

The quality of scientific journals published in India — some random thoughts

S. Ramaseshan

Introduction

If one were to conduct a survey amongst the scientists of our country who publish regularly asking for their views on the quality of our scientific journals, I have no doubt that more than 90–95% will say that our journals are in a bad state. We shall today examine whether our journals are truly so, and, if they are, whether we should take steps to put them out of their misery.

We have been told by earlier speakers that India has about two thousand scientific journals! Like doctors, we in India have a tendency to be preoccupied with the sick and not with the healthy; the sicker a person, an organization or a factory, the greater is our enthusiasm to revive them or resuscitate them. Today I shall talk only about our better journals (*about 20*) and leave the sick ones to be tended by others.

Why do our scientists prefer to publish in foreign journals

Let us first see why our (younger) scientists are reluctant to publish in Indian journals and prefer to send their papers abroad. According to them:

(i) All the senior scientists who sit on appointments and promotion committees are convinced that the quality of papers published in foreign journals is much better and more significant than those published in India. Many of these senior scientists frankly admit that since they neither have the time nor the inclination to read all the papers submitted by many candidates, they use an easier (and what they think to be the best) formula that the number of papers an Indian scientist publishes in foreign journals gives a measure of his scientific competence.

(ii) Most scientists in India feel that the quality of scientific journals published abroad is of a high order and therefore they would like their better papers to appear in western journals.

(iii) They would like to send their better papers to foreign journals because they would like to get a wider 'audience'.

(iv) Some are keen to know whether their work is really good or not; and since they feel that refereeing in foreign journals is much better, they send their papers to them.

(v) Most Indian journals are not specialist journals. Publishing in any good specialist journal abroad makes a scientist feel that he has become a part of an international coterie of specialists, and this definitely is a boost to his morale.

We have to take all these arguments seriously and examine them carefully.

Since I have been associated with Indian scientific publication over many years, I would like to state my personal position about our scientists publishing papers in our journals. *I am opposed to forcing young scientists (or for that matter older ones) to publish in Indian journals as I feel such constraints may affect the quality of science they produce.*

Our journals and the standards of refereeing in them

Some of the attributes of a good journal are: (i) Punctuality of appearance; (ii) quality of production, printing, paper, cover design, etc.; (iii) a good international circulation; (iv) quality of refereeing, and (v) quality of scientific papers that appear in it.

As regards (i) and (ii) one can assert that (a) most of our better journals appear fairly punctually; (b) the printing is quite satisfactory with no serious printing mistakes; the covers are quite attractive; in short they are produced quite well. In this we have come a long way during the last 25 to 30 years. The circulation of our journals is still poor but most of our better journals are indexed in *Current Contents* and get abstracted in the good international abstracting journals.

Regarding the refereeing, my personal view is that there are certain journals like *Physical Review Letters* and *Science*, where the refereeing standards are very high and it should be our aim to raise the quality of our refereeing to these levels.

However, this is not true of most of the foreign journals. Complete nonsense can and does get published in many of these. This is applicable even to those which

S. Ramaseshan is Professor-Emeritus, Raman Research Institute, Bangalore 560 080, India

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have a high reputation in India like *Physical Review*—a journal *non pareil* in the thirties. Papers in this journal now-a-days do contain serious errors and even blunders. Only about 15% are very good or excellent, and the rest would be in the range between mediocre and good.

As regards (iv) above one must agree that the comments made by referees of many reputed foreign journals are critical and often are of much use to authors.

It is common practice for the editor of publications of the Indian Academy of Sciences to write to senior scientists (in India and abroad) to get their views as to how the Academy journals are faring. To give you a flavour I shall quote from replies received from some distinguished astronomers in regard to one of our journals—*Journal of Astrophysics and Astronomy (JAA)*.

“We find the standard entirely satisfactory in respect of contents, appearance and editorial handling.

“The production can compare with that of any international journal.

“I do always read *Journal of Astrophysics and Astronomy*. I cannot see any paper in it that I would not have accepted in *Astrophysical Journal (ApJ)*.

“I am quite familiar with *Journal of Astrophysics and Astronomy*. In fact, I have been publishing in it... I feel I encountered perhaps the most difficult referees I had to deal with in this journal.

“Concerning your question about the general level of papers in *JAA*, it is my opinion that the level is quite good by international standards. Not much different from *Astronomy and Astrophysics* (a European journal).

“Concerning your question about papers that in my opinion should not have been published—I did not see papers of such level in *JAA*—although admittedly some papers are of higher quality than others.

“I can clearly point out several papers in *Nature* and even in *Astrophysical Journal* (for example) that should never have been published.

“As you know, editors of other journals (*ApJ* for example) have received complaints from me. I have not had occasion to feel that way about *JAA*. If there are substandard papers I will write to you.

“As far as getting best papers from India go, I wonder whether *Current Science* is not more of a competitor than American or European journals. Probably the charm lies in the rapid publication schedule.”

I am quoting these not to display them as certificates but to indicate that some in the world astronomical community feel we are not doing too badly.

Such comments are not confined to one journal. *Pramana*, *Journal of Genetics* and *Proceedings (Earth and Planetary Sciences)* come close to the standards of *JAA*. Members of the editorial boards of all the other journals of the Indian Academy of Sciences (and I am sure of some of the other better journals of India) work extremely hard and with commitment. I am certain that their attempts to establish high standards for their journals as far as scientific content, production, refereeing, etc., will succeed.

Many authors think that our journals restrict their referees only to Indians. This is not entirely true. About 10–20% of the referees are from outside India. This is done because many editors feel that getting good referees' comments is an important step for raising the standard of journal and even that of science in India.

The Science Citation Index

A word about Eugene Garfield's *Science Citation Index (SCI)* before I examine the view held by Indian scientists that they would like to publish their *better papers* abroad to attract a much larger audience. An important philosophical question in relation to science is, ‘What motivates scientists to publish their work in journals and why does the scientific community insist upon this?’ The answer could be summarized as follows: *Since science is a corporate activity, scientists have to communicate with each other. They therefore must expose their work in scientific journals for the critical evaluation of the scientific fraternity. Philosophers of science tell us that this is one of the main reasons why science survives.*

Almost as an extension of this premise, Garfield propounded the concept that the number of times a scientific paper is cited by other scientists is a measure of the influence that a paper has on the progress of science and hence it indicates the quality of that paper.

I am personally a bit ambivalent about *SCI*. My views about the harm that could be done by the unrestricted use of *SCI* in a developing country in India have been expressed earlier (see *Current Science*, vol. 61, no. 2, 25 July 1991). If at all it can only be used to evaluate pure science and not for evaluating applied science which has very different criteria for its assessment. I feel applied scientific institutions must not use *SCI* (especially in developing countries) for evaluation of their scientists for fellowships, promotions, appointments, etc. If this is done, scientists in these institutions will constantly have an eye on citations and so will not concentrate on or even look at the country's problems because such work will scarcely evoke citations (particularly from the West).

Even in the case of pure science applying *SCI* to India is beset with problems because of (a) the extreme reluctance of western authors to cite work done in

India and other developing countries; (b) the propensity of Indian authors to quote mostly western sources (probably to get fellowships and jobs in India and abroad, invitations to conferences, etc.); (c) the reluctance of Indian scientists to quote Indian authors (the sociological reasons for which we shall not discuss here). In spite of all these lacunae *SCI* seems to be the only quantitative method of assessing pure science in an international milieu. The statement made by Sir David Phillips, "Are we looking under the street lamp for the wallet which was lost somewhere because it is the only place that is illuminated", seems relevant. However, *SCI* has had spectacular successes in predicting Nobel prize winners, Fields Medallists, etc.

Citations received by our scientists

During my recent visit to USA, I came across the annual and cumulative volumes of *SCI* for the first time. The pages of these volumes can be read only if one uses a very high magnifying lens! I was fascinated. The amount of data contained on each page was stupendous. I began to peruse these volumes first as an amusing pastime but soon saw many things that were interesting and unexpected. In spite of my scepticism, as the scientific community at large (and that in India) has faith in *SCI*, I felt, I should try and get some information about Indian authors. I spent a few hours with these volumes and I present below some of my very tentative findings which are by no means accurate. (Much work can be done on these lines by bibliometric researchers.) Some of these findings substantiate the perception of some who are involved in our scientific publications.

(1) A few of our scientists (like G. N. Ramachandran say) not only have a high total number of citations but also high citation indices for specific papers—much higher than the international average and close to those of many outstanding scientists of the West. (The most citations are for reviews and not original papers—which is the general pattern worldwide.)

(2) Many scientists who are highly thought of in India have comparatively low *SCI*—much lower than the national average.

(3) Some have a high total number of citations mainly due to the larger number of papers they publish. (When I mentioned this to friends in the US, they said that a technique had been perfected by some scientists in the US based on 'clever' ideas like 'the smallest publishable units', 'multiple publications in multiple journals of the same results,' etc.) The average citation per paper for these scientists is usually much lower than the national average.

(4) Scientists often boosted by Indian media and fellow scientists as outstanding, scarcely make the national average.

(5) On the other hand, some scientists who are not at all rated highly inside the country, have very high citations.

The findings most surprising to me were:

(6) Amongst the scientists who have high citations, the papers published in Indian journals are cited more than those in foreign journals! Some of their papers in Indian journals almost reach the level of 'Citation Classics', while those in foreign journals scarcely make the international average.

One explanation of this is that when a scientist makes an important discovery in India, he tends to send his paper to an Indian journal for quick publication for he is apprehensive that he may be a victim of delays (which, we are told, occur often when new results from India are sent in to western journals) and thus lose priority. As one of our eminent scientists said:

Two classes of scientists have to patronise Indian journals—those who are working in the *forefront of science* and hence are *fighting for priority*, and those who cannot get their papers published anywhere else!

(7) A cursory examination of the citations of many of our scientists (who publish routinely and who confess that they send their 'better papers' abroad) revealed that the citations they received for papers published abroad are not very different from or sometimes even less than the citations received for papers published in India!

Does this indicate that the psychological feeling they have that papers in foreign journals attract greater attention of the international scientific community is a myth? Could this be interpreted to mean that instead of attracting a larger audience they are speaking in a larger auditorium in which most of the seats are empty!

(8) While individual scientists and individual papers may receive comparatively high citation, the average citation received for each scientific paper emanating from India is extremely low.

The quality of our science

At first all this appeared quite amusing till the possible implications of these conclusions hit me. However tentative these findings may be, they imply that the quality of science produced in India *on the average* seems to be very much below the international level. This view has been expressed by many experienced Indian scientists. One begins to wonder whether the science generated in India is inferior and also whether

the so-called *better science* produced by our senior scientists is also nothing to boast about?

As editor of *Current Science*, I wanted to celebrate discoveries made in India after independence by special issues. I could scarcely get a handful. (Unless of course there are still 'some mute inglorious Miltons' like Sambhu Nath De who are yet to be discovered.)

I also had an occasion to gather a fair amount of data on Indian scientific work in various branches of science including mathematics. One could barely cull out a total of 75 to 100 investigations in all subjects done in the last 45 years (since independence) that measure up to the best international standards (mathematics and astronomy however do not seem to be doing too badly).

We are told that there are 3000–4000 active scientists in India working in about 200 laboratories, publishing about 10,000 papers per year (more than 60% of which are in foreign journals). In spite of this enormous activity, why is the average quality of science at such a low level?

Should not all of us—the Academies and senior scientists—ask ourselves: 'Have we all failed to produce good science? Worse still have we all failed to promote creative science amongst the younger generation in the post-independence era?' This is extremely disturbing if it is true.

Are there any lessons to learn from history?

While contemplating this I asked myself as to whether the scientific community can learn something from history. Even though conditions have changed greatly let me take an example of a scientist of repute whom I happened to know. I refer to C. V. Raman (1888–1970).

(1) During his research career of 65 years he had about 50 students (and about 100–150 itinerant scientists who worked with him during vacations). Of the 50 students, 10–12 turned out to be scientists comparable to the best in the world, 15–20 who in their intellectual capabilities, originality and creativity, can stand shoulder to shoulder with many international scientists of repute.

(2) Raman published about 450 papers. Of which 150 were joint publications along with students and, more importantly, with his assistants, for example he had many papers—some in the *Proceedings of the Royal Society*—with his assistant Ashutosh Dey who had never entered the portals of a university.

(3) Raman seems to have trained his students to become scientists in their own right. I could consider any example from the fifty, but will take the cases of two—G. N. Ramachandran (student 1942–1947) and S.

Pancharatnam (student 1953–1958). During his doctoral career Ramachandran published about 20 papers in which he was the sole author and *none* along with his guide Raman. Pancharatnam published 15 independent papers and one with Raman.

A study of their papers clearly shows that the earlier papers were based on many ideas given by Raman. Slowly one perceives a change and the ideas of the students beginning to predominate. It is as though Raman slowly but surely trained them to become scientists capable of independent thought.

As Hamlet says, let us 'Look at this picture and that'.

We are told that every year almost a thousand students of science and engineering take their PhD degrees in India. Most of them have scarcely published independent papers during their PhD studies. (Incidentally most 'citation classics' in western countries come from the work of PhD scholars!)

We know that due to job opportunities better students take up engineering in preference to science. However, it is impossible to believe that all the students who do their PhD in science have no talent at all.

One wonders whether they are spoon-fed so much by their guides that they cannot stand on their own feet or think independently! Are they being used just as extra hands to help routinely in the research programmes of their supervisors? Or is there any truth in the statement made by a cynical doctoral student "Unlike Newton who saw farther than many because he stood on the shoulders of giants, our senior scientists *go* farther than most because they stand on the shoulders of their talented students".

All this again is very worrying. But before I deal with this problem let us see what we must do with our journals.

What should we do with our present journals?

If the standards of our journals are not high, should steps be taken to discontinue them? My answer is NO as far as our better journals go. This is *not* based on the well-known principle we have evolved that nothing that has been started in India should ever be stopped, however bad it be. The reasons are different. The scientific community and many scientists of India have done much to revitalize our journals. The journals are produced well, the refereeing procedures are continually improving and are as good and often better than in many foreign journals.

When *Pramana* was started about two decades ago, one of the primary aims (see first editorial *Pramana*, vol. 1, no. 1, July 1973) was to establish an impartial and courageous peer review/assessment system. We have done much to establish this in many fields. This peer-assessment system started by the Indian Academy of

Sciences for its journals has permeated (throughout) the country. Within two years, most funding agencies also started using such peer review procedures for assessing projects submitted to them. I believe that no really good project is now-a-days denied funding (although I am told some bad ones have been, and are being, funded).

I honestly believe that we need not be too ashamed of our journals and in fact everything possible has been done to improve our journals. Unfortunately, we cannot make our journals better because the quality of the science published in our journals leaves much to be desired. Most of our senior scientists, almost all the Fellows of the Academies and even many members of the editorial boards and the majority of our scientists, publish their papers abroad. I feel that forcing scientists to publish in India is not the solution. For there are indications that even if all of them publish all their papers in our journals, the *quantity* will definitely increase but the *quality* of science may not improve.

Even so why do I say that we should not stop our journals. More than two decades ago a dying scientist said: 'Do not allow our (Academy) journals to die. They are the only indicators of the quality of science being done in the country'. One had some doubts as to whether this was still true as so many of our papers went abroad; but today it is quite evident to me that our better journals do indicate the quality of science being done in this country. The science we produce (published in India and abroad) on the whole seems not up to world standard.

If we stop our better journals this indicator will vanish and we may live in a fool's paradise not knowing the quality of science we produce.

There is no need for pessimism

The picture that emerges from the earlier part of the talk appears rather gloomy. One reason maybe that we are possibly using tools which are quite unsuitable to assess science in a fast-changing developing country like India. While we should not sweep under the carpet the bitter possibility that the science produced in this country is of low quality, we have to keep in view many new parameters that have appeared. However there are a number of aspects that must be kept in mind.

(a) The sociology of science itself has changed much during the past 50 years—more so in India. Motivations that drive the young to do science have altered considerably. Hence we must be vary of analyses and solutions based on comparisons of the two eras.

(b) There is the tragic fact that we export the flower of our youth (trained in sciences) to foreign countries. This is one export these foreign countries welcome avidly and they do everything under the sun to promote

it; for the value they get in return to their nil investments is enormous. *This is the massive aid we, of the developing countries, give to advanced countries to prop up and sustain their science, technology and industry.*

(c) During the pre-independence era our science was dominated by giants. Unfortunately at that time there were very few other people doing science. After 1947, science was made to spread in a big way—so that at present we have thousands of scientists working in hundreds of laboratories. No wonder there has been a lowering of the general level in the quality of science. Even if *SCI* were a good indicator, most studies of assessing the science done in the country using the Citation Index give the average level attained. With the enormous expansion that has, and is, taking place here, such averaging techniques, I feel definitely, are not the best methods of judging the excellence of science in our country.

Optimists like me do honestly feel that very good science is definitely being done at a number of places in India. This is based on the old-fashioned concept that any scientist worth his salt can recognise good science when he 'sees' it (even if he himself may not be capable of producing it). The real problem, I feel, is therefore how to spread this culture of very good science that exists in a few places, to every nook and corner of the country where science is done so that the very face of science in India can be transformed.

Our position today is reminiscent of (but not identical to) that of physics in USA in the late twenties and early thirties. I quote:

A small physics community had begun to form in the United States; but it was a paltry thing compared to its equivalent on the other side of the Atlantic. There was talent available but the (real) context of physics was set by the continental researcher. The classes at Caltech and Columbia University were assigned textbooks written in Gottingen and Leiden; and graduate students in Cambridge, Massachusetts angled for the opportunity to travel to Cambridge, England. Aided by grants from the newly formed National Research Council, a pool of European-trained physicists slowly accumulated in USA; from them would come the leaders of the next generation like Openheimer, Rabi and others.

I. I. Rabi who after his dissertation, left for Europe said:

I found that I was better prepared than most Europeans of the same level. What we lacked—and my generation was (expected) to supply in this country—was a kind of understanding and a feeling for the subject. This is hard to get if you are not in contact somehow with *tradition*—(even) a verbal tradition with people who are really 'making' the subject. You have to see and absorb this living tradition and *create it in your own country.*

Unfortunately for various reasons the tradition which was growing up in India before independence when our

scientists were 'people who were making the subject' got diluted. In spite of the valiant efforts of Bhabha, we have not yet been able to replace it. Many scientists went (and were sent) abroad and only a fraction came back. Of these, a fewer number could build up a tradition and an atmosphere; but this was mostly around themselves and in one or two cases around their institutions (which sometimes an envious mediocrity tries to kill). An analysis shows that individuals (and institutions) which are doing well are the few who can still be in touch with intellectual centres outside India by continual visits and exchanges. Most of these better scientists and groups have a tendency to isolate themselves (some say for purposes of self-preservation) and therefore have not diffused the culture they have acquired and built up. Often even at these centres the spirit decays when the central figure goes.

A new class of journals

It is therefore incumbent on us to devise new methods suited to India for spreading the excitement of science and building up and preserving the necessary atmosphere for its growth.

This is the crisis creative science is facing in India. Universities and teachers in them, research institutions and their scientists, Academies and their Fellows, every organization and every person associated with good science, must help in tiding over this crisis—by creating the real exciting atmosphere in which science can flower out. There are many viable methods which can be pursued. I shall try only to indicate how journals can help in this endeavour.

In the US (long ago) due to pure chance I travelled along with Conyers Herring, the Savant of Bell Labs. I talked with him about various matters, including journals. He was doubtful if archival journals could really influence the growth of science *per se*. He felt that each country must evolve its own policies for its journals to give fillip to its science. He felt that the primary need of the US science at that juncture was critical reviews by masters who could pin point the problems that have to be solved if a subject is to progress properly and take new pathways. I think he cited the example of one review by S. Chandrasekhar in *Review of Modern Physics*, which caused the initiation of stochastic research in many new fields. Such reviews, according to him, could change the very face of a subject by pointing out new

directions and these can help conserve talents (and funds) nationally.

One wonders whether we could evolve editorial policies to produce journals with articles which can stir up the minds of our young. Here one must most carefully differentiate between articles which popularize science (an activity so essential in a democracy) and discerning ones that persuade young minds to become a part of the creative endeavour which is science. One has in mind such articles by masters like Purcell, Anderson and others which sometimes appear in journals like *American Journal of Science* explaining some elegant aspects of physics addressed to university students in simple language; or the ones by Weisskopf 'whose clear style and simple presentation made them accessible to colleagues uncomfortable with complicated formalism . . .' which helped to make important advances in field theory in the US.

Such articles appearing in journals easily accessible to college students and research scholars can demonstrate to them the excitement of science and inspire them to participate in some of its more profound problems. Most students here scarcely see the research journals of the world, which are too expensive for many universities in India to purchase.

Who should write these articles? Writing them is by no means easy. Every scientist at the peak of his creativity—young or old—must persuade himself that expounding the deeper implication of his science to the younger generation and getting a following is an important part of his duty. There are some in India who have done spectacular science when they were young and who are 'burnt out' (and often do not realize it). We also have a large number of older scientists who have a deep comprehension of science and who can truly perceive the twists and turns a modern subject is taking. All these should educate themselves to write articles and reviews of the type mentioned above. We can also reprint articles published elsewhere in the world with suitable annotations. These would not be archival journals or popular science journals; nor would they be review journals addressed to the experts.

My plea is that the scientific community should ponder seriously whether there should be any new and serious thinking necessary in regard to our journals so that they too could participate in clearing up the present murky atmosphere that prevails and help to establish a new culture.