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# **Cosmic Order and Cultural Astronomy: Sacred Cities of India**

By

**Rana P. B. Singh**

Banaras Hindu University, India

Foreword

**John McKim Malville**

(University of Colorado, Boulder, U.S.A.)

*A release in the UN International Year of Astronomy, 2009*

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P U B L I S H I N G

Cosmic Order and Cultural Astronomy: Sacred Cities of India,  
by Rana P. B. Singh with a Foreword by John McKim Malville

This book first published 2009

Cambridge Scholars Publishing

12 Back Chapman Street, Newcastle upon Tyne, NE6 2XX, UK

British Library Cataloguing in Publication Data  
A catalogue record for this book is available from the British Library

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ISBN (10): 1-4438-1417-2, ISBN (13): 978-1-4438-1417-1

## VIEWS ON THE BOOK

“Working together with the Rana Singh in India over the last fifteen years, I have realised the comprehensiveness and interrelatedness of geography in shaping and creating the sacredscapes and ritualsapes that have now considered as a way for ‘*new vision*’ in the present era. The results presented here are based on co-sharing and deeper interaction that were presented in several papers during last two decades, however the essays are updated, revised and expanded with a fresh writ of integrity, harmony, cultural astronomical reflections, and profusely illustrated with figures of which Rana Singh is a master craftsman. In the *UN International Year of Astronomy* (2009) this book will serve as sparking star for new thoughts from India”.

—Prof. John McKim Malville,  
Emeritus Professor, Astrophysics & Planetary Sciences,  
University of Colorado, Boulder, U.S.A.

“Rana Singh’s work reminds us that astronomy and cosmology cannot be understood as studies of the sky alone, but extend to all aspects of human culture, in particular to manifestations of the sacred through the physical environment, as embodied in geography, religious architecture, cityscapes and ritual. This book opens valuable new areas of investigation and is destined to become a major work in the field”.

—Prof. Nicholas Campion,  
Director, Sophia Centre for the Study of Cosmology in Culture,  
University of Wales, Lampeter, U.K.

“Prof. Rana P.B. Singh has done pioneering work on India’s cultural astronomy that has helped in our understanding of the visions of cosmos underlying sacred cities of India. This book provides insights that will be useful in anthropology, archaeoastronomy, geography, and religious studies”.

—Prof. Subhash Kak,  
Computer Science, Oklahoma State University, Stillwater, U.S.A.

“I have always felt envious when I have had the opportunity to read the works of Professor Rana Singh. For the last years, I have been engaged in a large scale project searching for cosmic order in the sacred buildings of ancient Egypt and, when trying to interpret the data, we have always had the handicap of dealing with a long-gone, forgotten for centuries, culture despite of the precious help of the hieroglyph texts. On the contrary, the millenary civilization from India is still alive and well alive! When you visit the impressive temples and get in contact with their sacred cities you can feel yourself part of the story even if you are not a Hindu believer. This is exactly the huge advantage than Prof. Singh has had when producing the series of essays that form this most interesting and dedicated volume. Archaeo- and ethno- astronomies acting simultaneously to offer us, with a sense of purity and clearness — his particular search for Cosmic Order”.

—Prof. Juan Antonio Belmonte,

IAC; President of SEAC, University of La Laguna, Canary Is. Spain

“To understand and appreciate how the sky modulates culture, you have to see how it lands on earth. In India, cosmic order is brought to ground in sacred cities, and Professor Singh surveys that landscape and establishes a foundation for these studies with deliberation, accuracy, and precision. *‘Cosmic Order and Cultural Astronomy: Sacred Cities of India’* is a pilgrimage toward a sophisticated but accessible perspective on a familiar issue — the role of celestial alignments and hierophanies in the sacred and symbolic environment”.

—Dr. Edwin C. Krupp,

Director: Griffith Observatory, Los Angeles, U.S.A.

“Rana Singh has compiled a body of work focusing on sacred landscapes that incorporate Hindu religious cosmology, mathematics, and geometry. Using his scientific expertise, Singh delves into archaeoastronomy measuring religious architectural features aligned to celestial bodies. However, he brings in the larger issues of understanding the original intentions of the city planners and temple architects, and the planned experience of pilgrims moving through the sacred landscape. This volume show promise to be a complete case study of how people have brought the heavens down to Earth by making their cosmic visions material”.

—Dr. Jarita C. Holbrook,

Research Scientist, University of Arizona, Tucson, U.S.A.

“One of the most important and memorable events in my pilgrimage through life was to become acquainted with the kind person and deep scholarship of Prof. Rana P.B. Singh. He has added immensely to my understanding of the sacred cities and landscapes of India, a land I regard with affection and often visit. It is with great pleasure that I welcome the appearance of this latest magisterial work, which guides the pilgrim and scholar alike in understanding the manifold links between human consciousness, culture and the cosmos in several of India’s most sacred cities”.

—*Prof. Michael A. Cremo,*

Historian of Archaeology, Bhaktivedanta Institute, L.A., U.S.A.

“Professor Rana Singh continues in this new book his search for cosmic geometries embedded in ritual landscapes. From the point of view of my own field of specialization, the comparative study of Ancient American civilizations, the interdisciplinary approach that Professor Singh applies to the study of sacred Hindu cities, and the role that geometry and astronomy played in the planning of these cities, is most illuminating. The Hindu material on sacred geography, is overwhelmingly rich from the point of view of comparative anthropological and religious studies. Rana Singh opens up many new and intriguing perspectives for the scholarly comparison of ancient non occidental civilizations on a global level”.

—*Prof. Johanna Broda,*

Instituto de Investigaciones Históricas

Universidad Nacional Autónoma de México, México City

“Ritual Landscape studies have lately become very fashionable. Rana Singh who has been working in this field for several decades can be considered a precursor. Many of the problems treated in his book have been mentioned and investigated by many in different countries with little more data than those offered by archaeological materials. This book presents a study of similar questions but on the bases of the history, architecture and religious culture of the Indian subcontinent. India is so rich and complex that to understand all the subtleties of its sacred landscape, one should better be a native. Rana Singh, a Hindu, of a venerable family, perfectly rooted in his own ancestral culture and territory, was certainly the best possible author for such an enterprise. We had almost nothing concerning India on the subject of sacred landscape; with this book this lack is now repaired”.

— *Prof. Arnold Lebeuf,*

Jagellonian University, Inst. for the Study of Religion, Kraków, Poland

“As a picture of the structure of the world, either a sacredscape or a cityscape may represent the common worldview of a society and culture enabling modern scholars to get valuable insights into ancient worldviews and cosmologies. Mastering his knowledge of ancient India combined with a broader interdisciplinary approach Professor Rana Singh reveals the celestial source of many planned Indian cities. From astronomy to mythology, Rana Singh explores the very essence of Indian worldview/cosmology articulated in its material culture and provides further evidence defining the role of sky watching within this ancient culture”.

— *Prof. Stanislaw Iwaniszewski,*

ISAAC President, & Professor of Archaeology,  
National School of Anthropology and History, Mexico City,  
and Curator at the State Archaeological Museum, Warsaw, Poland

“This collection of seven penetrating essays takes the reader on a fascinating journey into realm of the sacred, exploring in the process the cosmic geometry of a millenary culture whose continuing vitality is indeed remarkable. Spanning a period of over a thousand years, the author brings into focus the complex manner in which, slowly over time, collective human actions have woven together astronomical knowledge and cultural practices to form intricate patterns of behaviour, a sacred landscape interlaced by a myriad pilgrimage routes, and a cosmic order instantiated in the remarkable geometry of India’s ancient cities and temples. At the same time, the material is examined in a truly innovative fashion using cutting edge scientific techniques to explore and measure the sites as well as well honed theoretical models such as Self Organised criticality theory. In short, I highly recommend this work and am convinced that it will become a classic in the field of cultural astronomy”.

— *Emer. Prof. Roslyn M. Frank,*

Dept. of Spanish & Portuguese, University of Iowa, U.S.A.

“To experience the language which describes the sacrality of city sites created from the organic self-organized movement of its people forming a unique biological relationship to the cosmos Rana Singh’s *Cosmic Order and Cultural Astronomy*, offers an invaluable insight into the formation of cityscapes as no other writer can. He has written a groundbreaking work that re-awakens within us a sense of sacredness and the holy which can be re-discovered by understanding how the ancient cities of India are still alive today”.

— *Prof. Willard G. Van De Bogart,*

Nakhon Sawan Rajabhat University, Nakhon Sawan, Thailand



“The book of Prof. Rana Singh “*Cosmic Order and Cultural Astronomy Sacred Cities of India*” has astonished me by his penetrating insights into the cosmogonic and cosmological meanings of sacred space, architectural structures and religious ceremonies. Such broad cross-disciplinary study of landscape and cultural astronomy evidently deepens our understanding of the interrelatedness of traditional religious symbols, environment, geography and social activities. Author systematically and charmingly reveals that celestial world in India is traditionally regarded as a divinely regulated icon of cosmic order (*rita*) and astro-symbolical metaphors encode cosmic order and proceeds to translate that order into a continuous, multidimensional, phenomenal expression of eternity in everyday life of society. The symbolic language of astral sciences deciphers the synchronic rhythms imaged in the celestial world, and articulates the teleology of these rhythms in a narrative of emergent, diachronic environmental experience. Thus, this groundbreaking work radically transforms our understanding of Indian ethno-astronomy and religious culture”.

— Prof. Audrius Beinorius,

Director, Centre of Oriental Studies, Vilnius University, Lithuania



*This book is dedicated to*

Prof. John McKim Malville

[b. 24 April 1934—],

*with whom on 13 January 1993, I started my co-pilgrimage on the path of cultural astronomy in search of cosmic order, and who so patiently helped and supported me to walk straightforwardly while following the right edge of sacred geography and understand the meanings beneath all forms of complexity and chaos that results to meet in harmonious and sustainable way where ultimately transcendence of humanity meet with terrestriality of divinity — in Hindu cosmogony this state is called as ananda ('supreme bliss').*

—Rana P.B. Singh



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## FOREWORD

### COSMIC ORDER AND CULTURAL ASTRONOMY

The cosmic order and cultural astronomy that framed the cityscapes and sacredscapes described in this book of thematic essays cover a time span of over thousands years, from the sites of the Ramayana period (e.g. Chitrakut), and later Vedic period (e.g. Gaya) to the cultural capital city of India (Varanasi/ Kashi). All of these sacred sites and pilgrimage places display varying degrees of geometrical order and planning (cf. Malville 2000). By their respective geometries, each of these places establishes an interior cosmos with order and meaning. Geometries utilizing lines, triangles, rectangles, and circles were used to couple interior spaces with those of the larger cosmos. The geometric connection between microcosm and macrocosm that has always been easiest to construct and to interpret is cardinal orthogonality. Space within the city was designed to mimic the geometry of the larger cosmos by constructing a grid work of mutually perpendicular lines aligned to true north.

The word ‘cosmos’ comes from the Greek *kosmos* meaning a well-ordered whole. Our modern cosmos has strict boundaries at very small and very large scales. We cannot probe inward without limit, for we eventually reach an impenetrable boundary associated with the Uncertainty Principle of quantum mechanics. The smallest piece of the microcosm is known as the Planck length,  $10^{-32}$  cm. Smaller scales are *absolutely* unknowable due to quantum mechanical chaos in which an ordered sequence of elements of space (such as occurs along a ruler) cannot exist. The large-scale boundary of the universe lies at a far distance of  $10^{27}$  cm, corresponding to 15 million light years. Beyond that edge of the expanding universe, all of space and time is unknown and forever unknowable because space and time beyond the edge would be receding from us at speeds greater than light.

Like the walls of the ancient city, these numbers set the boundaries to our cosmos of today. Within those walls, all space is woven into a single continuous fabric. No isolated islands of energy or matter can exist in our universe, and much of modern physics today is involved in demonstrating the interconnectedness of all of its parts. Newton’s concept of Universal

Gravity, which tied the falling apple to the orbiting moon, first pointed the way to the unification of the cosmos and thereby established much of the holistic approach of today's physics.

The first systematic application of cosmic geometries in city planning in the ancient world may have occurred in the Indus valley some 4,500 years ago, inspired perhaps by the human urge to live in a cosmos rather than chaos. The orientation of the Harappan sites to the cardinal directions suggests not only the skill of the astronomer but also the apparent intent of an ancient urban planner to interweave, by means of geometry, the microcosm and the macrocosm. The Harappan cities appeared suddenly: the concept of planned urban space, in all of its complexity, may have evolved in 100 years or less (Parpola 1994; Possehl 1990). In an amazing burst of creative activity, a technique for determining true north was developed; a methodology for surveying geometrical grids was established; construction brick sizes were standardized; writing suddenly appeared; and a system of weights and measures was invented (Possehl 1990). Astonishing amounts of human energy and labour went into the planned construction of these cities. Mohenjo-Daro and Harappa covered approximately 1 km<sup>2</sup> each, and by means of their cosmic geometries, some 40,000 inhabitants in each city were brought into parallelism with the cosmos. The citadel of Mohenjo-Daro, which covered 400 x 200m and stood some 7m high, may have represented the cosmic mountain, in a manner similar to that of the ziggurat. In its Great Bath, rituals may have symbolized the emergence of life from the cosmic ocean (Parpola 1994).

The skies covering those ancient cities must have had astonishing powers of persuasion. The rising sun proclaimed the rebirth of days and years, and the moon measured the year. The absence of street lights and pollution produced a sky that was black between the bright stars. Perhaps all heaven and earth were seen as portions of a seamless whole, and at night the horizon may have vanished, eliminating any boundary between the celestial and terrestrial realm.

Fixed above the northern mountains was a star that did not move. Today we call that star Thuban, alpha Draconis, which reached 0.6° from the celestial pole in 2780 BCE. Following that time, precession of the earth's axis of rotation slowly moved Thuban away from the stillness of the centre and for three millennia no other bright star approached the celestial pole. The star we now know as Polaris has moved near the pole only within the last few centuries. Polaris will never reach as close to the celestial pole as did Thuban some 5,000 years ago.

Away from the pole, stars move across the dome of the sky in ever widening arcs. Some moved faster and more erratically than others; these

were the seven “planets” as seen from the earth, Sun, Moon, Mercury, Venus, Mars, Jupiter, and Saturn. The “river” that the planets followed in the skies is the ecliptic, known as the Ganga of the skies, the *Akasha Ganga*. The Harappans (ca. 2500 BCE) would not have used that term, of course, but may have imagined their own river to be a reflection of that river of the skies. Mercury, perhaps represented as a little green fish in Harappan script, swam quickly along that river, and dim Saturn, dangerous and black, moved slowly along the ecliptic like a turtle (Parpola 1994). Today the ecliptic path, followed by the sun, planets, and the time-keeping moon, is marked by the 28 *nakshatras* (lunar constellations). Parpola (1994) suggests that this manner of dividing the path of the moon started with the Harappans.

Not only did the Pleiades rise nearly due east at the time of the Harappan culture, but it also rose heliacally, just ahead of the sun, on the morning of spring equinox beginning in year 2240 BCE. This “double rising” of the sun may have marked the beginning of the Harappan year. In stories and myths that may possibly have been inspired by Harappan culture, there are many layers of symbolism that attest to this conjunction between the equinoctial dawn and the heliacal rising of the Pleiades (Parpola 1994). Most prominent is that the Pleiades is named after the *Krittikas*, the wet nurses of six-headed Skanda, who represents the six-seasoned year. Before this date of 2240 BCE, the new year was brought in by the bright, rose-coloured star known both as Aldebaran and Rohini, which first rose heliacally on the spring equinox of 3050 BCE during the early Harappan period. Dholavira, is one of the largest fortified Harappan cities that had the history of strong astronomical perception, presumption and prediction (cf. Bist 2000).

Building on Eliade’s (1959) ideas about sacred space and Wheatley’s (1971) studies of the origins of Asian cities, Jeffrey Meyer (1991) has provided an insightful and influential analysis of the characteristics of a “cosmocized sacred city,” of which Beijing was the last of a long line in China. The Shang period (approximately 1700-1100 BCE) may have generated the paradigm of the planned Chinese capital. Archaeological material from that period reveals cities at Zhengzhou and Anyang that were squares or rectangles containing individual structures all of which were cardinally aligned. In his summary of studies of Shang capital cities, Meyer (1991) notes the traditional belief that the prosperity and fate of a kingdom depended upon the quality of the geometry of the capital. Meyer (1991: 8) notes that a Shang dynasty ruler who wished to move his capital to a new location, argued that it had been moved five times and successfully took root each time: “As from the stump of a felled tree there

are sprouts and shoots, Heaven will perpetuate its decree in our favour in this new city.” It did not matter exactly where the city was placed as long as it conformed to the proper geometrical rules.

This theme of the pre-planned cosmic capital was clearly evident and extensively articulated in the Zhou dynasty (1100-221 BCE). Texts from the period, in particular the *Zhouli* (Rituals of Zhou), indicated the use of a gnomon, observations of the pole star, and the design of the ideal capital according to rules of cosmic order. There should be nine north-south and nine east-west streets within the city walls which were pierced by three gates on each side. The king’s palace was in the centre, lying on a north-south axis which was a major axis of symmetry for the city. The archaeological record from this period confirms the cardinality and axuality of cities, which were mostly squares or rectangles. While this ideal geometry may have never been achieved with perfection during the Zhou period, it apparently had major influence on later Chinese capitals, both inside and beyond the mainland.

The parallelism, synchronism, and resonances between heaven and the capital were essential, and Wheatley (1971: 414) speaks eloquently of the “intimate parallelism between the regular and mathematically expressible regimes of the heavens and the biologically determined rhythms of life on earth as manifested in the succession of the seasons, the annual cycles of plant regeneration, and, within the compass of an individual life, birth, growth, procreation, and death.”

The Chinese capital was understood to be the centre of the cosmos, lying on the *axis mundi*. At its centre, marked by temple or throne, there was a meeting of heaven and earth (Eliade 1958, 1967). There can be little doubt about the social consequences of such a geometry and the hierarchical nature of such a society. Location of real estate was even more important than it is in the modern city. Access to cosmic power and political influence diminished monotonically with distance from the city’s centre.

The meaning of order, power, and the North Pole in the Chinese capital city may be so specific to the context of imperial China that extrapolation of the model of the Chinese “cosmic” city to other cultures may have limited usefulness. However, there appear several similarities in different context of cultural connotations, especially the orientation to the north and alignment to the Sun.

Meyer also developed the characteristics of the opposite type of a city, the unplanned city of local sacrality. Such a place is a highly individualistic urban phenomenon, associated with singular events, unique people, and special places. Its specific location in the landscape is of primary

importance, having been located at a special place because of spectacular landscape, a history of pilgrimage, local myths, and traditions. These are places where “non-transferable” and “non-repeatable” events of human history occurred. Their quality is one of “utter specificity” and uniqueness (Meyer 1991: 160), and often they are marked by unusual and dramatic geological features, powerful local traditions, and what Preston (1992) calls “spiritual magnetism.” In India, these are *tirthas*, the ancient and modern “crossing-over places” of body and spirit, often historically important fords of rivers, e.g. the sacred cities described in these essays. These places, often pilgrimage centres, have an egalitarian openness, as opposed to the more hierarchical and stratified structure of the cosmic cities. Meyer (1991: 157) argues that because these cities of local sacrality lacked planning by an imperial authority, “there is no recognizable geometry of form, no evidence of overall planning, no relationship to a sacred king, no orientation, or axial way.”

Having developed his planned-cosmic/unplanned-local typology of cities so carefully, Meyer (1991: 147) admits that every religiously important city he has investigated contains characteristics of both types. For the emperor and his court at Beijing, the city was clearly cosmic; but from the “perspective of ordinary people, manifestations of local sacrality are more significant.” Meyer (1991: 170-171) finally decided that Beijing fits best into the “cosmic” category because it lacked a tradition of normative pilgrimage, i.e. regular visitations by ordinary people in search of meaning.

The cities of Varanasi and Vijayanagara contain geometries that indicate both cosmic and local influences, and both have been destination points for pilgrimage. The cosmic and local dimensions of these cities are not independent and mutually exclusive. For instance, they do not influence different sections of the city, but they are intertwined in complex interdependent relationships with each other.

In Varanasi, which has been in existence for perhaps three millennia, imperial power had no major influence on its design, although there are definite examples of planning in certain of the pilgrimage circuits. Varanasi (Kashi) is rich with cosmic symbolism and is understood to be a copy of the universe, where Brahma, the lord of creation, was himself born. The eight directions of space and the lords of the seven planets were also reportedly born in the city of Varanasi, exemplified with 56 forms (8 x 7) of Vinayakas/ Ganesha. When pilgrims circumambulate the city on the Panchakroshi circuit, they are symbolically encircling the entire cosmos. Several papers on this theme were authored and co-authored by Rana P.B. Singh, and they are now presented here in a framework of accumulative and integrated knowledge.

Vijayanagara was established in the early fourteenth century, as the capital city of the largest Hindu empire of medieval India, and the city lasted approximately 250 years until its destruction in CE 1565. Before it was chosen as a symbol of empire by the Vijayanagara kings, the area was a well-known *tirtha* and a major pilgrimage site. The resulting city combined one of the most dramatic landscapes of the subcontinent, major mytho-historic traditions, and extraordinary imperial power (Malville 2000, cf. Malville and Saraswati 2009).

Working together with the Rana Singh in India over the last fifteen years, I have realised the comprehensiveness and interrelatedness of geography in shaping and creating the sacredscapes and ritualsapes that are now considered as a way for a 'new vision' in the present era. The results presented here are based on co-sharing and deeper interaction that were presented in several papers during last two decades, however the essays are updated, revised and expanded with a fresh writ of integrity, harmony, cultural astronomical reflections, and profusely illustrated with figures of which Rana Singh is a master craftsman. In the *UN International Year of Astronomy* (2009) this book will serve as sparking star for new thoughts.

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Dipavali: 17 October 2009

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## PREFACE AND ACKNOWLEDGEMENTS

All my life I have felt close to place. Place speaks. Place talks. Place communicates. Place is a growing organism, a form of being. Place is an interrelated community, playing between Man and Cosmos. Presence of place was real to me long before I knew anything of the energies by which this works. I remember that since my childhood I have sensed “something” in and around a place. The visible and invisible messages have been a source of real meaning to my life. I have moved from one place to another, however carried the memories and mythic sentiments attached to the place. I don’t know how and why this is always with me. Somehow later in life I learn that place attachment is a human quest for understanding and also a feeling — the immanence and transcendence of a force linking Man and Cosmos.

I always thought in my life that there are several invisible spirits behind the landscape and built environment that together make the environment alive, meaningful, communicative and visionary. I also believed that as our understanding of sacred cities improves, we will become more wiser and compassionate about the ways we interact and communicate in this world. Keeping this quest in mind I occasionally wander along the stairways of the riverfront Ganga in Varanasi (Banaras). Passing several decades of such sitting and walking in the sandy and muddy areas, one day (on 13 January 1993) when sun was going down and the radiance of sunlight was being transferred into the gloomy shining towards darkness to have rest in the cosmic rhythm, I met a tall distinguished looking person who was seriously reading my old essay on ‘pilgrimage mandala of Kashi’ (1987) and was in search to meet the author for observing the astronomical happenings, correspondences and alignments of light and sites. His name is John McKim Malville [presently emeritus professor at the department of astrophysics and planetary sciences, University of Colorado at Boulder (USA) and an adjunct professor at James Cook University, Townsville, Australia]. The following next day was a festive and one of the most auspicious days for bathing and oblation of sacred water to the sun god, i.e. 14 January, Makara Samkranti — the day considered as the closest day to winter solstice (21 December) when human being perceive the affect of longer day time and change of the season. On this very day we started our co-pilgrimage in search of



man-cosmos relationship as existing at the sacred places and illustrated through locations of divine images in shrines and temples and exemplified through complicated but ordered network of correspondences and astronomical alignments. Quickly we realised that we both need each other in terms of interactional experiences and exchanges, and with the help of interdisciplinary approaches new visions and discoveries can be sought out. Thus our friendship and co-pilgrimage began on the cosmic path of infinity, on which at different milestones we find halt stations, resting places, spirituo-magnetic foci, however at different stages in terms of sacrality of space and spatiality of time we also followed separate paths, but never gone distant. That is how I perceive Kim Malville as my mentor and *guru* who constantly, consistently and collaboratively encouraged and supported me. In the period of last sixteen years we have jointly presented and organised several seminars on the issue of cosmic order, cultural astronomy and ritualsapes of sacred cities of India, in India and abroad both. During 1998-2003 under the auspices of University of Colorado Project on 'the Cultural Astronomy and Sacred Space in Banaras', we worked close together; this helped us to understand the link between the mythological reflections and the perspectives of cultural astronomy.

I feel that academic research is at its height of bloom when it brings different lines of rich thoughts into a creative tension with one another but together making a common path. Personally, I am uncomfortable being pigeonholed in a single, convenient category (e.g., "cultural geographer" or "historical geographer"), maintaining instead that there is no necessity of being simply one or the other. *Geography is an open state in the cosmic wholeness!* It is possible, even necessary too, I think, to adhere to several lines of thought simultaneously, to use different languages and perspectives to study different problems and issues, and to participate vigorously in multiplicity of intellectual discourses. As one might think other way, such a stance does not lead to eclectic superficiality; rather, it allows me at least, or so I hope, to draw upon contrasting perspectives, to select the best each has to offer, and to be inspired by their differences, similarities: contrasts and contractions.

Walking on the road for the last four decades, I strongly feel with firmness and familiarities that geography has always been a self-consciously intentionally inter-disciplinary body of thought, crossing the disciplinary boundaries but drawing from and in turn contributing to understand awe and wonder of nature, its mysteries and the transforming postulates of human genius. That's how I always tried to celebrate the discipline's diversity by conscientiously engaging in cross-disciplinary work. The essays in this book are the example of such practices.

I read, as much as time allows, the literatures in astronomy, philosophy of science, anthropology, sociology, and Indology, as well as popular accounts of the history of science in search of link between ancient mythologies and modern trends in theoretical physics.

The first presentation on the contents of this book was given as special presentations or lectures in different international conferences like International Conference on Development Geography (Vaasa, Finland: 21-23 June 1999), the 6th Oxford & SEAC Conference on Astronomy & Cultural Diversity (La Laguna, Spain: 24-29 June 1999), the International SASNET Workshop on Global Networking in South Asian Studies (Lund, Sweden: 27-28 August 2001), International Interdisciplinary Conference on Symbolology, Myths, History: Weapons and Wars in, from Rudra to Mahatma Gandhi (Milan, Italy: 19-20 May 2003), the 3rd International Convention of Asia Scholars (Singapore: 19-22 August 2003), the 18th European Congress of Modern South Asian Studies (Lund, Sweden: 6-9 July 2004), the 19th World Congress of the International Association of History of Religions (Tokyo, Japan, 24-30 March 2005), the 19th European Conference of Modern South Asian Studies (Leiden, the Netherlands: 27-30 June 2006), the 2nd SSEASR Conference of South and Southeast Asian Association for the Study of Culture and Religion (Bangkok, Thailand: 24-27 May 2007), Indo-Swedish Workshop on Cultural Geography and Religion (Gothenburg, Sweden: 13-27 October 2008), 16th World Congress of International Union of Anthropological and Ethnographical Sciences (Kunming, China: 27-31 July 2009), and the 17th SEAC Conference of European Society for Astronomy in Culture (SEAC), held in the Library of Alexandria, Egypt (25 - 31 October 2009).

It was a great auspicious occasion in the *6th Oxford & SEAC Conference on 'Astronomy & Cultural Diversity'* (Museo de la Ciencia y el Cosmos, La Laguna, Spain: 24-29 June 1999), where I met several distinguished astronomers with whom I maintained interaction and exchange of ideas that shaped my views and clear my understanding. Among them the notables are: Anthony Aveni, Juan Belmonte, Johanna Broda, John Carlson, Nicholas Campion, Roslyn Frank, Jarita Holbrook, Stanislaw Iwaniszewski, David King, Edwin Krupp, Stephen McCluskey, Clive Ruggles, Nicholas Saunders, Arnold Lebeuf, and David Vogt.

At the invitation and initiatives of John McGuire and Maggie Exon (Curtin University of Technology, Australia), I was invited as one of the keynote speakers in the International Conference on *'Towards an Electronic Cultural Atlas: E-publishing & Knowledge Management in the Humanities'*, and ECAI (Electronic Cultural Atlas Initiatives) Technical & Workgroup Meet (University of Sydney, Australia: 12-16 June 2001),

where I again interacted with scholars from diverse fields like astrophysics, atmospheric science, computer modelling, digital and electronic mapping sciences. Here I met and received feedback from scholars like the grand master of ECAI Prof. Lewis Lancaster (University of California, Berkeley, USA), William Powell (Director, Center for the Analysis of Sacred Space, University of California Santa Barbara, USA), and Wayne Mullen (Australian Archaeological Institute, University of Sydney), and others whose insights and ideas have strengthened my horizon of understanding.

Many friends and scholars have always been inspiring through their thematic writings, rational criticism and sharing the latest emerging literature; some of the notables are: Anthony F. Aveni (Colgate University USA), Michael Batty (London, UK), Martin J. Haigh (Oxford, USA), Juan Antonio Belmonte (La Laguna, Spain), Hans Christie Bjønness (NTNU Trondheim, Norway), Johanna Broda (UNAM Mexico), Nicholas Campion (Lampeter UK), John B. Carlson (CA College Park, USA), Michael A. Cremo (Bhaktivedanta USA), David S.P. Dearborn (LLL Austin, USA), Roslyn M. Frank (Iowa USA), John M. Fritz (Albuquerque, USA), Niels Gutschow (Germany), Jarita C. Holbrook (Tucson USA), Barbara Holdrege (Santa Barbara, USA), Cynthia Humes (Claremont, USA), Stanislaw Iwaniszewski (SA Museum Poland) Subhash Kak (Stillwater, USA), David A. King (Frankfurt, Germany), Edwin C. Krupp (Griffith Obs. LA, USA), Arnold Lebeuf (Kraków, Poland), George Michell (London, UK), Jan Pieper (LBD Aachen, Germany), Clive L.N. Ruggles (Leicester UK), Nicholas J. Saunders (Southampton UK), Bradley E. Schaefer (LSU Baton Rouge USA), David E. Vogt (Vancouver BC, Canada), and James A. Wescoat, Jr (MIT Cambridge, USA).

Having wonderful memories of discourses, collaboration, and field studies, I express my special thanks to Devi Prasad Dubey (SPS Allahabad), Madhu Khanna (JMI New Delhi), Sobita Punja (INTACH New Delhi), Devangana Desai (Mumbai), Lakshman Gurda (Gaya), Anne L. Marshall (University of Idaho, USA), Vrinda Dar (Kautilya Society, Varanasi), Mark Dyczkowski (London and Varanasi), and Ravi S. Singh (my earlier collaborator and presently a colleague at Banaras Hindu University). These friends know what I'm doing and as how to walk on the rugged terrain of complexity, chaos and non-equilibrium that in itself converges into order, followed by making disorder.

My intimate friend, co-pilgrim and guide on the path of cultural astronomy Kim Malville has been kind to write '*Foreword*' to this work; only he can bless me through this offering, and also only he can realise its importance in terms of interdisciplinarity and man-cosmos interaction. No way in words I am able to express my gratitude and thanks to him. I am

grateful to the following scholars and friends who have gone through substantial parts of the book and the summaries of all the chapters and send their viewpoints; they are Juan Antonio Belmonte (La Laguna, Spain), Willard G. Van De Bogart (Nakhon Sawan, Thailand), Johanna Broda (National Univ. Mexico), Nicholas Campion (SCSCC Lampeter, UK), Michael Cremo (Bhaktivedanta Inst. USA), Roslyn M. Frank (Univ. of Iowa USA), Jarita C. Holbrook (Univ. Arizona, Tucson, USA), Stanislaw Iwaniszewski (St Arch Museum Poland), Subhash Kak (Stillwater, USA), Edwin C. Krupp (Griffith Observatory LA, USA), and Arnold Lebeuf (Jagellonian University, Inst. of Religion, Poland).

I am thankful to Mr. Geert Robberechts (INTACH Belgium, Leuven), for his suggestions and information on Khajuraho that helped me to enhance the essay. Two of my doctoral students Ram Kumar Chaturvedi and Pankaj Prakash Singh have been of immense help through their devoted time in making and re-drawing several of the figures.

At the Cambridge Scholars Publishing Carol Koulikourdi and Andy Nercessian have been helpful at different stages, while Amanda Millar took all the care for type, setting and giving final shape; I am thankful to them and also to other friends at CSP for promoting this Series.

All the members of our family (elder son Pravin, younger son Prashant, daughter Prabha, daughter-in-law Jyoti, and our lovely 1¾ yrs old grandson Vishnu), and members of our extended family (daughter Pratibha, son-in-law Ravi, and grandson Abhisht), have been supportive to me in different ways, in distinct capacities and in defined means. I am thankful to all of them. My elder son, Pravin S. Rana, who did his doctoral dissertation on 'Pilgrimage tourism in Banaras region', has helped me to keep fit my computer; I hope that he will carry on the tradition what I learnt in my whole life!

In a sense this book is a token of small tribute to my life-partner since the last thirty-nine years, my wife Manju (Usha), who suffered and tolerated consistently much negligence and carelessness from my end, but above all constantly encouraged me to proceed for the good cause of studying Banaras. I hope she will finally grant me excuses.

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# CHAPTER 1

## INTRODUCTION: CULTURAL ASTRONOMY AND COSMIC ORDER AMONG SACRED CITIES

Rana P. B. Singh & John McKim Malville

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### **1. The Legacy**

The relationship between mankind and the sky is as old as mankind itself. Human beings started to recognize and interpret the objects and events in the sky as soon, as they had fulfilled their basic needs. Long before the discovery of scientific tools and techniques to understand and interpret the wonders and mysteries of cosmos, sky and stars served as the basic resources for acquiring knowledge (cf. Krupp 1983, 1991, 1997, also Hadingham 1984). Of course, this was true all over the world, but obviously it was more concerned and more commonly ways of practices in the ancient world like Egypt, Babylon and India. For sailing in a way to the waves and winds, predicting rains and cropping pattern, questioning identities of human beings in the cosmos, relationship between human life and celestial occurrences and relation and interaction between human beings and divinities are some of the issues that have their roots in the astronomical perception of ancient people. In the newly developed nations of Europe and America such studies fascinated scholars with reference to prehistoric people – their life system and their world of learning (cf. Ruggles and Hoskins 1999: 1-8).

Even today the same sky is studied by astronomers using sophisticated and precise machines and mechanism (e.g. GIS, GPS). However, in traditional societies still the age-old perceptions, oral traditions, associated rituals and celebrations, different uses of landscape geometries, built-up architecture and the environments, and several such happenings and lifeways expressions are used, narrated, codified and passed on the cradle of time from one generation to another – these altogether in different

ways, through different means, by different codes, on different lines of thought and in different contexts have attracted scholars from different fields to study and using result in various perspectives of expositions.

Concerning old writings Ruggles and Hoskins (1999: 17) have empathetically remarked, which is valid even today: “the temptation to impose onto these writings our attitudes, our interests, and our factual knowledge of astronomy, is all the more insidious. It must be remembered that history of astronomy is a journey back in time to cultures alien to our modern thinking, and that, like good anthropologists, we must try to see the world through the eyes and minds of those cultures.”

The more distant the object, the further back in time its lights takes us; and today the distances studied are sometimes so great that the objects involved are cited in evidence, far and against cosmological theories of how the universe appeared in its infancy.

Sacred geometry is based on cosmology, which presupposes an underlying order of universe – its creative principles that start and expand, manifested and archetypally represented, aligned and being corresponded among the attributes of nature/landscape or human constructs (built space and landmarks). Archaeoastronomy and cultural astronomy are the counterparties and never be separated. Alignments and orientations are among the reference points in landscape and built-up space are the concern of archaeoastronomy. This has been one of the common practices in scientific exploration in the recent past.

The ‘processed’ or ‘new archaeology’ interprets orientations in terms of society’s adaptations to natural environment, especially as perceived and defined in the past in terms of better protection or adjustment with the natural phenomena. On this line, landscape archaeology that especially intends reconstructing the cultural landscape and its attributed meanings and associated rituals becomes important. In case of India, landscape archaeology has a strong connotation and insights of continuity and acceptability in the society.

## **2. IYA: Perspective and Celebration**

The United Nations (UN) in its 62<sup>nd</sup> General Assembly, held on 27 December 2007, proclaimed 2009 the International Year of Astronomy, IYA, as an year of a global celebration of astronomy and its contributions to society and culture, highlighting the 400th anniversary of the first use of an astronomical telescope by Galileo Galilei (1564-1642), an Italian physicist, mathematician, astronomer, and philosopher who played a major role in the scientific revolution. Further on this line a Memorandum of