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BOOK REVIEW

Sciences of the Ancient Hindus

How an author refused to change the term *Hindus* to *Indians* and ended up having to self-publish his compilation of early Hindu scientific achievements

By Alok Kumar, New York

"The present proposal is commendable in seeking to contribute to understanding the history of Hindu science. But the current proposal is somewhat problematic, especially in light of the deeply contested nature of the adjective *Hindu* and its association with a particular kind of nationalist politics." Such was one international publisher's rationale to reject my book, *Sciences of the Ancient Hindus: Unlocking Nature in the Pursuit of Salvation.* It was not an isolated experience; One publisher after another demanded I replace the term *Hindus* with *Indians.* When I refused, the book was rejected. Finally, I had to no option but to self-publish. Upon hearing my tale, the editors of Hinduism Today invited me to explain how this book came to be, what it contains and what it means to me.

I was raised in a Hindu family in Haridwar, a holy city known for the Ganges river. My life has always been focused around my academic interests related to science. I do not have any involvement with the national politics of India, nor do I want to push any political agenda through this book. As a scientist, I have always focused on facts and truth. Therefore, I opted to stick to the term *Hindu,* since for about a millennia, the people who produced the *Vedas* and the *Upanishads* were known by this popularized term in nearby regions. The term *India* only became popular in the last 250 years—a period not covered in my book.

My parents taught me that Hindu culture has a long and glorious intellectual tradition. In attempting to learn the details of this tradition, I quickly realized that Hindu accounts of the ancient world are mostly ignored by the West, or simply labeled as biased or wrong. This trend has prevailed in the West for about 250 years. But what about the period that ranges from ancient times to the beginning of the British colonial period? I decided to collect the earlier Greek, Egyptian, Middle Eastern and European accounts dealing with the ancient Hindus. Among the Greeks I compiled the scientific achievements of the Hindus from the accounts of Aristotle, Arrian, Megasthenes, Clement of Alexandria and Apollonius of Tyanas; among Islamic scholars, al-Biruni, al-Khwarizmi, Ibn Labban, al-Fazari, al-Masudi and al-Uqlidisi; among the Chinese, Fa-Hien, Hiuen Tsang and Yijing; and from Europe, Leonardo Fibbonacci, Pope Sylvester II, Roger Bacon, Voltaire and Copernicus.

These accounts presented a much different picture. Even in the modern era, thinkers and scientists as diverse as Goethe, Emerson, Thoreau, Jung, Oppenheimer, Herder and Schrodinger, to name a few, have acknowledged their debt to ancient Hindu achievements in science, technology and philosophy. The mosaic that emerged from this research

A lasting legacy: *(clockwise from opposite page) the Iron Pillar of Delhi is a 23-foot column, considered a testament to the skill of ancient Indian blacksmiths because of its high resistance to corrosion; the famed "Damascus steel" of the ancient world was actually imported from India; this stone tablet sits near the Deity of Chaturbhuj Temple and possesses the first ever recorded or written form of zero*

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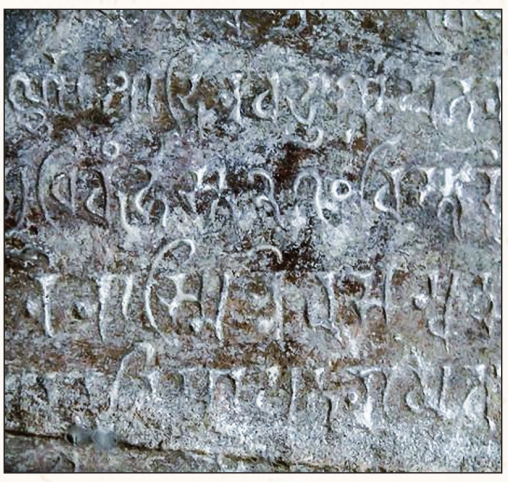

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contrasts sharply with the common portrayal in the popular media and even in academia.

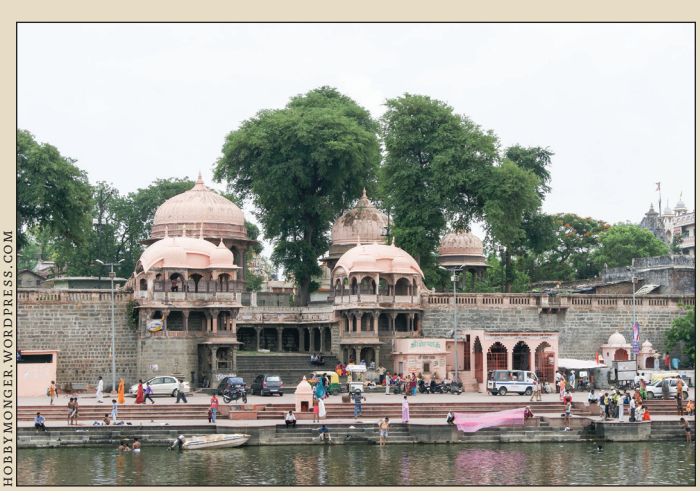
Modern science and medicine would be primitive and unrecognizable without the immense contribution of the ancient Hindus. They invented everyday essentials such as our base-ten number system and the concept of zero as a numeral. They developed the sophisticated system of medicine known as ayurveda, with its mind-body approach; detailed anatomical and surgical knowledge of the human body, including cataract surgery and the so-called plastic surgery. They unfolded metallurgical methods of extraction and purification of metals, including the so-called Damascus blade; knowledge of various constellations and planetary motions that was good enough to assign motion to the Earth; and the science of self-improvement popularly known as yoga. This book covers these topics in detail.

Intellectual curiosity can manifest in any circumstances, but certain conditions are particularly conducive to intellectual growth. India's vast mineral resources, diverse plant and animal life, favorable climate and sound social ethics provided material prosperity and social stability to the region and fostered the intellectual endeavors of the Hindus. Ralph Waldo Emerson (1803-1882 CE), an eminent American philosopher and poet, recognized this when he wrote: "The favor of the climate, making subsistence easy and encouraging an outdoor life, allows to the Eastern nations a highly intellectual organization—leaving out of view, at present, the genius of Hindus, whom no people have surpassed in the grandeur of their ethical statement."

Megasthenes (350-290 BCE), an ambassador of Seleucus I, visited the Indus-Saraswati region and reported that the people, "having abundant means of subsistence, exceed in consequence the ordinary stature and are distinguished by their proud bearing. They are also found to be well skilled in the arts, as might be expected of men who inhale a pure air and drink the very finest water." The Chinese traveling monk Yijing (643-713 CE) made similar observations of the region's prosperity: "ghee, oil, milk and cream are found everywhere. Such things as cakes and fruit are so abundant that it is difficult to enumerate them here."

Sa'id al-Andalusi (1029-1070 CE), a natural philosopher from Muslim Spain, wrote a book on the history of science, *Tabaqat al Umam,* in which he categorized nations based on their contributions to science. Al-Andalusi credited India with its leadership in science and technology: "The first nation to have cultivated science is India. This is a powerful nation, having a large population and a rich kingdom. India is known for the wisdom of its people. Over many centuries, all the kings of the past have recognized the ability of the Indians in all branches of knowledge." This book was popular in medieval Europe. It was first introduced to the English-speaking world in 1991 by myself, titled *Science in the Medieval World.*

The practice of debate was ingrained and highly valued among the Hindus. In fact, it was one of the eight ways to select the groom for a bride. A medical treatise, the *Caraka-Samhita*, emphasizes the role of debate and discussion in the learning process. "Discussion with a person of the same branch of science increases knowledge and brings happiness. It contributes towards the clarity of understanding, increases dialectical skill, broadcasts reputation and dispels doubts regarding things heard. Hence, it is the discussion with men of the same branch of science that is applauded by the wise." The *Caraka-Samhita* defines rules for such debate and suggests that we must avoid "celebration for



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At world's center: *the Ram Ghat in modern-day Ujjain*

Zero Meridian

Today the Greenwich observatory in England is considered zero meridian, by which the time and longitude of other points on Earth are defined. But during the ancient and medieval periods, Ujjain, an ancient city that still exists in Central India, was considered to be zero meridian by astronomers. Ujjain has a long intellectual history. It was home to King Chandragupta Vikramaditya as well as the famous mathematician and astronomer Brahmagupta and the mathematician Bhaskara. Both Aryabhata and Brahmagupta chose Ujjain as zero degree longitude in their astronomical works.

In Baghdad, al-Khwarizmi compiled a book of astronomical tables, *Zij al-Sindhind,* that was based on the Hindu astronomical system. Following the practice of Hindu astronomers, al-Khwarizmi chose Ujjain as zero meridian. A translated copy of this book was quite popular in medieval Europe.

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Great minds: *Aryabhata was a great mathematician and astronomer. He assigned diurnal motion to the Earth, with the Sun held stationary, long before his Western counterparts. His written works include the* Arya-Bhatiya *and the* Arya-Siddhanta.

the victor" or "any insult to the loser." These detailed rules of *shastrarth* (debate), as defined in the text, predate the similar guidelines in the West's nineteenth-century *Robert's Rules of Order* by two millennia.

The ancient Hindus memorized their literature verbatim. The spoken words, not the written words, have been the basis of literary and scientific traditions of the Hindus. The people who memorized the texts, mostly in rhythmic hymns, were highly respected, as they became the tools that kept the tradition alive. Special classes of people who memorized these books were defined: *Vedi, Dvivedi, Trivedi* and *Chaturvedi* are popular last names among the Hindus. Initially these names signified the number of *Vedas* the person memorized. Yijing writes: "The *Vedas* have been handed down from mouth to mouth—not transcribed on paper or leaves. In every generation there exist some intelligent Brahmans who can recite 100,000 verses. This is far from being a myth, for I myself have met such men."

al-Biruni, an Islamic scholar who lived in India for some thirteen years during the eleventh century, wrote of the importance of poetic literature among the Hindus in popularizing science: "By composing their books in metres the Hindus intend to facilitate their being learned by heart and to prevent people in all questions of science from ever recurring to a written text, save in case of bare necessity. For they think that the mind of man sympathizes with everything in which there is symmetry and order and has an aversion to everything in which there is no order. Therefore, most Hindus are passionately fond of their verses and are always desirous of reciting them, even if they do not understand the meaning of words, and the audience will snap their fingers in token of joy and applause. Hindus do not want prose compositions, although it is much easier to understand them."

The sciences of the ancient Hindus were an essential and integral part of their religion. The disciplines of astronomy, mathematics, chemistry, physics, yoga and medicine were all practiced to meet the needs of religion, as well as to fulfill natural curiosity. Unlike the members of some religions, Hindus have never had to make a choice between science and religion.

In the *Chandogya Upanishad*, astronomy, mathematics, logic, history, grammar and fine arts are considered useful in order to know the ultimate truth. Thus, astronomy, logic, mathematics and history became tools to achieve *moksha* (liberation from rebirth). This intellectual environment, in which an accurate understanding of the universe was considered useful to spiritual progress, allowed the natural sciences to prosper.

Aryabhata (476–550 CE), the great mathematician-astronomer, assigned diurnal motion to the Earth and kept the sun stationary in his astronomical scheme. He taught that the stars' appearance of movement in the sky is an illusion. To explain the apparent motion of the sun as observed from the earth, he used the analogy of a boat in a river: "As a man in a boat going forward sees a stationary object moving backward, just so in Sri Lanka a man sees the stationary asterisms (stars) moving backward exactly toward the West." About a millennium later, Copernicus used a similar argument to explain the motion of the earth.

The Sanskrit term *yoga* means "union" or "join." To some this implies the union of our physical self (body) and mind; to others, a union of personal self with the Divine. In either case a person transcends everyday mundane existence to achieve his/her fullest potential that leads to moksha—an ultimate goal for all Hindus. Body and mind are the joined pair that create synergy for this ultimate goal. Yoga is perhaps the oldest effective system of personal development for this purpose.

Yoga is an outcome of biomimicry practiced by the ancient Hindus. They observed various life forms, small and big—their life styles, the ways they exercised, the ways they cured themselves, the ways they relaxed and the ways they avoided sickness. These studies also evolved into a system of medicine called ayurveda.

In writing this book—glimpsed here through these few examples—I hoped to promote more scholarship on the subject, leading to a deeper understanding of the original scriptures. Another intent was to bring the Hindus' heritage closer to the mainstream knowledge that is taught in academia.

This field needs the influx of young scholars. It is the responsibility of all generations to collect knowledge of the previous generations, add to this knowledge and pass it along to the next generation. This is what I have tried to accomplish. Only the readers can judge my humble effort.

Order at: bit.ly/sciencesancienthindus

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