

Science and the Media

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A few years ago, there was a sensational report in the Indian media on how petrol could be made from water. For over a month the Indian media kept repeating this sensational report, even running full centre page analyses of it.

It would not be correct to say that my initial reaction was one of scepticism—I was frankly shocked and incredulous. Surely this was another one of those con tricks. But I was told that the report had been confirmed by the Secretary—of the Government of India's Department of Science and Technology (DST). Let us understand the logic of this argument. Scientists employed by the Indian government were aptly described by the late Dilip Salwi as “A B C D Scientists”. Their designation depends upon scale-of-pay and age, and correlates little with scientific achievements or knowledge. In fact, these “A B C D scientists” need not even know ABC of science! (They are not necessarily engaged in pursuit of science. Some do not even have basic degrees in science—not that a basic degree in science is the slightest assurance of knowledge of science today.) If government authority can be used to decide *who* is a scientist, it can also be used to decide *what* is science. The Secretary is at the top of the government clerical hierarchy of “A B C D scientists”. Consequently, it was implied that I had no authority to deny what the Secretary Himself had said.

Acting more-or-less on the same logic, the media went to town that, according to the Secretary DST, India's energy problems had been resolved by this revolutionary discovery that petrol could be made from water. For the media, an expert scientist is one who appears in the news. A great scientist is one, like Stephen Hawking, say, who keeps appearing in the international news. Few in the media have any idea of what exactly Stephen Hawking has *done*, or of what value it is to *people*. I do not know even a single journalist who can comment on the *validity* of what Hawking has done, or even whether it constitutes science at all. The media logic is that it looks for “news” (and the truth does not matter). What matters is that Hawking's book has sold millions of copies, and people are interested in hearing about him. If truth is going to be decided by appeal to the authority of “media scientists”, the precise achievements or field of specialisation of such “media scientists” is irrelevant: by virtue of authority, such a scientist is automatically an expert in *all* science. So the media went and asked a high-profile nuclear physicist and an astrophysicist whether petrol could be made from water! It took a whole month for the media to understand that a chemist or biologist next door might have more knowledge. (The chap next door does not make news, and the truth does not matter.)

With such profound neglect of knowledge and truth from all quarters, these reports about how petrol could be made from water kept grabbing the headlines for a month. Our decision-makers who are primarily informed by the media were agog by these “latest scientific developments”. Parliament took up the matter for discussion. The whole country seemed to have been taken by storm and was kept agitated for a month. However, despite the marked neglect of truth from all quarters, it was ultimately the truth that prevailed: it dawned on all these people that water was changed to petrol by means of a simple conjuring trick, as any sceptical child could have guessed. Subsequently, the whole episode was just treated as an oddity and quickly forgotten without any further reflection on how such a thing came about.

Without an understanding of the causes, how and why such a thing happened, similar mistakes are likely to recur in the future. The danger is clear. If this is the way our decision-making about science proceeds, then the decision-making is likely to be of very poor quality. The case of petrol from water involved virtually no technicality; it was manifestly bogus to anyone with the slightest commonsense. But social authority prevailed over commonsense. Despite the glare of persistent national-level publicity, it took so long for the fraud to be exposed.

So imagine the persistent frauds that are possible when decisions are made at a higher level of technicality—in deciding research grants for room-temperature superconductivity say. Or, consider the failure of an important technology mission, such as a satellite. Could it be due to bad design? It seems unlikely that the truth in these matters will ever emerge. The obvious symptoms of fraud are very much there, in the way failures are covered up. Since India became independent, no science or technology manager ever once accepted the blame for any failure and stepped down: since failure is always explained away in obscure technical terms, or else the blame percolates down to a scapegoat in the technical team. Equally, it is true since independence that no technical team ever received a national honour, since all credit for success somehow always goes up to the manager. This technique of credit management—getting credit for success and evading blame for failures—is also well known to astrologers; and both astrologers and science managers continue to carry credibility with a wide section of Indian society!

So, a proper understanding is required of how such a state of affairs has come about and what can be done to remedy it.

But before we go on to that, let us take a few more cases to convince ourselves that we are dealing with a general phenomenon and not an isolated incident.

As a second case, consider Stephen Hawking. To begin with, let me say that, like everyone else, I admire Hawking's personal battle against a debilitating disease. However, that personal admiration does not in the least come in the way of my assessment of his scientific work. This is in contrast to the media for whom Hawking's disability makes for a splendid human-interest story, and as already pointed out above, the media focus is on *saleability* and it is mostly unconcerned about the *validity* of Hawking's scientific theory.

Now, what exactly is Hawking's scientific achievement? His key work relates to what is called “singularity theory”. What is a singularity? It is a mathematical infinity of some sort. (A singularity is not the same as the Big Bang: for the Big Bang could be just the other side of a Big Crunch, and does not limit the cosmos, whereas a singularity is supposedly a beginning or end of time.) According to Hawking, himself, a singularity is a point at which the laws of physics break down, so anything at all could happen at a singularity. What exactly this means was well brought out by a science fiction writer who heard Hawking and thought about how to explain the meaning of a singularity to a lay audience. The writer asked: what would one *do* if one came face to face with a singularity? Well, since the laws of physics break down, and anything at all could happen, what was there to do but to go down on one's knees and pray! So, a singularity, as interpreted by Hawking, has a marked resemblance to God.¹ By proving the existence of singularities, Hawking has virtually proved that God exists!

The church readily grasped this underlying message. Here was a situation where science itself apparently led to the mathematically inevitable conclusion (theorem!) that it was self-limiting. While singularities had been around from before Hawking, it was Hawking who first applied singularities in

the context of cosmology. In this context, a singularity was also interpreted as a beginning or end of time: creation or apocalypse as the church saw it, when stated in an un-nuanced way. This was very convenient for the church which had long been maintaining that religion had a role in addition to science. Now science itself seemed to show that this was true: that the world had a beginning and end, and that at the beginning and end of the world one had no option but to give up science and fall back on the mysteries of God, creation, and apocalypse. It added to the awe that the science in question which seemed to compel this conclusion was nothing other than “Einstein's” general theory of relativity: one might disbelieve a priest, but how could one disbelieve such great science, especially if one did not understand it?

God, creation, and apocalypse—that was more than enough for the church, harassed by an aggressive science in the previous century. All that was needed was a new messiah—and Hawking himself fitted the bill. The church went to town in support of “the brief history of time”—the short age of the cosmos was an oblique reference to the inevitability of creation (and apocalypse). The media lapped it all up. This is how great science and scientists are made. (Einstein too arrived with a headline in the New York Times.) When Hawking came to Delhi, the media was in a frenzy. Interestingly, the key point that Hawking made in his presentation was to complain that he had been denied the Nobel prize. Now, however much they may have wanted to give it to him, the Nobel prize committee could hardly do so for there was nothing that could be called science here. That committee would have had to deal with a few experts who were somewhat better informed than the Delhi intellectuals who flocked to see Hawking *exactly* as devotees throng to see a godman: brimming over with faith, and completely bereft of understanding.

As a third example, take my own recent case. It was the 60th anniversary of Indian independence. The media was eagerly looking for some “good news” about Indian achievements. In this situation, the Manchester university website put out a news item about how Indians had discovered the calculus before Newton. The Indian media was thrilled. On 14 Aug 2007 the HT and *Telegraph*, Calcutta carried front-page stories, the *Hindu* had the PTI release from London on its back page; the *Indian Express* had it on p. 15, and the *Times of India* carried it the next day on p. 36. This is just a small sample of the large number of newspaper which carried the news, including the *Telegraph*, London. No one bothered to check the *authenticity* of the news: it was the *story* that mattered. More precisely, one journalist did check it out. He told me that he found that there was no peer-reviewed publication to back the claim of joint research done at Manchester and Exeter universities. However, he nevertheless went ahead with the story on the logic that even if he did not publish it, others would. This logic again emphasizes that for the media today saleability is all, and the truth surely does not matter!

However, the truth mattered to me. So I went around to media offices. I was armed with four things. (1) A news item from *HT Bhopal Live* of 8 Nov 2004, headlined: “Prof. Raju's charge of plagiarism found correct: UK varsity warns lecturer”. The body of the news item from 3 years earlier mentioned the same Dennis Almeida and George Joseph mentioned in the more recent news. Not only was there no new research to report, even the report that it involved plagiarism was three years old! (2) *Two* letters of apology from Dennis Almeida. One was an email dating back to 2005 after he was removed from his position at Exeter, following the investigation. The second was a handwritten letter of apology dated 24 April 2007, after he rejoined the Exeter university in some other capacity. (3) A report from an ethics committee of Exeter university which had earlier investigated my charges. Expectedly, this report was wishy-washy: but it did warn Dennis Almeida, and it did make the point that “under no circumstances” should the term “Aryabhata group” be used as author to report joint work done with me, for the reason that this did not give me adequate credit. The Manchester Press Officer had supplied to me precisely such a research report authored by the “Aryabhata group” which report contained

verbatim excerpts from my own writings dating back to 1999. (4) The fourth thing I had was a copy of my recent book *Cultural Foundations of Mathematics: The Nature of Mathematical Proof and the Transmission of the Calculus from India to Europe in the 16th c. CE* (Pearson Longman, 2007, Project of History of Indian Science, Philosophy and Culture, vol X, part 4). Here was a peer-reviewed publication—a whole volume of over 500 pages—devoted to the question of how and why the calculus developed in India and how and why it was transmitted to Europe. This was the culmination of a decade-old effort—as early as 1998 I had obtained grants for this from the Indian National Science Academy, and announced my programme in an advertisement, still archived and available on the Internet.² Appendix 7 A of the book, entitled “Transmission of the Transmission Thesis” describes in some detail how credit for the thesis that the calculus was transmitted from India to Europe itself came to be transmitted from India to Europe through Almeida et al!

How did the media react when confronted with this evidence? The HT took its time, but to its undying credit, it came up with a concise yet precise correction published on 25 Aug 2007.

“The claim made by two British researchers that they were the ones who unearthed the fact that Kerala mathematicians invented the calculus long before Sir Isaac Newton (Hindustan Times, August 14, 2007) was incorrect. The Kerala infinite series have been known to British scholars since 1832. Recent work on transmission of the calculus was first done by C.K. Raju, Editorial Fellow of the Project of History of Indian Science, Philosophy and Culture and is published in his book, *Cultural Foundations of Mathematics: the Nature of Mathematical Proof and the Transmission of the Calculus from India to Europe in the 16th century*. One of the British researchers, Dennis Almeida, was even warned in 2004 by Exeter University against plagiarising Raju's work. The error is regretted.”

Anyone can make a mistake, but it takes a lot of courage to own it up.

Unfortunately, the correction put out by the PTI was quite awful. The reporter completely failed to understand my point that the original story was a fraud, and was carried without checking the facts. For this reporter, even on the 60th anniversary of independence the truth still flowed from Manchester and scams originated only in India. The reporter went by this judgment, and the facts did not matter. The PTI report AGAIN did not bother to check the facts or even the documents that I had supplied. The PTI “correction” stated that I claimed to have discovered the Kerala infinite series, when, in fact, my book begins by pointing out that this has been known since 1832. Instead of checking out the Exeter university investigation report, or Dennis Almeida's apologies, the PTI “correction” stated that I “alleged” a collaboration with Almeida, and so on. Unlike Vijay Dutt of HT, the PTI London correspondent who had put out the story was perhaps interested in covering up. Despite this abysmal standard of reporting, the PTI's pre-eminent position ensured that this incorrect “correction” was again carried by a number of newspapers across India. Roger Highfield of the *Telegraph*, London, agreed he could not back up the story, and withdrew the item from its website, although it did not carry a formal retraction. The *Telegraph*, Calcutta, pursued a counter-story, but carried neither any correction nor any counter-story so far, to my knowledge. There the situation stands.

The three cases above—petrol from water, Stephen Hawking, and the Indian calculus—concern events that were reported by the media. So, it is worth considering a final case which relates to events *not* covered by the media. Once again I take an example with which I am personally familiar, so that I can be sure of the facts. While the above case was still going on, the following press-release was circulated.

Petition against “celebrity justice” in science

Several distinguished academicians, including Prof. M. G. K. Menon, Dr P.M. Bhargava, Prof. Ashis Nandy, Dr Vandana Shiva, Prof. A. N. Mitra, Dr M. S. Rangachari, Prof. Sumit Sarkar, Prof. Tanika Sarkar, Prof. Harish Trivedi, Prof. Ganesh Devy, Dr S. P. Shukla, and others, have petitioned the American Mathematical Society (AMS), urging it to give Prof. C. K. Raju a fair opportunity to present his case against Sir Michael Atiyah, former President of the Royal Society.

In his Einstein lecture of October 2005, Atiyah claimed to have invented a radical new mathematical paradigm for physics. Raju's Harvard-based son promptly informed Atiyah of Raju's similar proposal in his 1994 book, *Time: Towards a Consistent Theory*.

Raju had pointed out a subtle mathematical aspect of relativity missed by Einstein, but noticed by Poincaré, and had argued that the corrected theory could explain quantum mechanics.

However, in June 2006, a prominent article in the *Notices of the AMS* again promoted Atiyah's claim to the idea, naming it “Atiyah's hypothesis”, with Atiyah's consent. After Raju protested, his work was later mentioned in the *Notices of the AMS* in April 2007.

Raju objected that this covered up the fact that his work was suppressed **twice**—once after Atiyah definitely knew about it. In a letter to the *Notices*, Raju also pointed out Atiyah's mistake in advancing the idea as a hypothesis, though no new hypothesis is needed. (David Gross, 2004 Nobel laureate in physics, had vigorously pointed this out during Atiyah's lecture, but Atiyah failed to understand.) Atiyah's repeated mistake was proof that he had copied ideas without full understanding, Raju argued.

The *Notices* refused to publish Raju's letter, without giving any reason. The petitioners have protested that Raju's serious charges should not be hushed up, just because Atiyah is a celebrity.

In the meanwhile, the 65th meeting of the Delhi-based Society for Scientific Values noted that three experts had found valid Raju's charges against Atiyah, and the Society is investigating further.

The news release was accompanied by 20 pages of documents justifying every clause.³ Nobody carried it. The reason, as one journalist candidly put it, was that the media carries stories only of plagiarism by Indians: the other way around is difficult under most circumstances, and quite impossible to contemplate when it involves a celebrity. The Indian academics who signed the petition obviously do not mean much to journalists. An Indian may have discovered a major flaw in Einstein's theory, and a prominent Western may have grabbed credit for that, but the Indian media, which believed petrol can be made from water, obviously disbelieves this. Three experts of the Society of Scientific Values agreed that I had made out valid prima facie case, as reported by the Society on its website (<http://scientificvalues.org/cases.html>; case no. 2 of 2007) but even that went unreported. Had I been interested in seeking publicity, wouldn't I have done so long ago, when my book first appeared in 1994? Certainly, I write books to disseminate knowledge, but had I been interested in seeking newspaper publicity for my scholarly work on the Indian calculus, wouldn't I have promoted it in April 2007 when my book was published, instead of waiting over three months till August? But what does

the truth matter!

With the background of these specific cases, let us now try and understand matters in greater generality. In the 19th c., the image of a scientist was one who pursued the truth. After the failed revolution of 1857 many Indians such as Mahendra Lal Sircar or J. C. Bose pursued science in mission-mode because they thought that the key failing of Indian society was the absence of a scientific attitude. This belief in a “scientific temper” kept being promoted in India until fairly recently. There is a remarkable parallelism here between scientists and media-persons, since large sections of the media in pre-independence India were also very committed, and worked with a mission. After independence, however, something happened. The journalists turned professional, while Indian scientists turned into bureaucrats!

Post-independence Indian society planned for capitalism. Now, a capitalist society discourages free enquiry. This is not done by means of any absolute prohibition, but by making free enquiry disadvantageous. Thus, in India, the only places where free enquiry could be carried out were in the universities, where the primary job is that of teaching, not research. Accordingly, universities have been systematically starved of funds in relation to research institutes, where the enquiry could be more closely directed in support of profit. This continues to be true even today with the thrust on building a knowledge-society: the government prefers to open more and more elite institutions, while ignoring the primary source in the universities. I will not go further into this issue of universities vs elite institutions symbolised by the case of Meghnath Saha vs Homi Bhabha which perhaps requires a book by itself.

Today we have reached the third stage where both scientists and media are completely subservient to market forces. In a capitalist society, the expected role of a scientist is not to produce truth, but to produce innovation useful for commerce or war, for that is where the sharp increases in profit come from. So, a scientist is expected to produce, perhaps indirectly, profit or weapons. Truth may be holistic, but it is specialization which is seen to boost the efficiency with which innovation is produced, so that a scientist is expected to be specialised, often excessively so. The result of this over-specialisation is that quite often scientists are unable to understand the work of another in a different sub-sub-field of specialisation.

This situation of information inequality among scientists is accentuated because a capitalist society creates and maintains information poverty (in addition to economic poverty) as follows. Since innovation is produced by research, research is encouraged to the detriment of education (which only reproduces the labour necessary for research). Post-independence India has invested heavily in a few islands of research amidst a sea of illiteracy. This results in widespread scientific illiteracy: about 93%⁴ even in developed societies like the US, it touches almost everyone in India. So we have a situation where most scientists do not understand each other, and most people do not understand science and technology.

It is in this situation that the media is expected to mediate between specialised scientists and scientifically illiterate masses.

Since scientists have almost stopped understanding each other, truth is usually decided purely by authority (journals, grants, positions, etc.). Because Einstein is such a figure of authority in science, the elementary mathematical mistake he made⁵ while repeating Poincare's ideas, using Poincare's words, went unnoticed for a century. Although this author's point was understood by a few specialists, it remained largely hidden from public view until this author's ideas in the matter were repeated by

Atiyah, in his Einstein lecture (without however mentioning Einstein's mistake or Poincare in this context).

So, in practice, truth in science too is decided by authority rather than reason or experiment. But on whom does authority devolve? Does it devolve on the most knowledgeable or most creative people? No. It is foolish to imagine that in an unjust society, the top layers, in whom authority vests, are somehow insulated from injustice. As D. D. Kosambi so aptly said, “it is the scum that rises to the top”. Obviously, authority often enough devolves on those better able or more willing to manipulate social processes. (This incidentally means that a large portion of “respectable” and conventional scientific research is comparable to religious rituals and medieval theology.⁶) What confounds matters further, on the other hand, is that, in a capitalist society, the issue is not scientific creativity or who *produced* some research, but who *owns* it. Bill Gates is the owner of Windows whosoever thought of the idea of GUI or did the programming. That is why our government awards go to the science managers (or their immediate disciples), and it is these managers who are called “eminent scientists” by the media, although they are often scientifically semi-literate, and out of touch with recent developments, while the real innovators remain invisible. Because knowledgeable and creative people tend also to be upright, they become a threat to the power of these managers, and are usually sidelined or chased out of the system.

To summarise, in a scientifically illiterate society, state-backed scientists and journalists both rely on scientific authority, which does not devolve on the knowledgeable. This is what creates a situation where scientific work is often uncritically misreported by journalists. Note that those who decide grants, awards etc., themselves being scientifically illiterate, often go by media reports thus creating a vicious circle.⁷

So what is the remedy? Obviously, authority usually cannot be trusted to be honest and to work for people, but people at large can be. So the basic remedy is to make people scientifically literate so that they can judge for themselves what is or is not true. But this is a remedy which is difficult to implement for so many people derive their political power from their ability to fool people, and for people to be easily fooled they need to remain illiterate or at least scientifically illiterate. One possibility—a small glimmer of light that is visible in this gloom—is as follows. Some scientists and media persons, even though they may be employed by the government or private capital, may still have some residual independence left. It may be possible to form a group of such residually independent scientists who are willing to participate in this process of disseminating truthful information about science, which may be quite contrary to what people in authority say, but is nevertheless well reasoned out, and explained to people at large. It is desirable but not essential that the newscasts of such a group find a place in mainstream media: one could start in a small way with an Internet journal. This cannot be done by a single individual but requires a group which has enough expertise with it to grasp a large number of areas of specialisation. It is possible to think in terms of a core group which can be supported by a still wider group of experts who may need to be only occasionally consulted. Given current communication technology, such a cooperative endeavour is conceivable to put in place today at very low cost. I am hopeful that such a core group can be formed.

- 1 For a more detailed explanation of singularities for the layperson, and how they have been used to promote a specific theology, to inculcate values needed for globalization, see C. K. Raju, *The Eleven Pictures of Time: The Physics, Philosophy and Politics of Time Beliefs*, Sage, 2003, chp. 3. Of course, Hawking's interpretation of a singularity is bogus. For a succinct but more technical account of my objections to Hawking's interpretation of singularities, see C. K. Raju, "Cosmological Time", chp. 7 in *Time: Towards a Consistent Theory*, Kluwer Academic, Dordrecht, 1994, pp. 203-205, and C. K. Raju, "Distributional matter tensors in relativity", in *Proceedings of the 5th Marcel Grossman Meeting*, D. Blair and M. J. Buckingham (ed), R. Ruffini (series ed.), World Scientific, Singapore, 1989, pp. 421-23. For a variety of other objections to Hawking's singularity theory, see C. J. S. Clarke, *An Analysis of Spacetime Singularities*, Cambridge University Press, 1993.
- 2 http://sunsite.utk.edu/math_archives/.http/hypermail/historia/jul98/0067.html.
- 3 For a more detailed account of the dispute involved and further details of these documents, see "Transmission in the History of Science. II: the contemporary scene" at <http://indiancalculus.info/Transmissions2.html>. Reproduced in <http://www.blogs.ivarta.com/india-usa-blog-column8.htm>.
- 4 Gerald Holton, *Science and Anti-Science*, Harvard University Press, 1994.
- 5 This is an interesting example of how dependence on authority has led to persistent mistakes in science. See C. K. Raju, *Time: Towards a Consistent Theory* (Kluwer Academic, 1994; *Fundamental Theories of Physics*, vol. 65), chp. 5b.
- 6 The term "medieval theology" is here intended to denote the sort of useless theorising that preoccupied medieval Christian theologians, such as the debate over the number of angels that could fit on the head of a pin. However, for examples of the exact congruence between science and theology, see C. K. Raju, *The Eleven Pictures of Time: The Physics, Philosophy and Politics of Time Beliefs*, Sage, 2003.
- 7 Some of these considerations about the authority dependence of science and scientific principles first appeared in an article, C. K. Raju, "Mathematics and Culture", in *History, Culture and Truth, Essays Presented to D. P. Chattopadhyaya*, (ed. Daya Krishna and K. S. Murti, Kalki Prakash, New Delhi, 1999, pp. 179-193. Reproduced online in *Philosophy of Mathematics Education*, **11**, <http://www.people.ex.ac.uk/PErnest/pome11/art18.htm>.