 Conference

Springer

About the Authors

Stella Cottam was born in New York City (USA) in 1949, and has B.S. degrees in physics and medical technology from Fordham University and the University of Nevada respectively, an M.S. in library science from the University of Kentucky and a Master of Astronomy from the University of Western Sydney in Australia. She works as a microbiologist at the Veteren's Administration Hospital in Lexington, Kentucky (USA). Stella is currently studying part-time for a Ph.D. through the Centre for Astronomy at James Cook University. Her thesis topic is "Solar Eclipses and Transits of Venus, 1868–1882, and their Role in the Popularisation of Astronomy in the USA", and her supervisors are Wayne Orchiston and Richard Stephenson.

Steven Gullberg was born in Jamestown, New York (USA) in 1956, and has a B.S. from the State University of New York and a Master of Liberal Studies (Ancient Astronomy) from the University of Oklahoma. In 2009 he graduated with a Ph.D. from James Cook University with a thesis on "The Cosmology of Inca Huacas", supervised by "Kim" Malville and Wayne Orchiston. A former American Airlines pilot, Steven is currently involved in setting up a new national airline for Barbados. His astronomical interests focus mainly on Babylonian astronomy and Incan archaeoastronomy. A paper based on his thesis research (and co-authored by Kim Malville) was published in Astronomy and Cosmology in Folk Traditions and Cultural Heritage, *Archaeologia Baltica*, 10, and another paper appeared in *The Journal of Cosmology*, volume 9, in 2010.

W. Orchiston et al. (eds.), *Highlighting the History of Astronomy in the Asia-Pacific Region*, 631
Astrophysics and Space Science Proceedings, DOI 10.1007/978-1-4419-8161-5,

Ihsan Hafez was born in Beirut (Lebanon) in 1968. He has B.Sc. and M.Sc. degrees from the American University in Beirut and Boston University respectively and a Master of Astronomy from the University of Western Sydney in Australia. He works as a Manager in the refrigeration industry in Beirut. Ihsan founded the Middle East's only science and astronomical magazine, *Ilm Wa Alam*, and also the observatory at the Beirut Arab University, where he teaches undergraduate astronomy part-time. His research interests lie primarily in Arabic astronomy, and he has just completed a Ph.D. through the Centre for Astronomy at James Cook University. His thesis topic was "Abdul-Rahman al-Ṣūfī and *The Book of the Fixed Stars*: A Journey of Rediscovery", and his supervisors were Richard Stephenson and Wayne Orchiston.

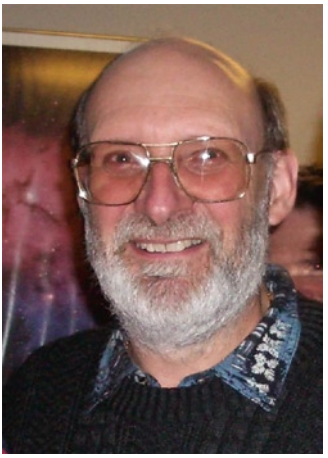
J. McKim ("Kim") Malville was born in San Francisco in 1934, and has a B.S. from Caltech and a Ph.D. from the University of Colorado. He has taught at the Universities of Michigan, Sao Paulo, and Colorado, where he was Chairman of the Department of Astro-Geophysics. He is currently Emeritus Professor of Astrophysical and Planetary Sciences, University of Colorado, an Adjunct Professor in the Centre for Astronomy at James Cook University (Australia), and a Tutor at the University of Lampeter, where he is teaching a graduate course in archaeoastronomy for the Sophia Center. His research interests range from auroral physics, solar physics (radio astronomy, corona, flares) and archaeoastronomy (Peru, Egypt, India, and the American Southwest). Books that he has authored or edited include *Prehistoric Astronomy in the Southwest, Time and Eternal Change, A Feather for Daedalus, Ancient Cities, Sacred Skies: Cosmic Geometries and City Planning in Ancient India*, and *Pilgrimage: Self-Organization and Sacred Landscapes.* He is an Executive Editor of the on-line publication *Journal of Cosmology*.

Tsuko Nakamura was born in Seoul in 1943, during the Japanese colonization of Korea, and has Masters and Ph.D. degrees from the University of Tokyo. He is currently Professor of Information Sciences at Teikyo-Heisei University, and was formerly an Associate Professor at the National Astronomical Observatory of Japan in Tokyo. Tsuko is a member of IAU Commissions 20 (Positions and Motions of Minor Planets, Comets and Satellites) and 41 (History of Astronomy). He is also on the Editorial Board of the *Journal of Astronomical History and Heritage*. His main research interests lie in the size distribution of small asteroids and comets, and the pre-modern history of Asian astronomical instruments and star maps. He is the author of numerous research papers in the above two fields, and the following books: *General Catalogue of the Japanese Astronomical and Land-surveying Books before 1870* (2005), *History of Cosmovison and Science* (2008), and *Japanese Astronomers of the Edo Period* (2008), all of which are in Japanese.

NHA Il-Seong was born in Seongjin City (North Korea) in 1932, and has B.Sc. and M.S. degrees from Yonsei University and a Ph.D. in astronomy from the University of Pennsylvania. He is Professor Emeritus at Yonsei University, a former President of IAU Commission 41 (History of Astronomy) and Chair of the IAU Working Group on Historical Instruments, and is on the Editorial Board of the *Journal of Astronomical History and Heritage*. He is one of those who initiated the International Conference on Oriental Astronomy (ICOA), and is the founder of the Nha Il-Seong Museum of Astronomy in Yecheon, Korea. His main research interests lie in the history of East Asian astronomy and in photometric properties of eclipsing binaries, and he has more than 200 publications, including the following history of astronomy books: *Oriental Astronomy from Guo Shoujing to King Sejong* (1997, co-edited by Richard Stephenson), *History of Korean Astronomy* (2000, in Korean), *The Story of Solar and Lunar Eclipses* (2002, in Korean, co-authored by Lee Jung-bok), *Astronomical Instruments and Archives From the Asia-Pacific Region* (2004, co-edited by Wayne Orchiston, Richard Stephenson and Suzanne Débarbat) and *Murals of Four Holy Animals* (2008, co-authored by Sarah Nha). Currently, Il-Seong is in the process of writing a multi-volume history of astronomy in Korea.

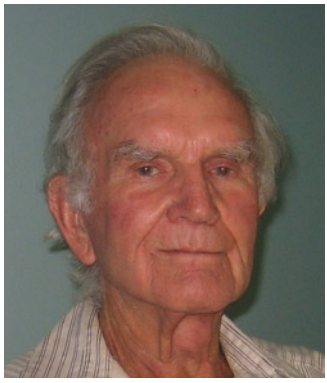
NHA Sarah was born in Philadelphia (USA) in 1971, and has B.Sc. and M.S. degrees from Yonsei University (Korea). Following her father's lead, she has research interests in eclipsing binaries and the history of astronomy. She is a member of the IAU Working Group on Historical Instruments, and was responsible for setting up and developing the Working Group's web site.

Yukio Ôhashi was born in Japan in 1955, and obtained a B.Sc. in physics and an M.A. in Chinese culture from Saitama University (Japan) in 1979 and 1981 respectively, and a Ph.D. in history of mathematics from Lucknow University (India) in 1992. He also completed the doctorate course of Hitotsubashi University (Japan) in Social Studies (Social History of the East) in 1989. He is a member of IAU Commission 41 (History of Astronomy). His main research interest is the history of astronomy in the East, and his publications include chapters in the following books: Kim Yung Sik and Bray, F. (eds.), 1999. *Current Perspectives in the History of Science in East Asia*; Selin, H. (ed.), 2000. *Astronomy Across Cultures. A History of Non-Western Astronomy*; Ansari, S.M.R. (ed.), 2002. *History of Oriental Astronomy*; Chan, A.K.L. et al. (eds.), 2002. *Historical Perspectives on East Asian Science, Technology and Medicine*; Orchiston, W. et al. (eds.), 2004. *Astronomical Instruments and Archives from the Asia-Pacific Region*; Jiang Xiaoyuan (ed.), 2005. *History of Science in the Multiculture: Proceedings of the Tenth International Conference on the History of Science in East Asia*; Chen, K.-Y., Orchiston, W., Soonthornthum, B., and Strom, R. (eds.), 2006. *Proceedings of the 5th International Conference on Oriental Astronomy*; and Narlikar, J.V. (ed.), 2009. *Science in India (History of Science, Philosophy and Culture in Indian Civilization, Volume XIII, Part 8).*



Wayne Orchiston was born in Auckland (New Zealand) in 1943, and has B.A. (Honours) and Ph.D. degrees from the University of Sydney. He is currently an Associate Professor of Astronomy at James Cook University, Townsville, Australia. A former Secretary of IAU Commission 41 (History of Astronomy), he is the founder and former Chair of the IAU Working Group on Historic Radio Astronomy and is also on the Committee of the IAU Working Group on Transits of Venus. In addition to Commission 41, he is a member of IAU Commissions 40 (Radio Astronomy) and 46 (Astronomy Education and Development). He is the founding Editor of the *Journal of Astronomical History and Heritage*. Wayne's research interests lie mainly in astronomical history, astronomical education and meteoritics, and he has more than 200 publications, including the following books: *Nautical Astronomy in New Zealand. The Voyages of James Cook* (1998), *Astronomical Instruments and Archives From the Asia-Pacific Region* (2004, co-edited by Richard Stephenson, Nha Il-Seong and Suzanne Débarbat), *The New Astronomy: Opening the Electromagnetic Window and Expanding our View of Planet Earth* (2005, editor), *Proceedings of the 5th International Conference on Oriental Astronomy* (2006, co-edited by Kwan-Yu Chen, Boonrucksar Soonthornthum and Richard Strom) and *Foundations of Australian Radio Astronomy. A New Picture of the Southern Sky* (2011, co-authored by Woody Sullivan).

John Pearson was born in 1947 in the USA, and has a B.Sc. (Physics) from Redlands University, a Master of Communication and Library Science (California State University) and a Master of Astronomy from the University of Western Sydney (Australia). In 2009 John graduated with a Ph.D. from James Cook University (Townsville, Australia) with a thesis on "The Role of the 40 Foot Schaeberle Camera in the Lick Observatory Investigations of the Solar Corona", supervised by Wayne Orchiston and "Kim" Malville. He is retired, and lives in Rancho Mirage, California (USA). His primary research interests are in the history of solar astronomy and in historic telescopes and other instruments. He is a member of the Antique Telescope Society. In 2008 his paper on "The 40-foot solar eclipse camera of the Lick Observatory" (co-authored by Wayne Orchiston) appeared in the *Journal of Astronomical History and Heritage*.



Bruce Slee is one of the pioneers of radio astronomy. He was born in Adelaide (Australia) in 1924, and received B.Sc. (Honours) and D.Sc. degrees from the University of New South Wales in 1959 and 1971 respectively. He is currently an Honorary Fellow at the CSIRO Division of Astronomy and Space Science in Sydney and an Adjunct Professor in the Centre for Astronomy at James Cook University, Townsville (Australia). He is a member of IAU Commissions 40 (Radio Astronomy) and 41 (History of Astronomy), and the IAU Working Group on Historic Radio Astronomy. He independently detected solar radio emission during WWII, was one of the original discoverers of the first discrete radio sources, participated in the first metre-wave all sky surveys, and along with Bernard Lovell pioneered the investigation of radio emission from stars other than the Sun. His other research interests include scattering in the interplanetary medium, absorption in the interstellar medium, pulsar research, surveys of clusters of galaxies, and radio relics in clusters. He continues to carry out research on active stars, microquasars and clusters of galaxies, and has also published a succession of papers on the history of Australian radio astronomy, mainly in collaboration with Wayne Orchiston and his James Cook University Ph.D. students. [Editors' note: We are pleased to report that all four 2005–2006 issues of the *Journal of Astronomical History and Heritage* were dedicated to Bruce Slee, in recognition of his remarkable 60-year involvement in world radio astronomy.]

Mitsuru Sôma was born in Kuroiso (Tochigi Prefecture, Japan) in 1954, and has M.Sc. and Ph.D. degrees in astronomy from the University of Tokyo. He is currently an Assistant Professor at the National Astronomical Observatory of Japan. Mitsuru is an Organizing Committee member of IAU Commission 41 (History of Astronomy). He is also a member of IAU Commissions 4 (Ephemerides), 6 (Astronomical Telegrams), 8 (Astrometry) and 20 (Positions and Motions of Minor Planets, Comets and Satellites). In addition he is also a Vice President for Grazing Occultation Services of the International Occultation Timing Association. His research interests include linkage of stellar reference frames with dynamical reference frames using observations of lunar occultations and changes in the Earth's rotation during ancient times using ancient records of eclipses and occultations.

Richard Stephenson was born in England in 1941, and has a B.Sc. (Honours) degree from the University of Durham, and M.Sc., Ph.D. and D. Sc. degrees from the University of Newcastle upon Tyne. He is currently an Emeritus Professor in the Department of Physics at the University of Durham and an Adjunct Professor in the Centre for Astronomy at James Cook University, Townsville (Australia). Upon his retirement from Durham University he was awarded a Leverhulme Emeritus Fellowship in order to continue his research. A former President of IAU Commission 41 (History of Astronomy), Richard is also a member of Commission 19 (Earth Rotation), and he is on the Editorial Boards of both the *Journal for the History of Astronomy* and the *Journal of Astronomical History and Heritage*. He is widely recognized as the founder of the specialist field of Applied Historical Astronomy, and uses ancient records from Babylon, China, Japan, Korea, the Arabic world and Europe to investigate historical variations in the Earth's rotation, historical supernovae, the past orbit of Halley's Comet, solar variability and historical aurorae. He has also carried out considerable research on ancient Asian astronomical manuscripts and star maps. For his work in historical astronomy he was awarded the Jackson-Gwilt Medal by the Royal Astronomical Society and the Tompion Gold Medal by the Worshipful Company of Clockmakers (London), and minor planet 10979 has been named Fristephenson. Richard has more than 200 publications, including the following books: *Atlas of Historical Eclipse Maps: East Asia, 1500 BC–AD 1900* (1986, co-authored by M.A. Houlden), *Secular Solar and Geomagnetic Variations Over the Last 10,000 Years* (1988, co-authored by Arnold Wolfendale), *Oriental Astronomy from Guo Shoujing to King Sejong* (1997, co-edited by Nha Il-Seong); *Historical Eclipses and Earth's Rotation* (1997), *Historical Supernovae and their Remnants* (2002, co-authored by David Green) and *Astronomical Instruments and Archives From the Asia-Pacific Region* (2004, co-edited by Wayne Orchiston, Nha Il-Seong and Suzanne Débarbat).

Ronald Stewart was born in Gordonvale (Queensland) in 1939, and has a B.Sc. (Honours) degree in physics (University of Queensland), a Master of Teaching degree (University of Technology, Sydney) and a Ph.D. in history of astronomy (James Cook University, Queensland). He was a Principal Research Scientist with the CSIRO's Division of Radiophysics working in solar radio astronomy before joining the Australia Telescope in 1986 where he worked in galactic and stellar radio astronomy. He also spent time as a visiting astronomer at the University of Hawaii

in 1972, the University of Colorado (Boulder) in 1981 and the Naval Research Laboratory (Washington, DC) in 1983. He left CSIRO in 1996 to teach secondary school science, and retired in 2006. Ron is a member of IAU Commission 40 (Radio Astronomy) and the IAU Working Group on Historic Radio Astronomy, and is currently researching the history of Australian radio astronomy in collaboration with Wayne Orchiston and Bruce Slee.

Richard G. Strom was born in New York City (USA) in 1944, and has a B.A. in physics from Tufts University (USA) and M.Sc. and Ph.D. degrees in radio astronomy from the University of Manchester (Jodrell Bank), UK. Until his retirement in 2009 he was Senior Research Astronomer at ASTRON (the Netherlands Institute for Radio Astronomy) in Dwingeloo, and Adjunct Professor of Astronomy at the University of Amsterdam. In 2010 he holds a Chinese Academy of Sciences Visiting Professorship for Senior International Scientists, and has been a Visiting Professor of Physics at the National University of Singapore. He is also an Adjunct Professor in the Centre for Astronomy at James Cook University, Townsville (Australia). Richard is a past Secretary and member of the Organising Committee of IAU Commission 40 (Radio Astronomy), and is also a member of Commissions 28 (Galaxies), 34 (Interstellar Matter) and 41 (History of Astronomy) and of the IAU Working Group on Historic Radio Astronomy. He is on the Editorial Board of the *Journal of Astronomical History and Heritage*. His research interests include supernova remnants, pulsars, large radio galaxies, radio polarimetry and interferometry, historical Chinese astronomical records and the history of radio astronomy in the Netherlands. He has numerous publications in a range of astronomical journals, and the history of astronomy book, *Proceedings of the 5th International Conference on Oriental Astronomy* (2006, co-edited by Kwan-Yu Chen, Wayne Orchiston and Boonrucksar Soonthornthum), in addition to co-editorship of the present *ICOA Proceedings*.

Kiyotaka Tanikawa was born in Gamago-ori (Japan) in 1944, and has M.Sc. and Ph.D. degrees in astronomy from the University of Tokyo. He is now a Special Visiting Scientist at the National Astronomical Observatory of Japan (NAOJ) following his retirement. He first had a post as an astrolabe observer at the International Latitude Observatory of Mizusawa (ILOM) in 1978 and stayed there until 1990. In 1988, there was a reorganization of Japanese astronomical institutes and the ILOM and Tokyo Astronomical Observatory of the University of Tokyo united to become the National Astronomical Observatory of Japan. Kiyotaka moved from Mizusawa to Tokyo in 1990 and began his career as an astronomer by making and analyzing CM diagrams of globular clusters before changing to theoretical studies: the restricted three-body problem, Solar System dynamics and chaotic dynamics in two-dimensional maps. In 1995 he added the general three-body problem to his research, and introduced numerical symbolic dynamics into this field. In 2001, he turned to history of astronomy when he began investigating historical changes in ΔT. Now he enthusiastically promotes the scientific study of ancient east Asia using the astronomical data that accumulated there.

Mayank Vahia was born in Bhuj (India), in 1956, and has B.Sc. and Master of Physics degrees from the University of Mumbai (India). He is currently a Professor in Tata Institute of Fundamental Research in Mumbai. He has worked on several projects involving Indian satellites flown on Indian, Russian and American missions to study high energy emission from the Sun and other objects. He has more than 190 publications in most of the major journals in astronomy and astrophysics as well as computer science. Mayank is a member of the IAU Commissions 41 (History of Astronomy) and 44 (Space and High Energy Astrophysics). For the past 4 years he has been researching the origin and growth of astronomy in the Indian subcontinent and has published more than half a dozen papers on the subject, including one in the *Journal of Astronomical History and Heritage*.

Harry Wendt was born in Angaston (Australia), in 1962, and has a B.Sc. (Honours) from the University of Technology (Sydney) and a Master of Astronomy from the University of Western Sydney (Australia). He currently works in a senior management role in the banking industry in Sydney, but has maintained a lifelong interest in astronomy, and particularly the history of radio astronomy. He is a member of the IAU Working Group on Historic Radio Astronomy. In 2009 he graduated with a Ph.D. from James Cook University. His thesis topic was "The Contribution of the C.S.I.R.O. Potts Hill and Murraybank Field Stations to International Radio Astronomy", and he was supervised by Wayne Orchiston and Bruce Slee. A number of papers based on his thesis research (sometimes co-authored by Wayne Orchiston, Bruce Slee and other members of the history of radio astronomy group at James Cook University) have appeared in the *Journal of Astronomical History and Heritage* and in *Publications of the Astronomical Society of Australia*.

Nisha Yadav was born in Mumbai (India) in 1983. She is a graduate in physics (2003) from Mahatma Gandhi University, Kottayam (Kerala, India) and is pursuing her Ph.D. in computer science at Mumbai University. She is a scientist at the Tata Institute of Fundamental Research, and has published more than ten papers on computer science and history of science in major Indian and international journals. Nisha has largely worked on various aspects of Harappan Civilisation and its script, and she has wide-ranging interests in the origin and growth of astronomy in India.

Tadato Yamamoto was born in Yokohama (Japan) in 1974, and has an M.Sc. (2000) from Kyoto Sangyo University and a Ph.D. (2004) in celestial mechanics from the Graduate University for Advanced Studies. He held a Post-doctoral Fellowship by Kyoto University between 2004 and 2007, and was one of the editors of *Proceedings of the Second Symposium on "History of Astronomy"* which was held in Kyoto on 19–20 December 2008. In 2008 Dr Yamamoto left astronomy, and he now works in a computer software company.

Seiko Yoshida was born in Hokkaido (Japan) in 1952, and had a B.Sc. in physics from Hirosaki University and an M.S. in history of science from Hokkaido University. After investigating relations between the Japanese anti-relativist Uzumi Doi and the Japanese physics circle during the 1920s, she became interested in the interaction between physicists and astronomers in Japan. She has especially focused on Kiyotsugu Hirayama, an astronomer sandwiched between two generations, his astronomical achievements, and the dynamics of the network of physicists and astronomers around him. Seiko has published three papers (in Japanese) about Hirayama in *Kagakusii Kenkyu*. She lives in Sapporo city, works as a researcher in science-technology studies at the Graduate School of Agriculture in Hokkaido University (Sapporo), and teaches history of science at the Muroran Institute of Technology.

Index

D

I

M

S

T