

The Vinod Wadhawan Blog

Celebrating the Spirit of Science and the Scientific Method

Home

Tuesday, May 31, 2016

DOING SCIENCE IN INDIA. A PERSONAL NARRATIVE (Part 3 of 3)

12. AT B.A.R.C. AGAIN, AS RAJA RAMANNA FELLOW (2005-2010)

For the Raja Ramanna Fellowship (RRF) I opted to be based at BARC Mumbai, rather than at CAT Indore. The BARC library, an old friend, was an important reason for this. I spent most of the time during this tenure on book writing, and on giving lectures. A couple of collaborations ensured that original-research papers kept appearing, in reasonable numbers.

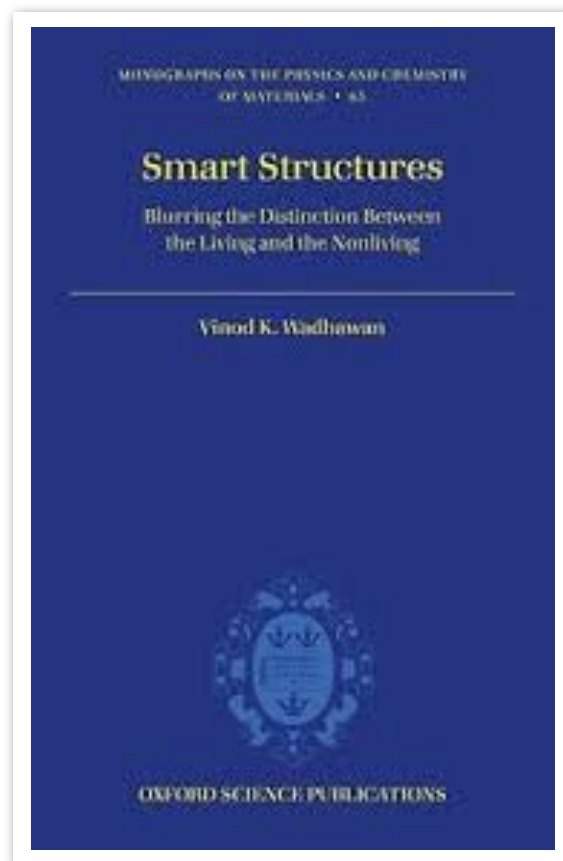
During this tenure I also supervised the writing and submission of Ph. D. theses of three of my juniors from CAT Indore.

Had the BARC changed much since I left it in 1991 and moved to CAT Indore? There was one palpable improvement, thanks to the then Chairman of AEC (Dr. Anil Kakodkar) and the then Director of BARC (Dr. Banerjee). They had succeeded to a substantial extent in reaching out directly to and benefiting many bright and hardworking youngsters among the scientists and engineers, through special grants of funds for certain specific research projects proposed by the young workers. I could not help feeling a twinge of envy towards these people, because my thoughts went back to the days (1977) when I had begun investigations on ferroelastic materials and I was denied a simple optical polarizing microscope of my own, the kind available even to school children.

Another major improvement, thanks to Dr. Vijai Kumar (the then Head of the Human Resources Division), and also Dr. Ravi Grover (the then Director, Knowledge Management Group of BARC), was the digitization of the information services of the entire DAE. We now had access to a huge number of journals and other sources of information right at our table tops. This was a boon for me for my book-writing work.

I had started writing my book on smart structures (Wadhawan 2007) in 2001, and it was completed during my RRF days at BARC. I sent the book-publishing proposal to the Oxford University Press, Oxford, one of the oldest and the most prestigious publishers. Their publishing process is interesting. The in-principle acceptance of the proposal and other decisions are taken by a committee headed by the Vice Chancellor of the University of Oxford. Two anonymous reviewers were appointed, and their comments were communicated to me. They had chosen the reviewers well, who made very penetrating and helpful comments. I have a rather keen sense of observation regarding the words people use in speech and writing. I could guess correctly the identity of one of the reviewers from a tell-tale word he used in a sentence. If I remember right, the word was 'hubris'. It occurred to me that I had met this person at a conference in Canada, and he had used this word at least twice in my presence.

Anyway, the manuscript was accepted, and then started the rather slow and detailed process of publication. I got a bit impatient, considering that they took more than a year to complete it.



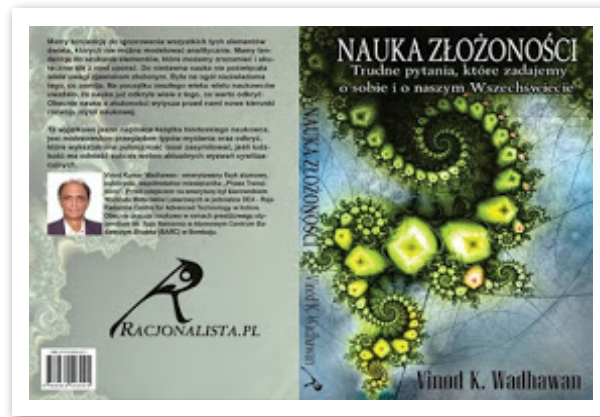
These days, self-publishing has become available as a good option, so my next two books are self-publications. The advantage with self-publication is that it is very fast, and the author is fully in control. You can bring out a revised edition instantly just by uploading a new, revised, pdf file. You can even set the price of the book. But self-publication is not for everybody. I can do it

because of my considerable language and editing skills. I am able to draft, edit, typeset, and upload the book, without needing any help from anybody, and without spending even a single rupee. But the disadvantage is that the book does not go through the usual process of *anonymous* refereeing, although you are always free to send the manuscript to experts for critical comments. Moreover, the book does not have the label, say, 'published by the Oxford University Press'. If published by the OUP, the libraries would first buy the book (just because of the reputation of the publisher), and the question of the merit of the book would come afterwards! In any case, since I don't care much about the number of copies the book sells, the enormous sense of control and responsibility that comes with self-publishing suits my temperament greatly.

After ferroic materials and smart structures, my next obsession has been complexity science. In 2010 I published a book on it: '*Complexity Science: Tackling the Difficult Questions We Ask about Ourselves and about Our Universe*' (Wadhawan 2010).



This book was translated into Polish by Ms. Malgorzata Koraszewska in 2010.



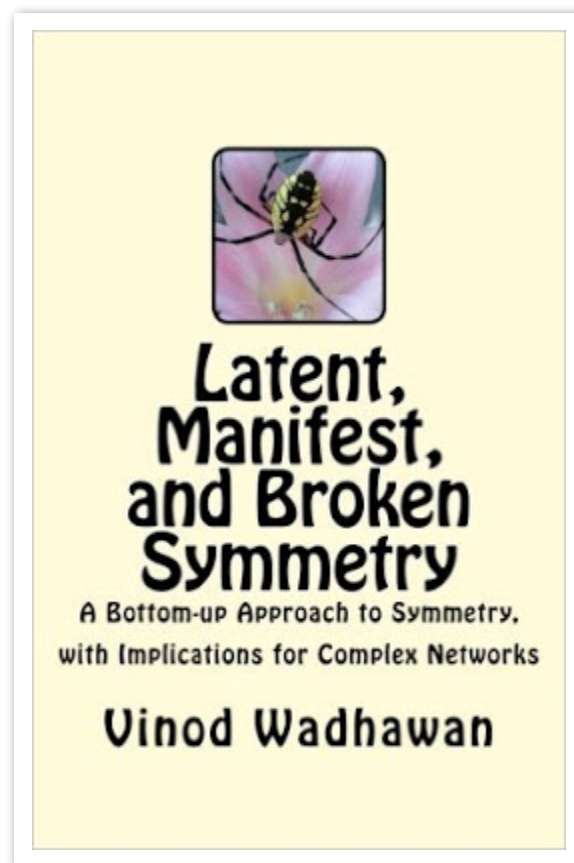
Since then I have been working on a better and bigger book on this subject. In this still ongoing project when I came to writing about the symmetry aspects of complex systems, I realized that I had too much material on that topic, and it would not be a good idea to bury all that as an extra-long chapter in the

book on complexity science. So I took time off and wrote a stand-alone book on symmetry: *'Latent, Manifest, and Broken Symmetry: A Bottom-up Approach to Symmetry, with Implications for Complex Networks'* (Wadhawan 2011/2014).

This book discusses, among many other things about symmetry, the symmetry of composite systems. The Hermann theorem of crystal physics states that if a crystal possesses an N -fold axis of symmetry, and we consider a tensor property of rank r such that $r < N$, then this symmetry axis has the same effect on that tensor property as when $N = \text{infinity}$. In other words, the system possesses 'transverse isotropy' so far as this property is concerned. The theorem can be applied, not only to crystals, but other composite systems also (making due allowances for the length scales involved). I had applied it to rationalize why, for example, the familiar cross-ply plywood does not warp under changes of temperature or humidity, whereas any single ply would (Wadhawan 1987). Carrying such considerations further, I have proposed in this book something I had worked out many years ago but had not published, namely a 'hexply' configuration for certain nanocomposites:

Suppose we consider the elastic stiffness tensor (a tensor of rank 4) for a cross-ply composite laminate. The effective point-group symmetry for it is $4/mmm$. Transverse isotropy does not exist for this tensor property because $r = 4$ for it and thus $N = r$, rather than $N > r$. To achieve the effective symmetry 'infinity by mm ' for the composite (necessary for transverse isotropy) we must design the composite such that N is greater than or equal to 5. The configuration with $N = 6$ (the so-called hexply) would be suitable and convenient to make. Similar considerations apply to the photoelastic tensor

also. A variety of nanocomposites are being designed these days for optical applications. If it is desired that a ply-configuration composite be not only optically uniaxial, but also possess transverse isotropy of photoelastic behaviour, then the hexply configuration is necessary. *Such a material would be free from vibration-induced fluctuations of tranverse birefringence.*



Complexity science is the next big thing in science, the final frontier. Conventional science, that is the science we have been doing so far, is generally about 'simple' or 'simplifiable' systems. Complexity science dares to study systems which just cannot be simplified so much that the reductionistic approach may work. Any attempt at modelling by making simplifying assumptions about a complex system destroys the very essence of the system. Clearly, new, unconventional approaches are needed, and most of the Indian scientists, true to character, usually shun anything unconventional and daring.

In fact, I find that most of them are complexity-science illiterate. Complexity science has determined my worldview. I have written about that in detail in one of my blog posts: ‘Complexity Science and My Worldview’ (Wadhawan 2014b). This post begins as follows: ‘We humans have a strong sense of self-awareness and we seek answers to questions like why the universe is what it is, why the laws of Nature are what they are, who created the universe, who created life, . . . etc. In this partly autobiographical article I describe how the science of complexity has given me the answers to such questions and moulded my worldview’.

13. THE POST-‘RETIREMENT’ YEARS (2011 - ?)

After my tenure as a Raja Ramanna Fellow at BARC was over (at the end of 2010), I have settled in Bengaluru, where my son and his family live.

Now I depend entirely on the Internet for all my academic activities. While the project for writing a college-level book on complexity science has been going on in the background, I have been quite active on my blog. I have written ~200 blog posts to date. This includes a series of 131 posts under the label ‘[Understanding Natural Phenomena](#)’. My goal here was to simplify complexity science, and explain how order can keep emerging out of disorder so long as there is a supply of free energy or negative entropy.

The response to my blog posts has shown me how easy it has become now to mentor a large number of people worldwide, all because of the Internet. To date there have been 127344 pageviews of my blog. A full 30% of them (the highest number) have been, not from India, but from the USA. This is what the high level of literacy can do to a country. The already literate get more literate at a faster rate.

14. THE IMPORTANCE OF SKEPTICISM AMONG SCIENTISTS

Society looks up to scientists for being opinion leaders when it comes to getting answers to the fundamental questions we humans ask about ourselves and about our universe. This includes the God question. Sadly, there are hardly any Indian scientists who are willing to stick their neck out and call a spade a spade. In fact, some of our senior scientists set very bad personal examples on such matters.

I was born in a deeply religious Hindu family. The childhood conditioning made me a religious person in the beginning. It was during the college years that I broke free and started questioning the basis of why one should believe in a God. I have given details elsewhere (Wadhawan 2014b), and I quote from that

post:

‘Many of us take it for granted that for every effect there must be a cause, and that *that* cause is the effect of a previous cause, and so on: Cause - effect - cause - effect - Is there (and can there be) an ultimate cause, the cause of all the ensuing effects? Many people are of the belief that ‘God’ is that ultimate and final cause, the ‘uncaused cause’.

‘But how can there be an uncaused cause? If you truly believe that God must be there because for every effect there must be a cause, then God also must be the effect of some still higher-level cause, and so on, *ad infinitum*. So, postulating the existence of God does not really help; it just pushes the ultimate question to ‘Who created God?’.

‘Suppose you say that one must stop somewhere in the reverse chain effect-cause-effect-cause-effect- . . . and then say finally that ‘I do not know who created God’. If you are willing to say that, then God becomes an unnecessary and therefore superfluous hypothesis: You may as well say that we do not know how the universe came into existence, why is there anything at all, why are the laws of Nature what they are, etc. In fact it turns out that modern science (particularly its somewhat new branch called ‘complexity science’) does have credible answers to these questions now.’

In the beginning I used to call myself an atheist and a rationalist. At some stage the label ‘humanist atheist’ seemed to describe me well. Then I realized that the term ‘freethinker’ would be even better.

Talking about humanists and atheists and freethinkers, the fact is that they come in a variety of hues and tendencies. For example, <http://nirmukta.com> promotes a rather militant form of freethought. Nirmukta was run by Ajita Kamal in the initial years; he died some time back. In fact, my debut on the Internet was through an article I wrote at Nirmukta.com (Wadhawan 2009a).

I found the Internet a very exciting platform for having one’s say. At Nirmukta the most widely read article I have written is the one co-authored with Ajita Kamal (Wadhawan & Kamal 2009b). It debunked biocentrism, and was quoted, among many others, by P. Z. Meyers at *Pharyngula*, and Steven Novella at *Neurologica*.

My interaction with Ajita Kamal was very fruitful. He pointed out to me that the typical attention span of the denizens of the Internet is not long, so one should avoid writing long articles on the Internet. He also induced me to write

a series of articles for Nirmukta (cf. Kamal 2010). I also became friends with Dr. Prabhakar Kamath during those days. He is a well-known psychiatrist and scholar, settled in the USA, and has recently written a very different kind of book on the Bhagwad Gita (Kamath 2013). He points out several inconsistencies among its *shlokas*, and gives his version of the reasons for these. I quote:

‘Around the middle of 3rd century B.C. loyalists of the Brahmanic Dharma created the *metaphoric parable* of Arjuna Vishada in reaction to (the) ascendance of Buddhism under Ashoka Maurya’s enthusiastic patronage (ruled 272-232 B.C.). Its goal was to shore up the sagging Varna Dharma, and prevent exodus of people, especially Kshatriyas, from Brahmanism to Buddhism. In fact, in this poetic parable, a grieving Ashoka on the battlefield of Kalinga (261 B.C.) was the model for a sorrowful Arjuna on the battlefield of Kurukshetra.

‘The central message to (the) renegade Kshatriyas in this story was that no matter how imperfect Brahmanism might be, one should not abandon it like (the) traitorous Ashoka and his cohorts did. Instead one must perform one’s socio-religiously designated duty (Svadharma) as dictated by the Varna Dharma resting on the doctrine of Guna/Karma.

‘Somewhat later, Upanishadists introduced their doctrines of Brahman and Yoga into the text in an effort to overthrow decaying Brahmanism, and to reform ritualist Brahmins and Kshatriyas into Jnanayogis and Karmayogis respectively. Predictably there was Brahmanic resurgence and backlash. At this point Bhagavatas entered the fray on the side of Upanishadists. They integrated the basic tenets of all Dharmas of India into the broad-based Bhagavata Dharma centred on *Lord Krishna alone*, introduced Bhaktiyoga as the alternative to all other modes of worship, and exhorted people to take refuge in Him alone.

‘This is how the 77 shloka-long Arjuna Vishada burgeoned to 701 shloka-long text known as the Bhagavad Gita-Upanishad. When the dust settled, Brahmanic editor(s) *hyper-edited* the text to integrate the three diverse doctrines, and to conceal evidence of conflict among them. This is how Hinduism rose like a Phoenix from the ashes of Brahmanism, and the Bhagavad Gita became its somewhat incoherent manifesto.’

The faithfuls are not amused with this kind of interpretation of the Gita but, I think, instead of attacking the credentials and motives of Dr. Kamath, they

should respect scepticism and come out with refutations based on facts and logic. Similarly, as I wrote in my reader-comments (on Flipkart), Dr. Kamath should also come out with more evidence to back his extraordinary, even provocative, views on the Gita.

Gradually my interest in Nirmukta faded. I felt that the people there tended to take a rather extreme stand on issues which are of a debatable nature. See, for example, the posts by Kamal (2009), Kakkalia (2009), Nayak (2010), and Veluswami (2012).

My own approach has been to be gentle when it comes to controversial issues, and make your point in small, incremental steps. This is best illustrated by the set of 131 posts I wrote on my blog (one every week) under the label 'Understanding Natural Phenomena' (cf. Wadhawan 2014c, and the references therein). These posts do promote freethought, but by using scientific facts and logic in an impersonal manner, befitting of any scientific discourse, and in small doses only.

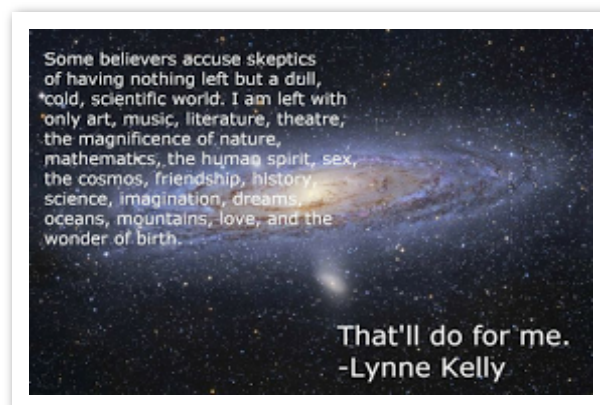
The debate on the God question is not likely to conclude anytime soon. Richard Dawkins (2006) spoke in terms of probabilities regarding the God question. According to him, on a scale of seven, if you are certain that there is no God, then you are a 7/7 atheist. He described himself as a 6/7 atheist in that book, but said in an interview later that he is a 6.9/7 atheist. I think this is a meaningless exercise. In any scientific discussion there should be, first of all, complete clarity and agreement on what each term used in the debate means. Suppose 'God' means the creator of everything (because of the assumption that there must be a cause for every effect). This 'God hypothesis', put forward under the assumption of the law of causality, is superfluous and unnecessary because, as I said above, it just shifts the fundamental question to 'Who created God?'. Richard Dawkins is making the mistake of assigning probabilities for the validity or correctness of a hypothesis which is not only unnecessary, but also self-contradictory; self-contradictory because it assumes the validity of the causality principle and then negates the principle by saying that God has no cause. Victor Stenger described it as 'a failed hypothesis' (Stenger 2007).

In my view, all that we have is Nature, and we are a part of it. A person with a scientific perspective, with no allegiances to any organized religion, has a tremendous sense of freedom, as also awe as to how wondrous natural phenomena are. One feels happy and elated at being a part of this universe. The term '*scientific pantheism*' is apt for this approach to life (Harrison

1999/2013), and I am a scientific pantheist minus the reverence part of it. [It is necessary to add the adjective 'scientific' because a lot of nonsensical mumbo jumbo went by the name 'pantheism' before the ascendance of the scientific method for understanding natural phenomena. Scientific pantheism is completely in consonance with the tenets of the scientific method.]

There are three main types of scientific pantheism (Harrison 1999/2013): *Dualist pantheism* ('spirit and matter are two completely different substances, and the soul is to some extent separate from the body and can survive the death of the body'); *physicalist pantheism* ('there is only one fundamental substance, namely matter/energy, and mind is a property of matter'); and *idealist pantheism* ('the one basic substance is mind or consciousness, and matter is simply a creation or delusion of mind'). I am a physicalist scientific-pantheist. I am one with Nature, and everything wondrous and beautiful in it is available to me to admire, explore, and try to protect.

So, I have evolved from being a believer, to being a humanist-atheist-rationalist-freethinker, to, finally, a scientific pantheist of the physicalist variety.



I quote M. Karyn of the World Pantheist Movement : 'For me, calling the Universe "god" does not accurately convey my experience of it. Rather than making the Universe my god, I prefer to view my experience as one of having gone beyond the god-oriented paradigm, from "having a god" to embracing something more elemental and profound: Life Itself, the Cosmos Itself, as an ever-changing tapestry in which I am one thread contributing to the living pattern'.



(<https://www.facebook.com/Pantheism/photos/a.96049621080.111440.89590536080/10154610353306081/?type=3&theater>)

15. WHAT'S WRONG WITH INDIAN SCIENCE?

Plenty.

15.1 The science academies of India

The science academies of India are good in patches. There are a large number of great Indian scientists who are deservedly Fellows of these academies. But then there are those who are too mediocre to deserve to be Fellows of these academies. How did they get in?

I am not a Fellow of any of these academies. This is a reflection, not on me, but on the academies, and is one example of what is wrong with Indian science. My nomination was first filed for a Fellowship of the Indian National Science Academy (INSA), Delhi. Not successful. The name was sent again. Not successful again. Once I happened to be having a chat with one of the ex-Presidents of INSA, and mentioned to him about this. His comment was typical of what only a true-blood Punjabi from Delhi can say so candidly. He said that one has to keep licking the boots of the captains of Indian science till the job is done. That reminded me of how I have been describing this malaise in Indian science: 'One must not only wag one's tail when the Boss is around, one must also wag it vigorously enough; and wag it even when he is not around'!

I was also nominated for a Fellowship of the Indian Academy of Sciences (IAS), Bengaluru. This time the big boss happened to be sitting in the final committee meeting. Negative.

Much later, Dr. S. K. Sikka sent my papers to an academy whose name I forget except that it is based in Allahabad. No success again. Dr. Sikka wanted to send my papers again next year, but I declined. I wrote to him: 'Thank you very much, but I gave one chance to the academy to elect me and they have

failed. I am not giving them a second chance’.

There is something called intellectual corruption, and the science academies of India are guilty of that to a substantial extent; or perhaps their value system is not what it should be; or both. The stranglehold of the big bosses is a curse we have to tackle if Indian science is to do better, much better. On the face of it, there is a democratic process wherein the existing Fellows elect new Fellows. But the glaring mistakes tell a sordid story of their own (continued below). The whole thing appears to be both intellectually corrupt and conceptually defective, and not inclusive enough.

15.2 Recognition of good science in India

Science in India is not run by the best of scientists. In my bitter moments I say sometimes that in Indian science the place at the top is not for gentlemen. A kind of political ferocity, even street-smartness, is needed for the jobs where people decide the fate of Indian science. The system is not able to send the best scientists to the top (of course, there are some honourable exceptions to this). And the system is self-perpetuating.

The requisite ‘qualification’ for the Fellowship of the science academies is only one of the manifestations of the malaise. Another is the mistakes committed (usually for personal rather than professional reasons) in the

assessment of the worth of scientists. This is best exemplified by the case of Dr. [Abhas Mitra](#) of BARC, who retired recently on superannuation.

Mitra (1991, 1996, 2010, 2014) took on Stephen Hawking, no less, by showing that a general-relativistic collapse should lead to *quasi*-black holes rather than true black holes, and that these so-called black holes are more likely to be ultra-magnetized, ultra-compact, ultra-hot balls of fire / plasma. Recent NASA observations apparently corroborate his research that the so-called black holes are only approximate black holes, from which matter and energy *can* escape.

He has coined two basic terms in astrophysics: Eternally collapsing object (ECO), and Einstein-Eddington time scale of contraction of self-gravitating objects.

Mitra’s research has spanned a wide range of activities: Gamma-ray astronomy, X-ray binaries and millisecond pulsars, cosmic gamma-ray bursts, diffusive shock acceleration, general relativity, gravitational collapse, various aspects of cosmology, and classical mechanics.

One would expect that a scientist of that calibre and range would get his due share of appreciation and honours from his peers in India. Not so. He retired as just a Section Head in BARC, and not a Division Head or a Group Director. After retirement he just went home. No extension of service, no Raja Ramanna Fellowship for him. Nothing. [Of course he continues to be active professionally, from home.]

To get my facts right while writing this article, I asked him whether he is a Fellow of any of the Indian science academies. He said 'None'. He was nominated, but did not find enough support. He thinks that in 99% of the cases it is a matter of 'match fixing'.

He went on to tell me about a very senior and one of the most successful general-relativists of India: Prof. K. D. Krori. Like Mitra, Prof. Krori is also a self-taught general-relativist, who also introduced GR to North-East India. He retired as Principal of the well-known Cotton College, Guwahati, and had guided the Ph. D. work of ~18 students, and has ~115 papers in PR, PRL, Can. J. Phys., J. Math. Phys., JPhyA, CQG and many others. He is famous for *the Krori-Barua solution* ('A singularity-free solution for a charged fluid sphere in general relativity'). But he remained outside the 'network', the tribe of relativists led by Narlikar, Dadhich etc. 'They completely ignored him, partly because he is a simple straightforward unassuming person'. He is 84 now, still writing books and articles. He is not a Fellow of any of the Indian science academies.

Abhas Mitra has his version of who were the senior scientists in BARC who did him in. But I shall speak here from first-hand knowledge about one of them. He was the 'seniormost physicist of the DAE' (his own phrase) in those days, so there was no question of anybody bypassing or overruling him when it came to deciding about the merits of Abhas's work. And he was not impressed. I suggested to him (during my tenure as a Raja Ramanna Fellow at BARC) that Abhas should be asked to give a public lecture ('Trombay Colloquium') about his work, and some experts could be invited to the lecture for a professional review in an open manner. That was not done.

There is a larger question here: Was he the only culprit? He is a theoretical physicist but not an astrophysicist or a cosmologist, and in this age of ultra-specialization the bosses have to depend on the opinions of experts about the worth of any piece of research work. So what have the experts in India been saying about Abhas's work? Nothing.

Here is an excerpt from a Facebook chat I had with Abhas:

VKW: Abhas, I am only a materials scientist, with absolutely no pretensions to being a theoretician. But what amazes me is that even an expert like Jayant Narlikar said nothing about your work in an article he wrote for Physics News (IPA), December 2014 issue. This amounts to shirking responsibility. People like him should either admire you for your work, or tell laypersons like me as to what they think is wrong in it.

AM: JVN is a strange case, yet he has much more integrity than many (other) Indian “scholars/researchers”. Personally, he does not believe in BHs (black holes), he has even some papers on it. But in public as far as BH is concerned he is with the mainstream. I am in touch with him since 1999, he is aware of all my peer reviewed papers, but his attitude here may be why take panga with Hawking & the world for the sake of an unknown BARC physicist. He is against mainstream as far (as) cosmology is concerned as his 99% stake is in Cosmology: “It is shown that inconsistencies arise when we look upon the Schwarzschild solution as the space-time arising from a localized point singularity. The notion of black holes is critically examined, and it is argued that, since black hole formation never takes place within the past light cone of a typical external observer, the discussion of physical behaviour of black holes, classical or quantum, is only of academic interest. It is suggested that problems related to the source could be avoided if the event horizon did not form and that the universe only contained quasi-blackholes”.

The above quote is from [Narlikar & Padmanabhan \(1988\)](#). Abhas Mitra is being rather mild on Narlikar, but he is very harsh on [Padmanabhan](#).

Here is more on Abhas Mitra, this time from an article [Is Cosmology in Crisis? \(2014\)](#):

‘You have an Indian Scientist named Abhas Mitra who challenged Stephen Hawking on Black Holes and was basically looked at as a kook. Hawking recently came out and essentially agreed with Mitra in part.

‘An Indian theoretical physicist who questioned the existence of black holes and thereby challenged Stephen Hawking of Britain at last feels vindicated. But he is sad.

‘Abhas Mitra, at the Bhabha Atomic Research Centre (BARC) in Mumbai, was perhaps the first and the only scientist who had the guts to openly challenge

Hawking of Cambridge University who is regarded by many as the modern-day Einstein.

‘For over 30 years Hawking and his followers were perpetuating the theory that black holes -- resulting from gravitational collapse of massive stars -- destroy everything that falls into them preventing even light or information to escape.

‘Mitra, four years ago, in a controversial paper in the reputed journal, Foundations of Physics Letters, showed that Hawking's theory was flawed. He proved black holes couldn't exist because their formation and existence flouted Einstein's general theory of relativity. Except a handful, the majority of mainstream scientists dismissed Mitra's conclusions even though, till now, no scientist has contradicted him in writing. Mitra invited several notable black hole theorists including Hawking and Jayant Narlikar of India to criticise his work but no one replied.

‘Naturally, Mitra now feels vindicated following Hawking's own admission two weeks ago at a conference in Dublin, Ireland, that there isn't a black hole "in the absolute sense."

‘In essence, Hawking's "new" black holes never quite become the kind that gobble up everything. Instead, they keep emitting radiation for a long time -- exactly what Mitra showed in his paper.

‘Hawking's about-turn has vindicated Mitra. But, in retrospect, he feels sad about the treatment he got at home while trying to take on Hawking all by himself.

‘Too "embarrassed" to be associated with a man who challenged Hawking, even Mitra's close colleagues avoided him and he became an outcast. To add insult to injury, BARC authorities removed Mitra from the theoretical physics division on the excuse that this division was meant only for those doing "strategic research."

‘This guy has an interesting take on these things. Here's more about him from Wiki: “Though Mitra stresses that the “Black Hole” solutions are correct, his contention is that Black Hole masses, arising from relevant integration constants, are actually zero. His peer reviewed paper published in Journal of Mathematical Physics of the American Institute of Physics supports this contention by showing that Schwarzschild black holes have $M = 0$. [27] If so, (i) The so-called massive Black Hole Candidates (BHCs) must be quasi-black holes

rather than exact black holes and (ii) During preceding gravitational collapse, entire mass energy and angular momentum of the collapsing objects must be radiated away before formation of exact mathematical black holes. And since the formation of a mathematical zero mass black hole requires infinite proper time, continued gravitational collapse becomes eternal, and the so-called black hole candidates must be Eternally Collapsing Objects (ECO). [28][29][30][31] Mitra's peer reviewed papers describe why continued physical gravitational collapse should lead to formation of ECOs rather than true black holes, and the mathematical "black hole" states can be achieved only asymptotically. [32][33][34][35][36] An ECO is essentially a quasi-stable ultra-compact ball of fire (plasma) which is so hot due to preceding gravitational contraction that its outward radiation pressure balances its inward pull of gravity. Some American astrophysicists [37][38][39][40][41] claimed to have verified this prediction that astrophysical Black Hole Candidates are actually ECOs rather than true mathematical black holes. The corresponding Harvard University Press Release [42] acknowledges Mitra's original contribution in this context.'

The treatment meted out to Mahatma Kalam is another blot in the history of Indian Science and Technology when it comes to honouring talent. The bankruptcy of thought that the Indian Institute of Science (IISc), Bengaluru, displayed when it came to valuing his work is well known. Even INSA had **rejected** his nomination for a Fellowship in the late 1980s, saying that the work quoted (the success of the SLV-3) involved a whole team, implying that his own contribution was not good enough by INSA's criteria. Something is wrong, seriously wrong. There is no place for honouring team leadership in the value system of our science academies.

Creative and original scientists are likely to be nonconformists and irrepressible by temperament. Our system does not allow them to flourish easily. They have to count on recognition from abroad for survival. And many of them just leave the country. Whose loss is that?

15.3 The kind of work the Indian theoreticians do

India is a poor country. We do have the potential to become a very rich and strong country, but we all will have to do our bit if the country is to realize that potential. This applies to everybody, the theoreticians of India included. Take a look at the kind of research papers they publish, and there will be shocks galore.

Even by a very liberal yardstick, not more than 10% of the Indian theoreticians

come close to being genuinely original and important in their research work. To this 10% I want to give a blank cheque, in the sense that we should let them pursue whatever interests them, nurture them, and make them feel important and wanted and appreciated (academy Fellowships, awards, all that).

What about the other 90%? It is not as if they have not been trying to do their best when it comes to originality and importance. The hard fact is that they are just not capable of that. Society must insist that if they cannot be excellent and original, they may as well be useful. They **MUST** spend at least 50% of their time and energy on research problems with a clear end-application specified by the funding agencies. They must do 'targeted basic studies', as Bob Newnham would put it. Instead of letting them do mainly what they *can* do, they must also be told what they *should* be doing. My country needs more Bob Newnhams.

It is sometimes argued that these theoreticians justify their upkeep by doing a lot of teaching work also. Yes, they do, but they only end up creating more clones of themselves. A teacher is always a kind of role model for his students. Only a Bob Newnham kind of teacher can set the right example of what kind of research should be pursued. We have to create conditions in which more Bob Newnhams can flourish in India. The present value system is just not up to it.

15.4 Instrumentation for research

India is importing just about all the major equipment needed for doing research in science, and that's a shame. The DAE culture *has* encouraged instrumentation work, but somehow that last-mile problem remains to be tackled in many cases. A certain kind of corruption is at work sometimes, as exemplified by the work of a scientist at BARC who spent many years perfecting the technology for constructing an argon-ion laser. He was in tears talking to me about the fate of his work, narrating how his boss had scuttled the whole thing because he wanted to import the laser. Why? Because the purchase involved travel by the boss to a foreign country for inspection and training, all expenses paid by the seller!

A similar story can be told about how the project for developing an X-ray generator was abandoned.

Nevertheless the DAE has done remarkably well in achieving self-reliance in the technology of nuclear power production. The entire cycle from mining to nuclear-waste disposal has been mastered, a great achievement indeed.

Another success story is that of our space programme. Big technology-development projects require team work, and that requires great team leaders. Our Department of Space (DOS) has had plenty of them: Satish Dhawan, Mahatma Kalam, and, more recently, Radhakrishnan.

The value system of a society determines what flourishes in it. We have to learn to value instrumentation and technology-development work if we are to make progress in that direction. Look at what China has been able to achieve in this regard.

Consider two scientists of similar calibre. One manages to get to use the best of imported equipment for his work, publishes his work, gets recognition for his work from the science academies of India, as also other awards. He has done well for himself, fast promotions and all that. Has the country benefited? Yes, if he is a truly original and creative scientist and his work increases the esteem of the country on the international scene. And no if his work lacks originality and relevance.

The other scientist has a more evolved sense of duty towards the country. He spends a lot of time and energy in building a major instrument needed for scientific research, and then uses it for doing his research. He clearly has a handicap or two. Unless there is system in place so that a government agency, say a National Instrumentation Corporation (non-existent at present) helps him in developing a world-class instrument from what he has done so far, he really does not have much motivation for working like this as a scientist. Add to this

the constipated value system of our science academies, which usually go by the number of publications in 'reputed' journals for deciding on Fellowships, awards etc., and you have a perfect recipe for a crippled career. This must change. There is so much emphasis these days on skill development, as also on 'Make in India'. Let us provide all it takes to do first-rate instrumentation work in India, taking the work all the way to the refinement and commercialization stage.

Let us also learn to honour our scientists who do technology-development work. Let us get our value system right. I want to recall here my experiences at CAT Indore where, among other things, I had to start from scratch and set up a laboratory for growing crystals needed for our laser programme. Apart from getting funds sanctioned for a new building and for buying some basic equipment, etc., I had to recruit scientists, usually with a Ph.D. in crystal growth. The recruitment was done by a committee, of which I was naturally a

member, which interviewed the candidates. This interview process was something the selected persons had a face every few years when I put up their cases for promotion to the next higher grade. More often than not, the problem I faced as a 'Divisional Representative' was that, even when the person had proved his credentials as a good crystal grower, his mastery over physics and chemistry etc. happened to be somewhat poor, and I had a tough time arguing with the committee that he should be given the promotion. The prevailing value system, by and large, does not value skill adequately, and it is considered more important that the person has strong 'fundamentals', even where the fundamentals are not critically relevant for the job at hand.

Coming to the question of publications by crystal growers, I am reminded of the days when the Journal of Crystal Growth (JCG) was started. At that time one of the reasons advanced for starting a new journal was that, keeping in view the nature of this R&D activity, it is necessary to have a publication platform that has different criteria for accepting a manuscript than, say, Physical Review. In fact, it is for such reasons that a large number of theme journals have mushroomed.

Generally speaking, a society gets what it values most.

16. INCULCATION OF SCIENTIFIC TEMPER IN SOCIETY

Indian science must be able to attract the best of talent. One requisite for that is to convey to the young people in an effective manner the joy of doing science. The government effort so far has been dismal. There is a large programme called Vigyan Prasar under the Department of Science &

Technology (DST). A couple of years ago they organised a conference in Delhi which dealt with what it would take to increase the prevalence of scientific temper in the country, and I was a speaker there. During my interactions with the participants and the officials I noticed that there is hardly any involvement of scientists with a proven record of promoting scientific temper with the activities of Vigyan Prasar.

Another problem with science in India is that there is a dearth of good science writers and journalists who can make science really interesting to the lay public.

After the conference some of us were invited to a meeting with the Vice President of India. He is the Chairman of the Rajya Sabha, and also of Rajya Sabha TV (RSTV). He heard us in detail about what more can be done to make the science-related programmes of the RSTV more effective in spreading the

culture of scientific temper. I made some suggestions and have, since then, incorporated them in a comprehensive blog post entitled '*Science, Scientists and Scientific Temper in Society*' (Wadhawan 2014a). This post also includes much of the material I presented in my conference lecture. Here are some excerpts:

'Scientific temper is all about applying the scientific method, not only when doing science in the laboratory, but in everything we do or think about. Scientists can play a major role here by striving to be the role models of rationality for society.

'But even if all the scientists did this conscientiously, there would still be a major hurdle in the way of promoting scientific temper in society. Natural phenomena are governed by the highly counter-intuitive laws of quantum mechanics, and we cannot expect everybody to master quantum field theory for appreciating how, for example, our universe arose out of nothing, i.e. without the intervention of a God or a Creator. Similarly, it is not easy to explain complexity science to one and all. But such problems can be tackled by proper parenting and education of children, as I explain next.

'Minds of young children are strongly influenced by what they learn from their parents (and teachers). Parents should aim at creating conditions in the family in which the child can grow to become an *independent* thinker. Every child should get exposure to all streams of thought before making a choice.

'If a child learns to have full confidence in science and the scientific method, he will not waste energy and time fighting what science has to say. Instead, he will take even the counter-intuitive quantum mechanics for granted, all the time fully assured of the fact that there is nothing dogmatic about the concepts and theories of science, and that even the most cherished ideas can be abandoned if the new evidence so demands.'

'Children learn not only from parents, but also from their school teachers. It is imperative that teachers should be role models of scientific temper. That calls for a very strict process of selection of teachers. And that, in turn, can happen only if even the selectors of teachers are selected carefully.

'School teaching is a vitally important activity. Conditions have to be created so that the finest available brains are attracted to this profession. Why is it that a university teacher has a higher prestige and salary than a school teacher? We have to set our priorities right.

‘Familiarity with, and caution against, the huge repertoire of logical fallacies can fire the imagination of children, and can make them instinctively look for any lack of logic, not only in the reasoning of others, but also their own. A society in which even children are adept at pointing out logical fallacies in whatever they hear or read would hardly need any additional measures for spreading the culture of scientific temper. Needless to say, scientific temper and felicity with logic must be supplemented with a humanistic outlook, as also a deep concern and love for Mother Earth.’

‘In India a peculiar situation prevails at present. An enormous amount of superstitious and other irrational sermonizing is occurring on television. This has a disastrous effect on young impressionable minds, and there is no legal remedy available for tackling it.

‘We as a nation are very fond of saying that truth prevails ultimately (*satyamev jayate*). But very often, by the time truth prevails, a lot of irreversible damage has occurred already. In any case, in real-life situations, *truth is seldom relevant*, and what really matters generally is the *perception* of truth by the various interacting individuals. It hardly requires any intelligence to have faith in something, whereas understanding of scientific facts can often be a daunting task for the public at large. Therefore it is necessary to curtail superstition propaganda occurring in the name of freedom of speech and freedom of religion.’

‘Under the Indian Constitution, promotion of scientific temper is a *duty* (a fundamental duty), whereas the freedom to carry out (and even promote) religious practices is a matter of *right* (fundamental right). This is an unequal

fight between what is logical and rational and what is illogical and irrational. We should amend the Constitution so that *irreligion* (which is the absence or antithesis of religion), backed by the scientific method, gets the same status and *rights* as the organized religions. If this is done, citizens would have the right to legally and successfully object to any public propaganda or sermons that make it difficult for them to promote scientific temper in society. Religious practices should be largely confined to the privacy of one's home, and should under no circumstances trample upon the rights of others who want to give their children the freedom to grow as freethinkers.’

Scientists must teach and inspire by personal example. Their lives must be role models of all that is noble, objective, and rational in their profession. A particularly good example of what I mean is the life and work of Stenger

(2007/2010). Inspired by him, I have tried to emulate his way of living so that I can say with some satisfaction that MY LIFE IN MY MESSAGE.



[Buddha at peace with the world!]

REFERENCES

Aizu, K. (1970). *Phys. Rev. B*, 2, 754.

Bhagwat, K. V., R. Subramanian & V. K. Wadhawan (1983). 'Ferroacoustogyrotropy'. *Phase Transitions*, 4, 19.

Bhagwat, K. V., V. K. Wadhawan & R. Subramanian (1986). 'A New Fourth-Rank Tensor For Describing The Acoustical Activity Of Crystals'. *J. Phys. C*, 19, 345-357.

Dennett, D (1995). *Darwin's Dangerous Idea: Evolution and the Meanings of Life*. Penguin Books, London.

Dawkins, R. (2006). *The God Delusion*, revised and updated paperback edition. A Black Swan book: [9780552774291](#).

Glazer, A. M & K. Roleder (2010). 'Professor Vinod Wadhawan'. *Phase Transitions*, 83, 655.

Gupta, V. P. & M. Gupta (Eds.) (1999). *An Encyclopaedia of Punjabi Culture and History*. Ambe Books, Delhi.

Harrison, P. (1999/2013). *Elements of Pantheism: A Spirituality of Nature and the Universe*, 3rd edition. First edition published in 1999 by Element Books, Shaftesbury, Dorset. Third edition © Paul Harrison 2013.

Hawking, S. and L. Mlodinow (2010). *The Grand Design: New Answers to the Ultimate Questions of Life*. Bantam Press, London.

Kakkaliya, S. (2009). <http://nirmukta.com/2009/01/24/do-we-need-yoga/>.

Konak, C, V. Kopsky & F. Smutny (1978). *J. Phys. C*, 11, 2493.

Krauss, L. M. (2012). *A Universe from Nothing: Why There is Something Rather Than Nothing*. Free Press, New York.

Kurzweil, R. (2012). *How to Create a Mind: The Secret of Human Thought Revealed*. Penguin Books, New York.

Kamal, A. (2009). <http://nirmukta.com/2009/11/28/is-hindu-atheism-valid-a-rationalist-critique-of-the-hindu-identity-usurpation-of-indian-culture/>

Kamal, K. (2010). <http://nirmukta.com/vinod-kumar-wadhawan/>

Kamath, K. P. S. (2013). *The Untold Story of the Bhagavad Gita: Revealing the True Intent and Spirit of the Bhagavad Gita in its Historical Context*. ISBN 978935126892. Self-published.

Kelly, K. (1994). *Out of Control: The New Biology of Machines, Social Systems, and the Economic World*. Perseus Books, Cambridge.

Laughner, J. W., V. K. Wadhawan & R. E. Newnham (1981). 'Studies of quartz as a secondary ferroic'. *Ferroelectrics*, 36, 439.

Litvin, D. B. & V. K. Wadhawan (2001). 'Latent Symmetry and its Group-Theoretical Determination'. *Acta Cryst.*, A57, 435-441.

Litvin, D. B., & V. K. Wadhawan (2002). 'Latent Symmetry.' *Acta Cryst. A*, A58, 75-76.

Litvin, D. B., V. K. Wadhawan & D. M. Hatch (2003). 'Latent symmetry and domain-average-engineered ferroics.' *Ferroelectrics* (2003), 292, 65-70.

Litvin, D. B. (2010). 'Ferroic crystals and tensor distinction'. *Phase Transitions*, 83, 682.

Mitra, A. (1991). 'Problems of ultra-high-energy particle acceleration in Cygnus X-3 - A critical reappraisal'. *Astrophysical Journal*, 370, 345.

Mitra, A. (1996). 'Do fireballs in the interstellar medium necessarily imply

blast wave propagation?'. *Astronomy and Astrophysics*, 313, L9.

Mitra, A. & N.K. Glendenning (2010). 'Likely formation of general relativistic radiation pressure supported stars or "eternally collapsing objects"'. *Monthly Notices of the Royal Astronomical Society Letters*, 404, L50.

Mitra, A. (2014). 'Why the $R_h = ct$ cosmology is a vacuum solution in disguise and why all big bang models should be so'. *Monthly Notices of the Royal Astronomical Society*, 442, 382.

<http://mnras.oxfordjournals.org/content/442/1/382>

Nayak, N. (2010). <http://nirmukta.com/2010/08/30/why-alternative-medicine-is-neither-science-based-nor-medicine/>

Nehru, J. (1946/2004). *The Discovery of India*. Penguin Books India, Delhi (the 2004 edition).

Newnham, R. E. (1999). 'Ceramics into the next millennium'. *British Ceramic Transactions*, 98, 251.

Pond, R. C. & D. S. Vlachavas (1983). *Proc. R. Soc. London A*, 386, 95.

Pragya Pandit, S. M. Gupta and V. K. Wadhawan (2006). 'Effect of electric field on the shape-memory effect in PMN-PT(70/30) ceramic'. *Smart Materials & Structures*, 15, 653-658.

Shubnikov, A. V. & V. A. Koptsik (1974). *Symmetry in Science and Art*. Plenum Press, New York.

Somayazulu, M. S., S. M. D. Rao & V. K. Wadhawan (1989). 'Direct Observation of Ferroelastic Reorientation in Single Crystals of the Superconductor Y-Ba-Cu-O'. *Mat. Res. Bull.*, 24, 795-802.

Srinivasan, M. & A. Meulenberg (February 2015), Guest Editors. Special section on *Low Energy Nuclear Reactions*, *Current Science*, 108 (4).

<http://coldfusionnow.org/tag/mahadeva-srinivasan/>

<http://coldfusionnow.org/special-lenr-issue-of-current-science-available-now/>

Stenger, V. J. (2007/2010). *God: The Failed Hypothesis: How Science Shows That God Does Not Exist*. Paperback edition published by Prometheus Books in 2010.

Tiwari, R. & V. K. Wadhawan (1991). 'Shape-Memory Effect in The Y-Ba-Cu-O Ceramic'. *Phase Transitions*, 35, 47-59.

Veluswami, G. (2012). <http://nirmukta.com/2012/03/17/a-response-to-dr-b-m-hegde/>

Vlachvas, D. S. (1984). *Acta Cryst. A*, 40, 213.

Wadhawan, V. K. & S. K. Sikka (1976). 'Diacetyltylophorinidine methiodide'. *Acta Cryst.*, B32, 3304.

Wadhawan, V. K. (1978). 'Ferroelastic effect in orthoboric acid'. *Mater. Res. Bull.*, 13, 1-8.

Wadhawan, V. K. (1979). 'Gyrotropy: An implicit form of ferroicity'. *Acta Cryst. A*, 35, 629.

Wadhawan, V. K. & A. M. Glazer (1981). 'Evidence for a tricritical point in the ferroelastic solid-solution series lead phosphate-vanadate'. *Phase Transitions*, 2, 75-84.

Wadhawan, V. K., M. C. Kernion, T. Kimura & R. E. Newnham (1981). 'The Shape-Memory Effect in PLZT Ceramics'. *Ferroelectrics*, 37, 575-578.

Wadhawan, V. K. (1982). 'Ferroelasticity and Related Properties of Crystals'. *Phase Transitions*, 3, 3-103.

Wadhawan, V. K. (1987). 'The generalized Curie principle, the Hermann theorem, and the symmetry of macroscopic tensor properties of composites'. *Materials Research Bulletin*, 22, 651.

Wadhawan, V. K. (1988). 'Epitaxy and Disorientations in the Ferroelastic Superconductor $\text{YBa}_2\text{Cu}_3\text{O}_{7-x}$ '. *Phys. Rev. B* (1988), 38, 8936-8939.

Wadhawan, V. K. (1997). 'A Tensor Classification of Twinning In Crystals'. *Acta Cryst.* (1997), A53, 546-555.

Wadhawan, V. K. (2000), *Introduction to Ferroic Materials*, Gordon & Breach, Amsterdam.

Wadhawan, V. K., P. Pandit & S. M. Gupta (2005). 'Relaxor ferroelectrics as very smart materials'. *Mater. Sci. & Engg. B* (2005), 120, 199-205.

Wadhawan, V. K. (2007). *Smart Structures: Blurring the Distinction Between*

the Living and the Nonliving. Oxford University Press, Oxford.

Wadhawan, V. K. (2009a). <http://nirmukta.com/2009/07/26/a-scientific-view-of-the-god-delusion/>

Wadhawan, V. K. & A. Kamal (2009b).

<http://nirmukta.com/2009/12/14/biocentrism-demystified-a-response-to-deepak-chopra-and-robert-lanzas-notion-of-a-conscious-universe/>

Wadhawan, V K (2010). *Complexity Science: Tackling the Difficult Questions We Ask about Ourselves and about Our Universe*. LAP Lambert Academic Publishing, Saarbrücken.

Wadhawan, V. K. (2011/2014). *Latent, Manifest, and Broken Symmetry: A Bottom-up Approach to Symmetry, with Implications for Complex Networks*. Printed by CreateSpace, Charleston, SC, USA, ISBN 9781463766719

Wadhawan, V. K. (2014a).

<http://vinodwadhawan.blogspot.in/2014/05/science-scientists-and-scientific.html>

Wadhawan, V. K. (2014b).

<http://vinodwadhawan.blogspot.in/2014/11/complexity-science-and-my-worldview.html>

Wadhawan, V. K. (2014c).

<http://vinodwadhawan.blogspot.in/2014/04/127-understanding-natural-phenomena.html>

Wood, I. G., V. K. Wadhawan & A. M. Glazer (1980). 'Temperature dependence of spontaneous birefringence in ferroelastic lead orthophosphate'. *J. Phys. C*, 13, 5155-5164.

Vinod Wadhawan at 8:30 AM

Share



1



Add a comment

Top comments

**Vinod Wadhawan** via Google+

5 months ago

Shared publicly

**DOING SCIENCE IN INDIA. A PERSONAL NARRATIVE
(Part 3 of 3)**

12. AT

B.A.R.C. AGAIN, AS RAJA RAMANNA FELLOW (2005-

[Read more](#)[Home](#)[View web version](#)

About me

**G+ Vinod Wadhawan****G+ Follow**

143

I am a condensed-matter physicist. For the last few years I have been active spreading **the message of science and the scientific method**. In this context I have written over 30 articles at [Nirmukta.com](#). I am listed as an '**Enthusiastic Bright**' at the Brights Net.

Books written

1. **Introduction to Ferroic Materials** (2000)
2. **Smart Structures** (2007)
3. **Complexity Science** (2010)
- 3a. **Nauka złożoności. Trudne pytania, które zadajemy o sobie i o naszym Wszechświecie** (2010)
(Polish version of Book No. 3. Translation by Malgorzata Koraszewska.)
4. **Latent, Manifest, and Broken Symmetry** (2011)

I did editing work for the journal *Phase Transitions* (Taylor & Francis, U.K.) for 25 years, and took voluntary retirement from the task of **Associate Editor** in 2010.

WebRep

Overall rating

