

PARADIGM SHIFT

2019-2020 # 2

PART I

History -- and Not Science -- is the Answer!

(1) Sense and Nonsense of Ancient Indian Science

"We as a scientific community should be seriously concerned about the infiltration of pseudo-science in science curricula with backing of influential political parties. Giving a scientific platform for a pseudo-science talk is worse than a systematic attack that has been carried out by politically powerful pseudo-science propagandists in the recent past. If we scientists remain passive, we are betraying not only the science, but also our children".-Dr. Ram Prasad Gandhiraman, NSA's Ames Research Centre, California.

"...science does not need 'decolonization. Any attempt to 'purify' science, to make it conform to preferred culture, philosophy or ideology, destroys its logic and robs it of its potential for cultural critique. Defense of secular thought everywhere demands a defense of the rationality of science." - Meera Nanda(*2)

"The conviction that we have always already known everything that is worth knowing and that everything we knew is only confirmed...by science, has prevented us from developing an ethos of honest inquiry. The compulsion to establish harmony with the core of the Vedic world view has held back the progress of science in the past, and will continue to hold us back if we keep going down this path". -Surabhi Kanga, the Caravan, July 21,2016

"This is how the secularist dream ends: with nuclear bombs in the silos, and the Vedas in the schools; with satellites in space, and horoscopes in our lives down here on earth".(3)

Comment:

When the sub-continent was partitioned into India and the Islamic Republic of Pakistan, India was constituted as secular comprising of many faiths. It was left with not so much a separation of state and religion as the goal to embrace all traditions equally.

Since the 1990s, however, Hindu nationalism has become a reality. In 2014, the BJP gained a parliamentary majority and in 2019 it was re-elected. Ever since then, Indians have been subjected a non-stop barrage of narratives doled out by the RSS eulogizing and glorifying the ancient Indian (read Vedic) way of life and the accompanying fantastic, and certainly unheard of scientific achievements.

This also involves a conflation of myth and superstition and then a spurious equivalence is sought to be created between ancient myths and modern science. In the process the same postcolonial arguments are used to find an epistemology in the most orthodox core of Hinduism, namely the Vedas and the Upanishads. Conversely, modern science is being peddled as 'just another name' of the perennial wisdom of these ancient texts with the constant drumbeat of "we already knew the answers". All in all, the idealistic view of nature and their mystical mode of knowing taught by the Brahmanical texts are being preferred ways of learning and doing science, appropriating the latter for assertions of

Hindu supremacy with the ultimate goal of a 'Hindu India'. "(*2)

The obsession in locating modern science in ancient religious texts is part and parcel of the history of India today. It is the dominant trope for accommodating modern science in the wider web of beliefs. This harnessing of ancient tradition with politics is not associated with India alone; nor dissimilar to how every other religio-political projects relate to Western ideas, whether these are Islamic fundamentalists or Christian ones. In Pakistan, law-making is based on a particular interpretation of Islam. In the US, a strand of orthodoxy is mingled with Christian fundamentalism and the rejection of evolution, i.e., the programmes of 'creation scientists' in the US..." and the 'Vedic scientists' in India....", (2) and Islamic sciences. However, the urgency for scientific legitimating of Hindu dharma is more actively and self consciously fostered by Hindu nationalists and their followers. "Attribution of great scientific discoveries to ancient Hindu 'rishis' 'munis' has been an integral part of the indoctrination of 'swayamsevak'..." (4)

These trends have been a serious concern for those scientists, academicians, among others, engaged in authentic science research. Hence, the 107th edition of the Indian Science Congress (ISC), on the theme 'Science and Technology: Rural Development' was launched recently in Bangaluru (formerly Bangalore). The organizers took special care to ensure that pseudo science and "pseudo-scientific" articles or talks do not infiltrate the Congress in any way. The rationale was clear.

The previous year, the ISC was held at Lovely University, Jalandhar where the then VC had made a highly controversial and (even) weird comment. He asserted that the Kauravas of the Mahabharata were born of 'stem cell' technology and that Rama and Ravana had fought with 'guided missiles'. While such comments are rightly dubbed as pseudo-scientific, such remarks at the Congress are not unprecedented. In 2015 this event in

Mumbai had an entire session dedicated to 'aircraft from the Vedic age'. Some months ago, an MLA of the ruling establishment, P.S. Thakur - an accused in the Malegaon blast issue - claimed that their Party members - S. Swaraj, the late A. Jaitley and B. Gaur - reportedly, died due to black magic by the Opposition! Arun Jaitley and S. Swaraj had long been seriously ill before their death and B. Gaur, at the time of death, was 89. It is also well known that P.S. Thakur, ahead of the election results, had praised Gandhi's assassin, N. Godse, as a patriot and yet was fielded by her Party as a parliamentary candidate, and she won. In a similar vein, scientific glories of an ancient Hindu civilization are hailed sky-high. The Prime Minister has not helped matters. He has claimed in 2014 that the elephant-headed Ganesha was a product of ancient cosmetic surgery. In his speech to the United Nations General Assembly, the Prime Minister had also suggested that yoga can help tackle climate change and that "Climate has not changed. Our habits have changed. Our habits have got spoiled... Indian 'rishis' using their yoga vidya would attain Divya Drishti. There is no doubt that the invention of television goes back to this". Following him other public figures have been freely uttering non-sense on science. (See Box pg.8) Dr. Harsh Vardhan who shared the platform with the Prime Minister told the audience of research scholars that the late Stephen Hawking believed that an ancient Hindu text might have a theory far more superior to that of Einstein's $E=mc^2$. The Chairman of the website for Institute of Scientific Research on the Vedas (I-Serve) - on asking for clarification -- Hawking's office replied that no recorded statement to that effect was ever uttered by the late scientist, Stephen Hawking!!

Further, in its educational reforms, the Hindu nationalist regime, has been revising the history of science as "top priority" alongside its campaign rhetoric, "India First". Claims of India's antecendence in everything from mathematics, medicine and surgery to say

nothing about nuclear weapons, spaceships and other Star Trek-style technologies get blown up sky-high.

What the Prime Minister failed to figure out was that even the smallest elephant head ever known, even an embryonic one, would have been impossible to fit on the biggest human neck, surgical strikes notwithstanding. Moreover, even if such a surgery were possible, it would be a head-transplant as opposed to a cosmetic surgery!(5)

Such outlandish claims are not just a problem - and factually inaccurate -- but misusing science to stoke a sense of nationalist pride can easily fall prey to jingoism. Yet, such claims serve as core beliefs of the ruling establishment and are asserted repeatedly.

According to Banu Subramaniam (6) such repetitions result in a "scientized religion" and a "religionized science" creating "a vision of India as an archaic modernity". The deification of ancient Indian science is an essential prerequisite of its myopic worldview with a deep and persistent yearning for a "modernity" that was ancient and indigenous but is now irretrievably lost. This loss is a blow to the collective Hindu psyche confronted with a modernity which is not only Western in origin but predatory and hegemonic. Nobel laureate Venki Ramakrishnan calls this a manifestation of a deep inferiority complex.(7) In the zealous drive, launching India veritably back to the Stone Age, are the real achievement and scientific breakthrough of ancient India! (See Box below)

The ancients produced a host of scientists, astronomers, philosophers, mathematicians, economists, political scientists, writers, poets and surgeons, among others. For example, the Higgs boson particle is named partly after an Indian physicist, S.N. Bose, an Einstein's contemporary. Further, to cite an example from the pantheon of ancient India's achievements, namely, Mathematics. Mathematics' golden era was during the classical period in the first millennium (not as per the exaggerated claim, in the Vedic period), close to in time to the growth of the great literature of Kalidasa, Sudraka and other writers. (See Box below) Such a varied corpus of talent did help the nation carve a very special niche for itself in the galaxy of civilizations of that time in contrast to the theocratic nation state that present entities like the RSS is hell bent upon creating...".(5)

Ancient India's Contribution to Global Civilization (8)

The mathematical revolution in India was led particularly by Aryabhata, born in 476 AD, and developed by Varahamihira, Brahmagupta, Bhaskara among others. While it was highly original, Aryabhata's extraordinary contribution was influenced by mathematical developments in Greece Babylon and Rome. Under Aryabhata however, mathematics along with astronomy developed in leaps and bounds, pioneering contributions to the whole world. It bestowed to the world more than what it had learned from outside.

As new understanding appeared in India, and spread widely -- to Greece and Rome and also China - and played an important role in the extraordinary progress in Chinese astronomical work, (even) the head of the official Chinese Board of Astronomy in the 8th c. was an Indian mathematician, Gautama) and to the Arab speaking world which would become the most important vehicle of mathematical progress in the 8th to the 11th centuries. What began with India learning something from others soon became India teaching a lot to others who, in turn, made massive contribution to the world of mathematics. Fraternal links between India and other civilizations at the time were at its zenith!

Emerging in a primitive form in Sumaria and Babylon, trigonometric notions received the attention of Euclid and Archimedes in Greek mathematics in the 3rd c. BC and Hipparchus in Asia Minor a century later. In the first century BC, 'Surya Siddhanta' in India aired trigonometric construction with further

refinement. The Greek influence was clearly evident in Indian mathematics but 'Surya Siddhanta' had more developed trigonometry, as applied to astronomy, than what Alexander and the Greek migrants brought to India. For instance, towards the end of the 5th c. AD, Aryabhata produced his comprehensive account of advances in mathematics, the concept of the 'sine', which is still the most widely used trigonometric idea, found is definitive exploration. (8)

How did this Aryabhatian concept come to called "sine"? It is not a word in Sanskrit or any other Indian language.

Aryabhata called the sine by the Sanskrit term, "jya-ardha" - that is, half-chord - making use of the geometric basis of trigonometry and often referred to it as "jya" for short. When Arab mathematicians translated this concept into Arabic, they called it "jiba" - a corruption of 'jya'. Arabic is written only with consonant, omitting the vowels, and so Aryabhata's jya was represented as "j,b" - the two consonants in 'jiba'. The sound 'jiba' has no meaning in Arabic, but the same representation "j,b" can also be pronounced as "jaib" which is a fine Arabic word, meaning a cove or bay.

When the Arab texts on sophisticated trigonometry, on the lines derived from Aryabhata, were finally translated into Latin (Gherardo of Cremona, an Italian working in Toledo, did the translation in 1150 AD), the word 'jaib' was translated into the corresponding Latin word "sinus", which is Latin for a cove or bay. And from there - from the word 'sinus' - comes the modern trigonometric term 'sine'. The much used mathematical terms sine carries within it the memory of Aryabhata's Sanskrit term jya, and its sequential Arabic and Latin translations.

What came to India from Europe in a somewhat simple form, returned to the world as a more developed tool of mathematics and astronomy.

Further, the 'place value' concept in the decimal system of numbers and contribution of the concept of 'zero' also travelled to Europe from India via the Arab world. Aryabhata was the first person whose mathematical operations such as addition and subtraction created the figure that starts with zero

There have been other major contributions e.g. agronomy, etc., which again through Islamic scholars, made their way to the European's body of knowledge that eventually became Western Science. Ancient Indians also understood the science and skills of settlement planning, architecture and governance of natural resources. Consider the question of water management, a vexed question today. Traditionally, Indians built highly refined water systems that varied to suit different eco-systems so as to harvest every drop of water. Archeological excavations near Allahabad found proof of early Indian hydraulic engineering. Dating back to the end of the 1st c. BC, the Sringeripura tank is a splendid system to take the flood water of the Ganga into a set of distributing chambers, including water weirs, to clean the water for drinking. It can be a matter of belief that Lord Ram drank

water from this tank. The technology was so highly evolved that it would put to shame all public works in India today.

In Dholavira, located in the Rann of Kutch of Gujarat, archaeologists discovered that the city had had lakes to collect monsoon runoff, bunds and inlet channels to divert water, and intricate drainage system for storm water, drinking water, and waste. British gazettes speak of this system with awe, calling India a hydraulic society. The British irrigation engineer who was called in 1920 to advise the colonial government on how to handle famines said the best answer was to return to the ingenious system of flood management of Bengal. But this was never done! Ancient Indians also understood the skill of water governance. Kautilya's Arthashastra, written around 300 BC has details of how tanks and

canals are to be built and managed. The key was to clarify the enabling role of the state -- the king -- and the management role of local communities. They kings provided fiscal incentives to communities and individuals who built water systems.

On the other side of this issue, the integrity of science experts is under fire with science the target of religious fundamentalists and opportunistic politicians. Various forms of modern-day science and their potential benefits have been rejected as unpatriotic. A government official had claimed that "doctors prescribing non-Ayurvedic medicines are anti-national".

Indians are indeed proud of its ancient heritage. But it must not blind us at the bigger picture of this heritage with its larger question viz., the comparative nature of life in present-day India -- the focus on endless rituals, the evils of the caste system, among other concerns. India today is such a filthy nation - the untreated sewage in the rivers and garbage on the streets, etc. - because Indian society is one where waste is very much an "untouchable" issue. As long as the idea of manual scavenging - somebody from the "lower" caste will carry away human excreta -- India will never be a clean India! (9). There is also the need to contest the jingoistic claims of cultural superiority and the claims of pseudo science

I

Impact of Colonialism

With the onset of colonialism -- British, Portuguese (Goa) and French (Puducherry) colonialism especially British colonial rule -- ancient India's achievements took an adverse turn. British colonial policies created large bureaucracies for management. They also changed the tax system; collection of revenue became paramount, even during droughts. Thus, there was little to invest in community assets. The decline came quickly and cemented by development policies of the post-colonial governments even affecting the

ability of Indian scientists to engage in relevant research. Moreover, according to the renowned historian, Romila Thapar, the achievement of ancient Indians failed to be consolidated due also to the intervention and opposition of the religious orthodoxy who opposed philosophers who believed in reason and science.

Science, cradled in the West, in alliance with British colonialism, is largely a colonial legacy that continues to haunt Indian science and other disciplines to this day. On Independence, one of India's major goals was that the Indian educational structure would spearhead the transition of the nation -- suffocated by feudal and British Victorian values - into one united in the pursuit of knowledge: of development, peace and prosperity. The Constitution of India explicitly calls for the development of a scientific temper, humanism, spirit of inquiry and reform (Art.51A(h)).

The virtues, as embedded in the Indian Constitution, however failed to take deep root in the psyche of the modern day Indian society; its vision, foundered in a morass of mediocrity. Freedom failed to decolonize Indian culture as a whole. This led to a disconnect between society and science, detrimental to the practice of science. Students for instance largely do not understand the way of thinking that science teaches, and fail to acquire a robust scientific temper. Thus, many who have gone through the education system up to the highest level including educated in the finest institutes of science, using modern scientific tools, continue to harbor unscientific beliefs and superstitions. The education system itself is unscientific. This is partly to its roots in the colonial education system the contents of which continue to influence the social sense of even the most educated.

The India-born British author Saini (1) recounts her meeting with Indian scientists. She reveals their mindset on India's caste system; they believe that millennia of genetic separation have turned caste into a "biological

reality". That is, they support the notion that certain communities (in India) are naturally suited to different occupations! She however states that caste is merely another kind of racial hierarchy and..." in many ways mirrors race, in as much as it divides people into groups and treats them differently. It is as unscientific as racial categories, yet there are scientists continue to believe that certain castes are endowed with different innate skills or abilities".

The author's reply alarmed even graduates of Science, Technology, Engineering and Mathematics who firmly believe that science and data solves everything! She counters this view by stating that it is not science but history that has the answers. After all, race is a social construct and cannot be understood only with data. "...data can remind us that it is a social construct, but only history can teach us how and why it was constructed...Science is just a pawn in the bloody game". (10)

The author further added that the study of genetics has only reinforced "the common unity of the human species. But political establishments worldwide are instead engaged in a project of denial". She refers to an Indian minister in Parliament who denies the Theory of Evolution and instead preferred to believe that Hindus descended from "sages" rather than from apes! Again that "some have claimed that Hindus have lived in India for millions of years which is an order of magnitude longer than our species has even been around". (1) (Many Chinese academics, incidentally, advocate the theory that ancient Chinese predated the migration from Africa!).

India's link with science has been mixed. One strand in the post-colonial discourse was the call to decolonize science - challenging the dominant paradigm that science is patently "Western" -- an alien tool of imperialism and modernity. It also inspired former colonies towards a critical outlook and dissent in the face of established beliefs and conservative traditions. For instance, the recent anti-caste activist, Rohith Vemula and the murdered

scientists (mentioned above). The other strand stems from religious and obscurantist beliefs. This has led to the growth of a fringe culture of science with scientific studies misused to shape perceptions on belief systems and culture. It viewed the content of science and its application to be "Western" and that only through the development of indigenous sciences that decolonization can take place. The end result of this outlook is nothing but growth of pseudo science!

However, scientist Meera Nanda states that science does not need 'decolonisation' as the "attempt to 'purify' science, to make it conform to a preferred culture or ideology, destroys its logic and robs it of its potential for cultural critique..." (2) And, the scientist Angela Saini, (11) adds that the obscurantist beliefs are being held to support prejudices and to "take us back to a time when women had their place and minorities had their place...there are many who would like to return to that kind of world...the resurgence of sexist and racist pseudo..." and casteist science. This is all too evident today

II

Mushrooming of Pseudo Science

Various School of philosophy -- materialism, idealism, positivism, post modernism, spiritualism - have been waging battle in the intellectual sphere for supremacy to the extent of even unduly burdening India's religious scriptures and texts with its scientific achievements. These have their distinctiveness and realms to fulfill. Aryabhata invented his astronomical theorems without the aid of modern instruments, which scientists were able to unravel only in recent times! Indeed, the slogan 'Vasudhaviva Kudubakam (the world is one family) calls for acceptance and respectful coexistence.

Genuine science with a distinct methodology of comprehending the world around is distinct from other categories of philosophy, be it ancient or modern. It defines the modern age. If

there is one knowledge system and tradition that practically defines the modern age it is modern science. While Arabic, Indian and Chinese civilizations undoubtedly contributed to the enterprise of science, there is no denying that the changes in world view and methods that culminated in the birth of modern science arose in the West through the 16th and 17th centuries. From Europe, the universally applicable methods and theories of modern science spread to the rest of the world.

In recent years however under the tutelage of the ruling dispensation science and scientific studies has been attacked for being "western". Instead, mythology and exaggerated claims on ancient history and science are promulgated leading to the growth of pseudo science.

The growth and promotion of pseudo science is primarily the work of Vijnana Bharati, the science wing of the RSS. Its claims hark back to an imagined glorious Hindu past e.g. "Golden Age". For instance, the Aryan migration theory. The theory posits that the originators of Vedic culture dispersed into India around 4,000 years ago. Hindu nationalists, however, believe that the roots of Hinduism are vastly more ancient, and claim that genetic research has debunked the theory. But increasingly, studies such as a 2017 meta-analysis corroborate the point of relevant influxes around four millennia ago (*13).

Pseudo science has a severe debilitating social impact and propagates quack science and harms scientific temper. It can demotivate scientists and even lead a bad scientist to engage in pseudo-research; scientists and educators can even propagate pseudo science by training their students who then become its flag bearers.(7) Pseudo science also belittle and camouflage the genuine contributions of both ancient and modern Indian scientists, the latter which include the like of C.V. Raman, S.Schandrasekhar, J.C. Bose, G.N. Ramachandran, H. Khorana, V. Ramakrishna, among others.

Pseudo science, in a time of toxic identity politics, has now even become an ally of racism in the West. Neo-Nazism is on the rise in Europe today! To help counter its virulent spread, the writer, Saini, is preparing and placing together an international team of experts. Above all, the author warns against the infiltration of science by ideas of difference. "Identity matters for many reasons, mainly cultural and political. But we have to recognize that these identities are social constructions, not biological ones! They may map onto certain biological features, in some fuzzy, statistical ways, but that doesn't make any group distinct. We must always remember, even while fighting for our rights as a particular group, that we are human first and that we are human together! Those who seek to tear us apart want us to biologise difference" (1).

Box #1

In the Name of Ancient Indian Science (See also graphics in Part II)

Believe it or Not!

- ❖ Deputy Chief Minister of UP, Dinesh Sharma claimed that Sita's birth from an earthen pitcher in the Ramayana was proof of an ancient "test tube baby project"
- ❖ "Tripura Chief Minister, Biplab Deb claimed that the Internet existed during the Mahabharata period
- ❖ "Baba Ramdev claims an Ayurvedic cure for all illnesses ranging from AIDs to homosexuality!
- ❖ "Even Prime Minister Modi sees in the miracle birth of Karna outside the mother's womb and the grafting of an elephant's head onto Ganesh's human torso proof that modern level of science and science were available in ancient India. In 2014 Modi had told school children that climate change is not an environmental concern but a matter of human beings' capacity to cope with heat and cold, which changes over time. Global warming, he explain on TV, "is just a

state of mind"

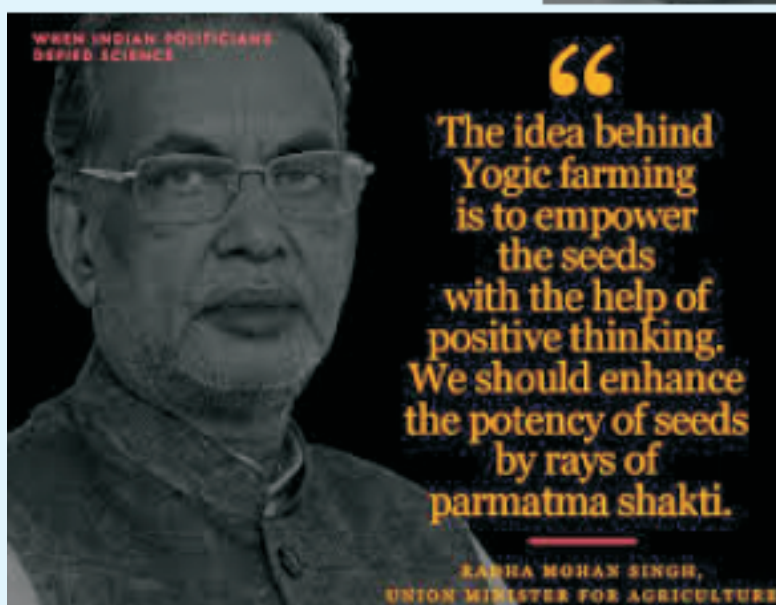
- ❖ "The VC of Andhra University in his paper at a conclave stated that stem cell and test tube technologies were highly evolved during the Mahabharata that had made it possible for one woman, Gandhari, to produce 100 Kaurav sons without this extraordinary birthing process killing her. The VC also claimed that India is credited with the Theory of Evolution on the grounds that 10 avatars of Vishnu came before Charles Darwin
- ❖ "The junior Education Minister, Satyapal Singh, had recently declared that Darwin's Theory of evolution by natural selection was "unscientific" on the grounds that "nobody, including our ancestors, have said or written that they ever saw an ape turning into a human being"
- ❖ "A High Court judge also claimed that India's national bird, the peacock, "is a life-long celibate" and although "does not indulge in sex", peacocks were immaculately conceived by a pea-hen drinking the tears of her 'husband'...
- ❖ "The education minister of Rajasthan, Valued Devnani, claimed that the cow was the only animal that inhaled and exhaled oxygen
- ❖ "At the science congress one scientist suggested that gravitational waves would be renamed as "Narendra Modi waves"
- ❖ "In September 2018 at a lecture, "Vaimanika Shastra" which means "Aeronautical Science, organized by a group called "Bharataam Re-awakening" -- aim of which is to glorify Indian's past and the contributions of their ancestors to the world, -- claimed that ancient India had developed aeronautical technology centuries before the Wright Brothers flew their first plane
- ❖ "Another scientist calls for funding of research into fuels made of donkey urine - another ancient Indian technology -

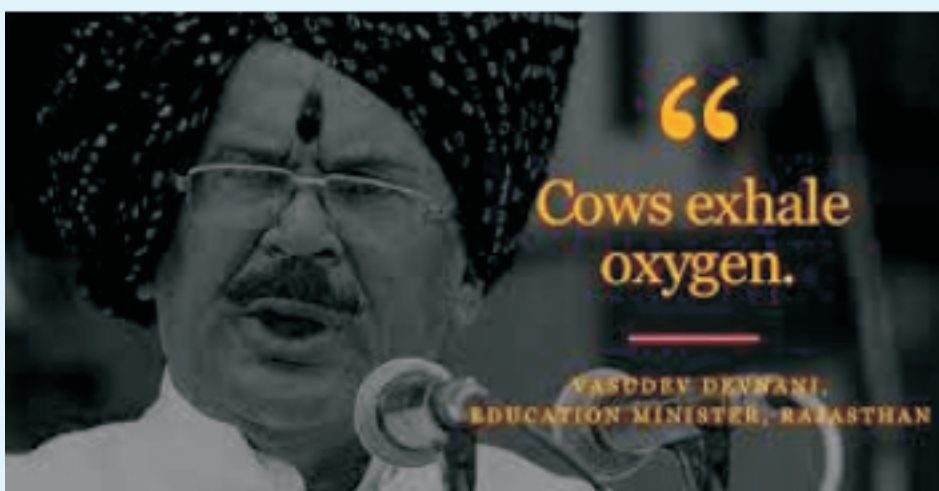
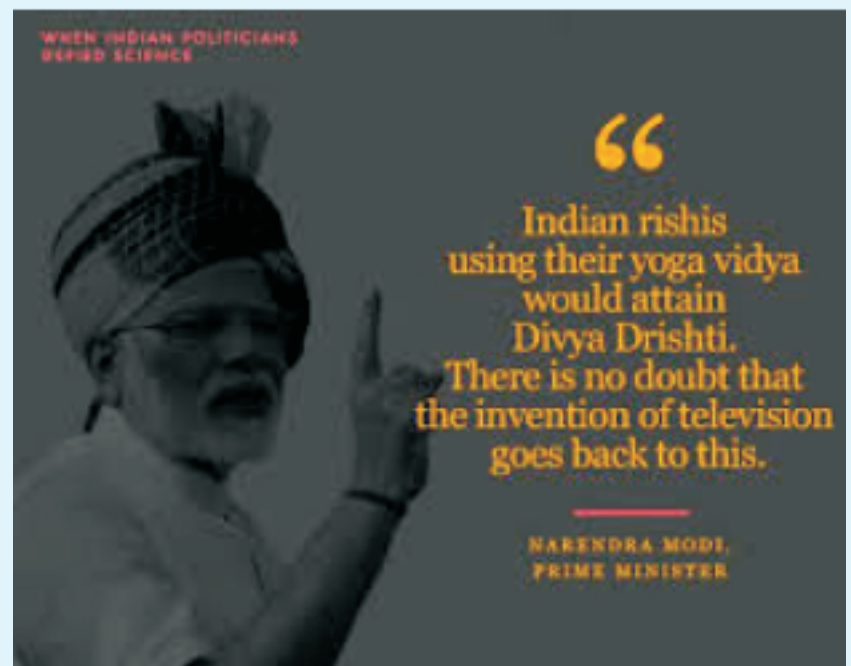
- ❖ "Indian politicians have made some of the most bizarre scientific claims in the recent past. For instance,
- ❖ The Chief Minister of Gujarat, V. Rupani, said, "Imagine what kind of engineers Lord Ram had to build the Ram Setu that links Sri Lanka and India. Even squirrels offered their help in building the bridge". Elsewhere he had noted "we worship Lord Ganesha. There must have been some plastic surgeon at that time that got an elephant's head on the body of a human being and began the practice of plastic surgery". At another time he stated, "We realize that the Mahabharata says Karna was not born from his mother's womb. This means that genetic science was present at that time".
- ❖ Ramesh Pokhriyal Nishank, UP M.P. "Maharshi Kanad had conducted a nuclear test during his time"
- ❖ Radar Mohan Singh, Union Minister for Agriculture, "The idea behind Yogic farming is to empower the seeds with the help of positive thinking. We should enhance the potency of seeds by rays of paramatma Shakti"
- ❖ Rajnath Singh, Union Home Minister stated, "They say a US observatory has informed us about lunar and solar eclipse on a particular date...Ask any pundit. They will open the Panchang and tell you the dates of eclipses 100 years ago".
- ❖ Ramesh Pokhriyal Nishank, said, "Astrology is the biggest science. It is, in fact above science. We should promote it"
- ❖ Subramanian Swamy, "Homosexuality is a genetic flaw..."

As can be expected, the growth of pseudo science has led to huge opposition from scientists and others. On August 9, 2017 a protest march with some 12,000 scientists took part in "March for Science" with the demand that the Government allocates at least 3% of GDP and R & D and mandated by the Indian

Constitution, and to end the 'propagation of unscientific, obscurantist ideas and religious intolerance'. Lately, Mumbai Mirror of February 25, 2020, reported that a number of people including several scientists from both India and abroad signed an appeal to persuade the Centre to withdraw a proposal that solicits research into indigenous cows. Concerns were raised over the unscientific nature of topics listed for research and that "The claims made are outlandish. It would be better to say let us find out whether cow products have antibiotic properties". Earlier, these protests were also linked to the murder of 3 rationalists. The first occurred in the murder of the anti-superstition activist Narendra Dabholkar on August 2013, followed by the murder of CPI writer Govind Pansare in February 2015 and the academic Malleshappa Kalburgi in August 2015. Later, the journalist, Gauri Lankesh, was murdered. Since then various writers have begun to expose how science is being spun at a time when India faces enormous social and economic challenges -- of heat waves and acute water shortages signposting intensifying climate change, with farmers protesting against worsening conditions, and children dying from lack of basic health interventions, a forking path lies ahead.(6)

Pseudo science is a parochial understanding of science but a more cosmopolitan approach to science is paramount importance and need. The latter approach would recognize how different networks of people have often worked in tandem in scientific projects and the cultural exchanges that helped them. There should be encouragement for budding scientists to question whether science has done enough to dispel modern-day prejudices based on race, gender, caste, class and nationality(*R.D.Roy







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