

## Perceived bias against Āyurveda

A. S. Pârasnis

### Bias against Āyurveda?

Patwardhan *et al.*<sup>1</sup> have complained against the cover story on herbal medicine in the *TIME* magazine (10 June 2002) that has not as much as mentioned Āyurveda. Subsequently, Roy<sup>2</sup> has reinforced that feeling of hurt.

Over 112 years ago, Gopāl Ganēsh Āgar-kar (1856–95), Mahārāstrīan firebrand social reformer – and Tilak's contemporary, collaborator and friend – wrote articles on 'science' in his weekly journal *Sudhārak* ('The Reformist'). He took the examples of Newton's law of gravitation, and of Āyurveda, concluding that when the latter arose and was consolidated, it could be called 'science' but that it no longer may be, whereas Newton's works remained science<sup>3</sup>. 'What is the situation today?' will be the burden of this article as a response to *Herbal remedies and the bias against Āyurveda*<sup>1</sup>. Āgar-kar applied the then accepted criteria for calling something *science*. This article strives to apply criteria as recognized today<sup>4</sup>; also to what arises from Roy's letter informing us of his enlisting Chopra to propagate respect for Āyurveda. What arises is the question of Chopra's pseudo-scientific quantum healing and other doctrines. I shall also refer to *Hathayoga*, another major contribution of ancient India, for there are similarities between the life perspectives of Āyurveda and Hathayoga, and between the attitudes of the respective practitioners. Several institutions in India and USA practise and propagate the two together. No apology is, therefore, needed for considering all these cognate issues together.

My theme is not outright rejection of Āyurveda, nor denial of its potential in the right hands and with modern attitude. Rather it is to examine the attitude prevalent among its protagonists, practitioners and followers in India and abroad, who attribute to Āyurveda things that it itself did not. Worldwide, there is resurgence of herbal remedies, mostly unsupported by science. Since Āyurveda is largely herbal, lovers of it in India have rushed to project it as something great. This is as irrational as the increasingly total belief throughout the world in so-called 'alternative medicine'. It has become a fashion to downgrade

modern medicine on a supposedly philosophical plane.

It is truism that Āyurveda is not primitive herbalism like, say, tribal medicine. It is an organized system of medicine with its own specific philosophy and structure, as are the systems of China (TCM), Japan (Kampo) and Korea. The question really is: Is today's Āyurveda a living science? It is not one of bias against it in the Western world or India. Modern medicine, wrongly called allopathy<sup>5</sup> even by its practitioners, is a science, and journals that publish research in it have declared criteria for publishing submitted material. Editors sometimes make mistakes, even those of *Nature*, *Physical Review*, *JAMA*, *New England Journal of Medicine*, and *Lancet*; and journals may have biases. That should not be an issue. We ought to look for reasons why Āyurveda is not taken seriously. The fact is that even in India most people, most practitioners of modern medicine and most scientists also do not take it seriously; possibly, they take it more seriously than they do homoeopathy.

### Obvious limitations of Āyurveda

In India – and among Indians and non-Indians in USA who are in the field of alternative medicine, or are sympathetic to it – there is a tendency of saying 'Āyurveda knew it all', and of representing it as a panacea. This, said in many publications and websites (q.v.), already makes it suspect. There are public discourses, pseudo-scientific books and articles, and websites which claim that if everybody lived as prescribed by Āyurveda, all disease would vanish from the earth. Can we take such statements seriously?

In reality, whatever Āyurveda knew was only the empirical fact, not well documented by modern pharmacological and statistical standards, that, for example, certain parts of certain plants – and certain natural chemicals – are sometimes useful in treating certain ailments of some patients. Āyurvedic people then did not – and today do not – know exactly which compound(s) in the intimate complex mixture of hundreds of compounds is(are) useful and why, what parts are harmful and why, the mechanisms of their complex biochemi-

cal reactions with body tissues, how to ensure near-100% (at least admissible) efficacy, what the side effects are, how to monitor prognosis, what the optimal dose is, why and how things sometimes work in the first place, etc. They did not know how to separate the compounds, useful, harmless, harmful; they had not evolved principles to describe the compounds exactly; they did not have universal standards. The references to Āyurvedic research cited by Patwardhan *et al.*<sup>1</sup> are mostly from dedicated journals or publishers. Modern medicine has exacting standards that are even today unknown to alternative systems of medicine throughout the world, including Āyurveda. Alternative systems of medicine, including Āyurveda decline to think and do research on modern lines. Āyurveda does not wish to look at drugs and their effects in molecular terms. This was because molecules were not known then (except in philosophical ways). It is not as if the attempts had been made and dismissed. Now there is every reason to make serious attempts. Such scrutiny is not at variance with Āyurvedic philosophy (of, for example, *tridosh*).

In a related connection, Chattopadhyay<sup>6</sup> has pointed out the need for rigorous in-depth studies and standardization of all herbal medicines 'to ensure the safety of the users'. Sangwan *et al.*<sup>7</sup> have found 70-fold variability in Indian herbal products based on *aeuwagandhā* or 'winter cherry' (that is proof of there not being universal standards), and have emphasized the same need. Dubey *et al.*<sup>8</sup> have corroborated that growing, harvesting and storing of herbs are faulty, herbal products are adulterated, have altered efficacy, and their processing is crude. Their saying 'India is sitting on a gold mine of well-recorded and traditionally well-practised knowledge of herbal medicine' needs be qualified. While neither are records of herbal medicine reliable nor is it 'well-practised', India probably is sitting on a gold mine of the right climatic conditions that promote the growth of a variety of medicinal plants. It is noteworthy that all these workers are modern scientists concerned about undesirable side effects of herbal products. Āyurvedic people themselves are not so concerned, judged by a lack of their protests.

### Fundamental difficulties with Āyurveda (and other ancient systems)

The commendably well-researched book *Man and Medicine: A History* by Udvardi<sup>9</sup> details how the origin and development of Āyurveda, like that of all ancient systems, are uncertain, full of confusion, controversial, clouded in legend, and not well documented. The traditional views, education and practice of all ancient systems demand a large measure of the medicine man's belief that borders on faith; often from patients as well. As far as Āyurveda is concerned, along with faith, there is the question of its suspected relationship with the Vedic culture. People abroad who think of Āyurveda – to accept, reject, commend, condemn, or criticize it – do not worry about fine questions of whether it truly is part, or extension, of ancient Indian philosophy and yoga, and whether the spirituality thus implicit in it really defines a 'religion', clearly different from their own religions<sup>10</sup>. No one would like if it did. They feel so, because of the way it is presented. For secular people, whether abroad or in India, anything based on belief, faith and spirituality cannot be called 'science', for these are not valid instruments of scientific logic. Secular thinking can hardly be called 'bias'; it is perfectly valid.

Not only traditional systems, in particular Āyurveda, but also things like 'colour therapy' claim to be holistic. A suitable definition of 'holistic medicine' is:

Holistic medicine is a system that fosters attainment of the physical, physiological, psychological, mental and social aspects of health by looking at the whole person, including analysis of physical, nutritional, environmental, emotional and social lifestyle values. It encompasses all modalities of diagnosis and treatment, including drugs and surgery, and involves holistic personal efforts to achieve balance and well being.

In ancient times, the progenitors of Āyurveda and other systems may have tried to look at human life, health, illness and drugs 'holistically' in the light of the then existing meagre knowledge. What is known today about human beings and their physical, physiological and psychological characteristics and responses to foods, germs and drugs was unknown to them. What was developed from insufficient knowledge can no longer be claimed to

be holistic. The 'whole' (*holos*, in Greek) was not known then (nor is it today, but much more is known). It is claimed that modern medicine is not holistic. By the definition above, no system is. Must a system accept spirituality of some kind to qualify for being called 'holistic'?

In a workshop held in Kaivalyadhama, Lonavla<sup>11</sup>, a leading Āyurvedic practitioner at Pune seriously claimed in his talk that regular ingestion of milk, especially cow's, gives immunity against cancer and AIDS. How can people take a system of medicine seriously if its protagonists continually make ridiculous claims? Much introspection must be done before asking others not to have bias against Āyurveda. There must be a scientific limit to cultural and national pride.

A further ground for not taking Āyurveda seriously – that, again, cannot be called 'bias' – is that nowadays newspapers and other media are full of reports that some researcher in India has shown that such-and-such Āyurvedic drug works well where modern medicine fails. There are claims of treating AIDS and cancer successfully with Āyurvedic drugs. Markets in India and abroad are overflowing with supposedly Āyurvedic products claiming wonders. Newspapers of 12 February 2004 report the speech of a well-known individual claiming that today's nanotechnology is all there in Āyurveda, namely its *bhasma*-making procedures<sup>12</sup>! Not one Āyurvedic scholar protested.

### A question of attitude

What is said above also applies to Japan's *kampo* system and similar systems in China, Korea, Thailand, and yet *TIME* has taken cognisance of them. Two examples given by *TIME*<sup>13</sup> will show the difference.

In 1995 Ryoo Byung Hwan, Vice-President of life-science business of SK Chemicals in Singapore, and a strong advocate of traditional medicine, decided to find out if the claims of Korean herbal medicine of a cure for arthritis were justified. He believed that they were, but thought that it was essential to submit them to modern tests to prove that they were actually justified. Thus, the usual barrier of unwillingness to research by modern means was crossed willingly. He procured 600 herbs of Korean medicine and, after detailed studies, narrowed down to three for arthritis; the others had no use for arthritis. Pills, named Joins, were made from

their extracts and tested in parallel with Voltaren that is a powerful and effective anti-inflammatory drug made by Novartis, Switzerland. Joins was tested in several Seoul hospitals and was found to be almost as good, yet without gastric disturbance that Voltaren produces.

The second example is that of sweet wormwood, a weedy plant found in China. Its extract has long been used to treat malaria, not necessarily successfully. At the instance of practitioners of traditional medicine, biotech companies in China and USA have recently developed the drug, Artemisinin. With some logic, it is being tested in China, USA, the UK and Germany also for reducing the side effects of chemotherapy in breast cancer. The results are promising<sup>13</sup>. The point of note is that it was the traditional practitioners who initiated the research.

Not only our individual *vaidyas*, but also Āyurvedic and yoga research institutions are against doing research on Āyurvedic preparations and methodology by modern means and, more importantly, in the light and perspective of modern medicine. A glance at research reports, mostly published in 'dedicated' journals whose acceptance standards are ill known, will show that it is 'validation research'. This research starts from the premise that everything written in *samhitās* is correct, strives to prove it, and proves it. A system that depends so much on this premise cannot be taken seriously, howsoever much its empiricism may sometimes cure some patients for a while, which is, at best, anecdotal evidence. As Lakhotia<sup>14</sup> points out, the vicious cycle 'poor science, poor journals, poor recognition' exists even in refereed 'standard' scientific research publications in India. One can recognize it easily in the 'dedicated' journals. Ravishankar's<sup>15</sup> suggestion of not funding such journals of any discipline officially has merit.

In the education and training of Āyurveda (and, if one would, homoeopathy) an element of blind belief, bordering on superstition, pervades texts, articles, courses, discourses, public pronouncements, media reports, and teaching. The education and training in modern medicine may not be perfect but, besides the fact that perfection is not claimed, there is a definite element of liberal thought. That is how some practitioners of modern medicine studied Āyurveda or homoeopathy privately, and occasionally prescribed those drugs, albeit on an experimental basis, until the Supreme Court gave a directive that

medical practitioners may not prescribe drugs from a system in which they do not have a degree from recognized institutions.

Patwardhan and co-workers<sup>16</sup> have more recently reviewed exhaustively the possibility of the discovery of new drugs using existing Āyurvédic 'database'. As pointed out earlier, this database is ill-documented and incomplete. That is why this is an attractive possibility and may, for all we know, be realized; but this research needs be done on the lines – not necessarily the philosophy – of modern medicine and must include clinical trials of drugs discovered. Acceptance of the results of any clinical trials depends upon whether they satisfy modern pharmacological and statistical standards. Simply finding that such-and-such Āyurvédic drug has these-and-these 'important' compounds would not suffice.

Unwillingness to test ancient texts by modern methods is in itself sufficient to take a medical system with caution and reservation; this cannot be called 'bias'. From the point of view of the philosophy of science, the unholy tendency of calling everything 'science' – because, then, the public tends to take it more seriously, if not actually believe in it – can be countered and defeated only by defining exactly what 'science' means, which we shall leave for the last section of this article in order not to break the link here.

### Chopra's pseudo-science of quantum mind

Roy's enlisting<sup>2</sup> Chopra for giving dignity of Āyurvēda might have inspired hope for it, but for the latter's scientifically fallacious doctrines and the legal controversies that surround him, which all will again lead to complaints that Westerners ignore Āyurvēda<sup>17</sup>. Therefore, we need critically to look into Chopra-style mysticism that he claims derives support from quantum mechanics. Quantum concepts are claimed to support the mystical notion that the mind creates reality – one form of the so-called anthropic principle<sup>18</sup>. About Āyurvēda, Chopra says, 'Ancient Āyurvédic texts describe each herb as a packet of vibrations that match a vibration in the quantum mechanical body', and further, 'If you have happy thoughts, then you make happy molecules. On the other hand, if you have sad thoughts, and angry thoughts, and hostile thoughts, then you make those molecules which may

depress the immune system and make you more susceptible to disease<sup>19</sup>'. These statements are grossly unscientific and must be rejected, independently of whether ancient texts actually say so (Udwadia book<sup>9</sup> has absolutely no references to such assumptions). He thus relates his 'perfect health' and 'synchro-health' concepts to Āyurvédic, supposedly holistic, outlook. If there had been no reference to quantum mechanics, molecules, disease and immune system, his assertions could be dismissed more charitably as innocuous saintly thoughts. More comments on Chopra are found in the new book *Voodoo Science*<sup>20</sup> by Robert Park, former President of American Physical Society.

Chopra has claimed<sup>21</sup>, 'I was sitting on a foam rubber pad, using the technique (of 'lifting-off') as I had been taught (by Maharishi Mahesh) and... when I opened my eyes, I was 4 ft ahead of where I had been'. In the current official website of his institute, he says that in one of the seminars that he routinely conducts<sup>22</sup>, 'participants will learn the quantum mechanical framework for healing'. As, thus, he retains the claim of the truth of paranormal phenomena, and that of quantum mechanical support, we must examine all his doctrines together.

Another mystic, physicist Amit Goswami, claims in his book *The Self-Aware Universe*, '... psychic phenomena, such as distant viewing and out-of-body experiences, are examples of the nonlocal operation of consciousness.... Quantum mechanics entails such a theory by providing crucial support for the case of nonlocality of consciousness'. Since no monitored, reliable, believable and reproducible psychic phenomena have been found, in spite of intense efforts lasting over a century and a half (and still continuing), such statements must be rejected outright. Physicist Stenger<sup>23</sup>, by a simple re-examination of (i) wave function collapse in a two-slit experiment, and (ii) effective non-locality without superluminal travel, in a pair-production and eventual recombination experiment, has shown such statements to be false. Concluding a long deposition before a US Senate hearing, physicist Pagels says explicitly<sup>24</sup>: 'The claim that the fields of modern physics have anything to do with the "field of consciousness" is false. The notion that what physicists call "the vacuum state" has anything to do with consciousness is nonsense.... The presentation of the ideas of modern physics side by side, and apparently sup-

portive of the ideas.... about pure consciousness can only be intended to deceive those who might not know any better.... To see the beautiful and profound ideas of modern physics, the labour of generations of scientists, so wilfully perverted provokes a feeling of compassion for those who might be taken in by these distortions.'

One recalls the pre-quantum-physics mystical propositions of well-known physicist Oliver Lodge that were dismissed in the 1890s. Lodge, who had played a major role in demonstrating by means of his coherer the existence of Maxwell's electromagnetic waves, had argued that if wireless telegraphy was a reality, wireless telepathy also was.

### Dilemma of the mystics

As over a century ago, so today, the dilemma of the mystics follows closely from what is happening in science, to which they look for support. The concept of field, arising out of Newton's gravitational and Maxwell's electromagnetic theories borne out thoroughly by terrestrial and extra-terrestrial observations, was used by occultists and Lodge-like scientists to assert that continuity, not Dalton's atomism, was the guiding and unifying principle of Nature. This fitted well with ether – the comforting embodiment of continuity. Unlike Lodge and fellow beings who did not have to contend with Einstein's doing away with ether, modern-day mystics have to deal with that too. Then has come quantum physics. So they turn to well-entrenched quantum concepts to assert that quantum discreteness rather than continuity is that basic principle of Nature. They either do not understand quantum physics, or interpret it incorrectly. Mystics do not appreciate, or do not know, that objective reality, with no special role for consciousness, human or cosmic, is consistent with all observations on which is based modern science. Following Stenger<sup>25</sup>, we may recognize that '(Chopra's) quantum mind rescues the dualists from the damage caused by the destruction of the electromagnetic ether. However, like so many similar proposals, the theory of quantum mind will get nowhere until it makes some prediction that can be tested empirically. In the meantime, it must be rejected as non-parsimonious, especially since we have in our hands a perfectly economical and logically consistent theory that agrees with

all the data and requires no additional component in the universe beyond matter'.

Often the mystics take succour from Late David Bohm's hidden variables and implicit order and what follows from them. Unfortunately for them, his quantum potential, from which follows the mysticism, has failed to predict unique, testable experiments. Modern-day mystics use the EPR paradox and Bell's theorem incorrectly in a similar way, dealing with all of which here will take us far afield.

### Āyurvēda and hathayoga: similar regressive attitudes

Considering here hathayoga and research in it is in order, because many practitioners of either system take the two as connected; the best that can be said about their commonality is that each defines a way of life, right or wrong, acceptable or not acceptable. Hathayoga is a proven gift of ancient Indian culture to modern times, but look at the statements made about it and research done in it. All research done in India and abroad – for example, US – is published in 'dedicated' journals. Like Āyurvēdic research, it has 'validation' character. It is a similar attitude that could also make hathayoga suspect. In any Internet search engine, keying in 'Yoga', gets over two lakh sites! ('Physics' does not have that many.) Most of them are from America, maintained by practitioners and institutions, with some of which long-residing immigrant Indians are associated. The same question can be asked: Why not do research in yoga by the methods and perspective of modern medicine? Much sophisticated instrumentation is available. For simply exploring things, one does not have to abandon yoga or Āyurvēdic philosophy. Because of the ease of practising hathayoga and its tangible health benefits, we generally do not find widespread bias against it in the Western countries (however, see ref. 11). Nevertheless, what is the attitude to doing research on hathayoga? The research culture initiated by Swāmī Kuvalayananda in 1924 by founding Kaivalyadhāma, Lonavla, near Pune, has all but died there after his death (1966) and that of his original associates. Current research, again, has the character of validation. It is not a matter of just sticking probes and electrodes into bodies; it is one of exploring claims, of both ancient and current times.

### Criteria to call a system of organized thought and/or practice science

We may now list, without going into deep discussion here, the following well-recognized discrete characteristics of science, and see if today's Āyurvēda (or yoga or homoeopathy) satisfies them.

*Science is secular:* Science admits of only those concepts that are amenable to observation. With a view to remove the perceived bias against Āyurvēda, Roy has enlisted Chopra's help, but Chopra's statements, in connection with consciousness, like 'the physical world, including our bodies, is a response of the observer'<sup>20</sup>, that are tantamount to not only an acceptance of the anthropic principle but also 'other worldly mystical belief' are untenable. Penrose has argued that the principle is not needed for a discussion of consciousness<sup>18</sup>.

*Science is rational:* Only *buddhi-prāmā-ōya*, 'acceptance by logic alone', has a place in science. *Shabda-*, *granth-*, *guru-prāmā-ōya* have no place, which Sanskrit terms may be translated into English as 'acceptance by traditional teaching', 'acceptance as written in ancient texts', and 'acceptance as gospel handed down by a guru' respectively. They essentially entail rejection of rationality. Practitioners of Āyurvēda (or yoga or homoeopathy) depending solely on old texts is not rational.

*Continual expansion of the unknown boundary:* Science (inclusive of modern medicine) did not stop with Aristotle, Hippocrates, Célus, Jenner, Galileo, Newton, Maxwell, Lister, Fleming, even the great Einstein. This continual growth will exist as long as mankind and science exist. Contrarily, Āyurvēda and homoeopathy work only within the framework of ancient and medieval texts. The former stopped with Charaka and Sushruta, the latter with Heinemann himself.

*Continual transformability:* Science continually transforms: it abandons old, unworkable, unsubstantiated, unobservable concepts, and evolves new concepts and laws whenever necessitated by observation. Āyurvēda, yoga and homoeopathy do not accept transformability of principles. To some extent, traditional yogic practice has been modified successfully and usefully by, for example, Iyengar<sup>26</sup> con-

sistent with modern lifestyles. Some yoga traditionalists are against it.

*Awareness of own limitations:* Science strives for truth, but does not claim to know it all at any given time. It is the only system of thought that knows, accepts and expresses its limitations. Much dependence on ancient texts amounts to saying 'They knew it all'<sup>27</sup>.

*Self-regulating and self-correcting mechanism:* In science, self-regulating and self-correcting mechanisms are always on the alert. The most recent example is the 'black hole', a concept evolved by Chandrasekhar in the middle thirties but rejected by Arthur Eddington. In two decades, not only was it accepted by the scientific community, but also later he was awarded the Nobel Prize.

*Absence of rituals:* There is no ritualistic culture, or *karmakāōda*, in science.

*Falsifiability, the reigning criterion of science:* The Sanskrit word (also used in Marāthi and Hindi) coined for Popper's 'falsifiability' is appropriate, namely *khaō-dan-kshamatā*. How do we know that a proposition or law is true? Observations can be made on its contents and, if they agree with the proposition, its basis, its conclusions and its predictions, it is accepted. It turns out that an infinite number of observations (or 'experiments' of philosophers) would have to be done. In other words, this justifiability, or *maō-dan-kshamatā*, cannot establish the truth. So enters Popper's falsifiability. Only if experiments are thought of to 'disprove' the proposition, are attempted, and they are unsuccessful, can the proposition be accepted as truth. This happens in the progress of science all the time<sup>28,29</sup>. Planning to disprove anything in ancient texts is as much anathema and heresy in Āyurvēda as in yogic or *Upanishadic* philosophy.

Centuries ago when, for example, Āyurvēda began and grew, it satisfied some of these criteria and could be called 'science', as Āgarkar stated. Today, one is not sure. In particular, the criterion of falsifiability is not satisfied by Āyurvēda. This is not to deny its potential, but only to cite reasons why it is not taken seriously.

### Conclusion

R&D on the chemistry of Āyurvēdic drugs is not the same thing as clinical trials for

its acceptance in modern times. The full potential of Āyurvēda can be realized only by subjecting its drugs to modern investigation.

The concoction of Āyurvēda, yoga, mysticism, and quantum mechanics, as variously visualized by mystics like Chopra<sup>30</sup> and Goswami, with its great potential for misuse, is a deadly and misleading one. The earlier Āyurvēda and yoga get out of it, the better it is.

No pseudo-science can be considered seriously unless and until its protagonists agree to proper research into its doctrines, proper by the criteria of science enumerated above. As far as Āyurvēda – with which has started the debate – is concerned, we have to admit that it appears pseudo-science because of the way it is presented to the world and because of tall claims made of its efficacy. As far as related issues are concerned, it is one thing to propound mysticism and other worldliness, and ask people to follow, as medieval saints of India did, but it is quite another to mislead people by uninformed pseudo-science.

Not to put too fine a point on it, *TIME* and *New England Journal of Medicine* cannot be faulted, much as it may hurt one's pride. Indeed the *JAMA*–Chopra affair may have played a role in the experience of Patwardhan *et al.*<sup>1</sup> – which happening cannot be faulted either.

1. Patwardhan, B. *et al.*, *Curr. Sci.*, 2003, **84**, 1165.
2. Roy, R., *Curr. Sci.*, 2003, **85**, 841.
3. Pradhan, G. P. (ed.), *G. G. Agarkar's Selected Articles from Sudhārak*, Sahitya Academy, New Delhi, pp. 246–248, 369 ff, etc., 1956.
4. See last section of this article; also Pārasnis, A. S., Ageing, Antioxidants, Āyurvēda, and Research, Plenary Talk, IV International Conference on Yoga and Value

- Education, Kaivalyadhāma, Lonavla, December 2002.
5. This term, which should be condemned even if widely used, was coined by Heineemann, the father of homoeopathy, to distinguish it from his new system. It can perhaps be applied to medieval European medical system of the apothecaries, not to 'modern medicine' that arose in Europe as part of Europe's developing scientific culture. See *Concise Oxford Dictionary*, Oxford University Press, Oxford, 2000, 10th edn. For a complete historical account with references, see [www.ncahf.org/articles/a-f/allopahy.html](http://www.ncahf.org/articles/a-f/allopahy.html), Misuse of the term allopahy.
6. Chattopadhyay, M. K., *Curr. Sci.*, 2004, **86**, 366.
7. Sangwan, R. S. *et al.*, *Curr. Sci.*, 2004, **86**, 461.
8. Dubey, N. K., Rajesh Kumar and Tripathi, P., *Curr. Sci.*, 2004, **86**, 37.
9. Udwadia, F. E., *Man and Medicine: A History*, Oxford University Press, London, 2001.
10. Newsmidia report that some State School Systems in USA have banned the practice of yogic āsanās claiming, under an obviously wrong assumption, it to be part of another religion.
11. See Proceedings of the Workshop held on 29–30 June 2002.
12. Bhatkar, V., See for example, *Times of India* or *Sakal*, 12 February 2004.
13. See *TIME* Cover Story, 10 June 2002; also quoted by Patwardhan *et al.*<sup>1</sup>
14. Lakhota, S. C., *Curr. Sci.*, 2003, **85**, 20–22.
15. Ravishankar, J. S., *Curr. Sci.*, 2003, **85**, 565.
16. Patwardhan, B. *et al.*, 2004, **86**, 789–799.
17. See Skolnick, A. A., <http://nasw.org/users/Askolnick/naswmav.htm>, for detailed history of the dismissal by a Californian court of a \$2 million defamation lawsuit filed by Chopra in connection with an investigation by Skolnick of a paper by Chopra and co-authors published in *Journal of the American Medical Association* under incomplete certification. *JAMA* then withdrew the published paper.
18. Penrose, R. L., *The Emperor's New Mind*, Oxford University Press, Oxford, 1983, ch. 10.
19. Quoted by Barrett, S., <http://www.quack-watch.org/04ConsumerEducation/chopra.html> from Chopra's well-known book.
20. Park, R. L., *Voodoo Science: The Road from Foolishness to Fraud*, Oxford University Press, Oxford, 2000, p. 208.
21. Chopra, D., *Return of the Rishi*, Chapter 13. Also quoted by Barrett (loc.cit.).
22. Chopra, D., Official website: [http://www.chopra.com/article.asp?id=4&program=chopra\\_seminars](http://www.chopra.com/article.asp?id=4&program=chopra_seminars).
23. Stenger, V. J., *Quantum Quackery*, Sceptical Inquirer 1997, [www.csicop.org/si/9701/quantumquackery.html](http://www.csicop.org/si/9701/quantumquackery.html).
24. Pagels, <http://www.trancenet.org/research/pagels.shtml>.
25. Stenger, V. J., *Post-modern attacks on science and reality*, <http://www.quack-watch.org/01QuackeryrelatedTropics/reality.html>.
26. Iyengar, B. K. S., Practices propagated in International Yoga Institute, Pune.
27. I am grateful to the reviewer for pointing out that Āyurvēda has indeed accepted its limitation by defining some conditions as *asādhya* meaning 'not curable'. This is one reason to consider Āyurvēda as standing out among ancient systems, whatever its other shortcomings.
28. Popper, K. R., *The Logic of Scientific Discovery*, Routledge, London, 2002.
29. Kuhn, T. S., *The Structure of Scientific Revolutions*, University of Chicago Press, Chicago, 1996.
30. For rebuttal of Chopra's mysticism from a medical, rather than physics, point of view, see Stephen Barrett, <http://www.quackwatch.org/04ConsumerEducation/chopra.html>.

*A. S. Pārasnis (formerly at the Department of Physics, IIT Kanpur) lives at F-17 Chaitravan Residency, 127/2 Aundh, Pune 411 007, India.  
e-mail: arawindp@hotmail.com*