

# Re: BHARAT'S (INDIA'S) CONTRIBUTIONS TO THE WORLD

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It is interesting how a well done article about the narrow minded perspective of western history to the contributions of other cultures has been twisted into it's reverse, an implied by the subject line, narrow minded perspective which ignores the real content of the article. If the west can be held to have had racist filters in effect then the reverse filter of this kind of racism is no less crude and boorish.

>*'Lost Discoveries': The Non-Western Roots of Science*

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>*By Stephen S. Hall*

>*The New York Times*

>*December 1, 2002*

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>*In the early 1990's Dick Teresi went to Portland, Ore., where the county school board had started a politically correct and ill-starred program dedicated to "multicultural science." Among the curriculum tools it devised, he notes in "Lost Discoveries," was a series of essays explaining how the ancient Egyptians used sophisticated gliders for travel and recreation, how the Incas floated above the Nasca plain in hot-air balloons and how the Egyptians had also mastered advanced skills in precognition and psychokinesis. Teresi was promptly dispatched by a magazine to debunk these claims, which he did with relish. As he writes in his book, "One can only wonder why this ancient civilization, with airplanes and telekinesis at its disposal, bothered with swords and spears to fight its battles."*

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>*It was wise of Teresi, a science writer and former editor of Omni magazine, to establish his bona fides as a skeptic at the outset. He calls "Lost Discoveries" a book of "unkempt historical details," but in surveying the non-Western roots of science he has created a very neat chronicle -- and a timely reminder -- of how much of*

>the foundation of modern scientific thought and  
>technological development was built by the mostly  
>overlooked contributions of Arabs, Indians, Chinese,  
>Polynesians and Mesoamericans. How timely? A dozen pages  
>into the text, I found myself wondering how many  
>publishers would have been courageous enough, after Sept.  
>11, 2001, to take on a book that documents, among other  
>things, the superiority of Arab intellect and Muslim  
>science in ancient and medieval times.  
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>The "standard model" of the history of science locates  
>its birth around 600 BCE in ancient Greece, where the  
>dramatis personae typically include Pythagoras,  
>Empedocles, Democritus, Aristotle and other sages, who  
>laid the modern foundation for math and the sciences. It  
>was this foundation, buried during the Middle Ages, that  
>was rediscovered during the Renaissance. What were the  
>peoples of India, Egypt, Mesopotamia, sub-Saharan Africa,  
>China and the Americas doing all this time? "They  
>discovered fire, then called it quits," Teresi observes  
>sarcastically. He admits starting this exercise "with  
>the purpose of showing that the pursuit of evidence of  
>nonwhite science is a fruitless endeavor. . . . Six years  
>later, I was still finding examples of ancient and  
>medieval non-Western science that equaled and often  
>surpassed ancient Greek learning."  
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>This catalog of achievement, while not exactly news, is  
>breathtaking in the sheer sweep of human ingenuity. The  
>Babylonians developed the Pythagorean theorem at least  
>1,500 years before Pythagoras was born. Indian  
>mathematicians performed multiplication and algebra, and  
>even ventured toward calculus, a millennium before  
>Europeans. An Arab astronomer, Ibn al-Shatir, spelled out  
>the theory of planetary motion 150 years before  
>Copernicus. The "Mercator projection" was used by  
>Chinese cartographers centuries before the birth of  
>Mercator. In the third century B.C., physicists in China  
>pretty neatly summarized Newton's first law of motion.  
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>Centuries before Gutenberg, the Chinese used movable  
>type; by CE 868 block printing was so widespread that  
>government authorities issued edicts to curtail the  
>proliferation of printed astrological calendars. In order  
>to play their famous ball games, the Aztecs invented  
>vulcanized rubber centuries before Goodyear, and the  
>Chinese were manufacturing "Bessemer steel" nearly  
>2,000 years before Sir Henry Bessemer "invented" the  
>process. Francis Bacon once commented on the "obscure  
>and inglorious origins" of the magnetic compass,  
>gunpowder, and paper and printmaking, three inventions

>that he claimed transformed civilization. "They all came  
>from China," Teresi writes, and were invented centuries  
>before the West became aware of them.  
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>"Lost Discoveries" is derivative and popular, in the  
>best sense of both words. Anyone who has read Teresi's  
>previous work -- including, most recently, "The God  
>Particle," which he wrote with the Nobel Prize-winning  
>physicist Leon Lederman -- knows that he is a  
>knowledgeable and witty writer, with enough irreverence  
>to ventilate what could easily become a self-righteous  
>enterprise. He has sifted through an enormous scholarly  
>literature, and the book owes a great deal to experts  
>like Joseph Needham, George Gheverghese Joseph, Anthony  
>Aveni, Alfred Crosby and other academics who have been  
>the intellectual archaeologists, uncovering this rich  
>story of discovery. Some of the material has made an  
>appearance in other popular treatments, like Jared  
>Diamond's "Guns, Germs, and Steel." But the breadth of  
>Teresi's survey -- and the judiciousness and wit with  
>which he lays out his evidence -- not only amounts to a  
>marvelous job of repackaging but also, by sheer accretion  
>of detail, rises as its own monument of rediscovery.  
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>Teresi examines the roots of mathematics, astronomy,  
>cosmology, physics, geology, chemistry and technology  
>(one of my quibbles with this syllabus is that it fails  
>to tackle biology or medicine head on, although some of  
>the life sciences and pharmacology are glancingly  
>discussed). The sections on mathematics, astronomy and  
>geology are particularly strong. "If we are to say that  
>non-European cultures had science long before the  
>Europeans exported it to them," Teresi says, "we must  
>prove they had math." His evidence is overwhelming. The  
>Egyptians first mastered fractions, and Babylonian  
>mathematics essentially created a BCE version of the  
>calculator, with its tables of reciprocals, squares,  
>cubes, square roots and cube roots. A science historian  
>quoted here says the Babylonian creation of a "place-  
>value notation system" -- a way of writing numbers, for  
>example, with a place for ones, tens, hundreds, and so on  
>-- was similar in impact to invention of the alphabet.  
>The Maya and the Indians of Asia independently created  
>the number zero in the early centuries after the death of  
>Christ. In discovering algebra, the ancients invented a  
>language of science that wouldn't be appreciated for  
>several millenniums. "A modern scientist, measuring  
>lengths in angstrom units and time in femtoseconds, might  
>find himself more comfortable in third-millennium B.C.  
>Egypt than in third-century B.C. Greece or even in 17th-  
>century A.D. Italy," Teresi writes.

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>Similar advances were recorded in astronomy. Teresi notes  
>that "the ancient Indians, long before Copernicus, knew  
>that the earth revolved around the sun and, a thousand  
>years before Kepler, knew that the orbits of the planets  
>were elliptical; the Arabs invented the observatory and  
>named most of our popular stars; the Chinese mapped the  
>sky; and the Amerindians noted important events with  
>daggers of light or optical snakes that thrill us to this  
>day." An annotated bone fragment dating back 3,500 years  
>demonstrates that the Chinese had by then measured the  
>length of the year to be 365 1/4 days; NASA scientists  
>recently used these "oracle bones" to help determine  
>how much the earth's rotation is slowing down.  
>Humankind's ancient skills in hydrology, metallurgy,  
>mining and steel making, to mention a few areas of  
>practical endeavor, inspire awe and, in the author, a  
>little irony too, about the sometimes lethal nature of  
>multicultural technology transfer: "The Crusaders  
>encountered the sharp end of Saracen weapons, which were  
>made of steel mined in Africa, forged in southwestern  
>India and fashioned in Persia and the Middle East."

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>The sections on cosmology and, surprisingly, physics,  
>don't rise to quite the same level. Here Teresi has a  
>couple of axes to grind -- not bad axes, but distracting  
>ones nonetheless. Cosmology occupies itself with the  
>origin and history of the universe; our primal hunger for  
>creation stories, whether told by shamans or  
>astrophysicists, makes this a universal area of human  
>fascination. But in dwelling upon shortcomings in what he  
>calls the "putative" Big Bang theory, Teresi is  
>distracted by a modern controversy that skews his  
>discussion of ancient cosmologies. Similarly, in his  
>treatment of physics, he harps on the modern  
>"disconnect" between theory and experiment. In both  
>instances it's not the substance of the arguments but  
>rather the way they afflict the tone and deflect the  
>trajectory of the narrative that is the problem.

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>A different, and more interesting, problem is advertised  
>by the tentative vocabulary of the following line, a  
>syntax of uncertainty that is echoed throughout the book:  
>"Many ancient cultures had inklings of quantum theory."  
>Teresi's narrative is thick with inklings, hints,  
>suggestions and similarly "vague parallels" between  
>ancient ideas and accepted modern knowledge. Sometimes  
>these parallels feel like a stretch -- when, for example,  
>Teresi likens the Buddhist concept of maya, or nonbeing,  
>to the Higgs boson, an elusive elementary particle yet to  
>be discovered by modern physicists. To his credit, Teresi

- >is usually the first to acknowledge the stretch marks in
- >his arguments, and is quick to cite expert opinion
- >aligned in opposition.
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- >As in horseshoes, hints don't count in science; you have
- >to "get it" entirely to use the knowledge either
- >practically or intellectually. In that sense, one of the
- >most stimulating and provocative passages in the entire
- >book comes when the mathematicians Robert Kaplan and
- >George Gheverghese Joseph go toe to toe in a long
- >footnote, arguing whether the ancient Egyptians truly
- >"understood" irrational numbers. Their disagreement
- >gets at the philosophical dilemma that "Lost
- >Discoveries" attempts to reconcile. At what point does
- >knowledge become true understanding -- true in the sense
- >that it is reproducible, predictive and can be adapted to
- >useful human endeavors? In other words, when does it
- >qualify as science? As the book makes clear, the origins
- >of science mingle with a cultural devotion to
- >superstition, religion, alchemy and astrology. Hence
- >Vedic Indians mastered the use of square roots to build
- >sacrificial altars in proper proportions.
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- >You needn't buy every inkling or hint to enjoy browsing
- >Teresi's little cabinet of curiosities. There is the
- >Chinese geologist Chang Heng, who in A.D. 132 invented an
- >early seismograph that not only detected earthquakes but
- >indicated the direction in which the primary shock wave
- >originated. We meet the mathematician al-Khwarizmi, one
- >of the early directors of Baghdad's "House of Wisdom"
- >in the ninth century, whose name survives in the term we
- >use for any special method of solving a problem
- >(algorithm). The caliph al-Mamun built an observatory in
- >A.D. 829 with a quadrant 20 feet in radius, dwarfing the
- >celebrated instrument of Tycho Brahe seven centuries
- >later. For those of a more pragmatic bent, the ancient
- >Harappan culture, which flourished from about 3000 to
- >1500 B.C. in what is now Pakistan and western India, is
- >credited with developing wood-covered sit-down
- >lavatories, built into the outer walls of houses and
- >connected to a sophisticated network of municipal
- >drainage. We even learn that the ancient Egyptians
- >concocted potions using hippopotamus fat to control
- >dandruff.
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- >The larger question underlying "Lost Discoveries" is
- >why this astonishing record of human achievement has been
- >ignored or dismissed for so long. Part of our reluctance
- >to acknowledge it may stem, understandably, from cultural
- >pride, although this has sometimes expressed itself in
- >ungenerous ways. Teresi notes that Morris Kline, a

>prominent American historian of mathematics, once  
>dismissed the mathematical achievements of the Egyptians  
>and Babylonians as "the scrawling of children just  
>learning how to write," and the British historian of  
>science G. R. Kaye is quoted here exhorting his  
>colleagues to search for and celebrate "traces of Greek  
>influence" in the history of knowledge. "Our pop  
>science historians -- Bronowski, Daniel Boorstin, Carl  
>Sagan, et al. -- have certainly been faithful to that  
>directive," Teresi writes. But that is hardly the only  
>reason. "Of the thousands of texts in which the Maya  
>recorded their findings," he also notes, "only four  
>survived the Spanish book burnings." A sad subtext of  
>the entire book is just how precious, and perishable,  
>even fundamental knowledge can be.

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>At the same time, "Lost Discoveries" makes for  
>thrilling reading. By the time we encounter the Arab  
>scholar al-Biruni, active around A.D. 1000, who  
>brilliantly analyzes the geology of India as a vast  
>alluvial plain while contemporaries in Europe still  
>interpret the earth through the prism of the biblical  
>flood, we emerge with a tremendous respect for cultures  
>that have had the courage to confront their own belief  
>systems by the logical, systematic and rigorous  
>collection of factual evidence, which is why science has  
>always been considered such a threatening enterprise by  
>defenders of hierarchies and orthodoxies. "Lost  
>Discoveries" is probably a little too detailed and  
>overwhelming for high school students, but it might make  
>terrific companion reading in undergraduate college  
>courses on the Western canon or, perhaps even better, the  
>core text for a course in intellectual history called  
>Humility 101.

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>Stephen S. Hall is working on a book about the history  
>of regenerative medicine and the prospects  
>for "practical immortality."

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>More at:  
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><http://www.nytimes.com/2002/12/01/books/review/01HALLLT.html?pagewanted=3&ei=5070&en=226467846800b902&ex=1091505600>