Improving scientific research, even without changing our bureaucracy

There are many discussions on the reasons behind the output (rather impact) of Indian scientific research not being at the desired level. There is a broadly held opinion that our bureaucracy puts procedural hindrances on normal scientific activities, including purchase of equipment and travel to conferences abroad[1]. There can be no disagreement with this opinion, except the proviso that pressure to collaborate or travel should not be excessive. We must consider that solitude allows inception of new ideas and planning of unusual experiments.

The call to free Indian science from bureaucracy[1] shifts the responsibility of corrective actions away from scientists. The expanding university (or higher education) system is adding a large number of young science researchers, and my suggestion of remedial steps that can be taken from within the scientific community targets these young researchers. I will discuss two issues that inhibit our research output levels, and where corrective actions have to come from within the scientific community. In both cases we shall attempt enhancing the level of research by making our younger scientists more ambitious academically. Doing this through standard publicized procedures is more important for young scientists in newer institutions as they have lesser access to live mentors. Basically, we have to make them believe that they can contribute much better than their seniors could! While we do inherently believe so, this belief must be made obvious through the procedures we set up.

We older scientists have experienced many occasions where Indian researchers have been accused of plagiarism of works from abroad, but there is hardly any talk of the works of Indian scientists having been plagiarized by scientists from abroad. One mundane explanation can be that those from abroad are persistently reminded to paraphrase and thus avoid being accused of text-plagiarism[2]. But what about idea-plagiarism, or process-plagiarism, or result-plagiarism? We senior scientists do not talk of having suffered due to any of these detestable forms of plagiarism. If our coming generations do more original work, there will be others who would try to usurp their credit. Not preparing our coming generations for such events is tantamount to our stating that they will not do anything worth usurping.

Some instances of Indian scientists becoming victims of idea-plagiarism by established foreign bylines do occur, but it is either not easy to get corrections or the victimized Indian scientists do not have the desire of going through what appears to be a mentally disturbing procedure. I have recently gone through such an experience and succeeded in establishing our contribution with the established foreign scientists having to apologize in the journal. The correction was however much less than what I considered necessary. When I raised the issue in meetings with other scientists, I realized that there was no redressal mechanism available through any Indian body. We do not appear to be ready for ideas/processes/results of Indian researchers being plagiarized by established foreign bylines.

We are advertising in our universities that our young researchers should not plagiarize. This conveys that they may usurp the credit of others. Simultaneously we should teach them the steps necessary to protect their work from being plagiarized because we must convey that they would also be producing ideas that others may consider worth usurping! As we ensure compliance with software checks for text-plagiarism, we are putting up soft copies of thesis (on the Shodhganga site of INFLIBNET, following the directives of UGC), where ideas or results that are not yet published in journals could be usurped. If our younger scientists show a much higher level of originality (than we could) in their ideas and processes, they are quite likely to find established foreign bylines using these contributions of theirs without attributing due credit. We must make our young researchers aware of these possibilities and mentor them on how to handle the situation when and if it arises. We need to set up 'plagiarism cells' in our universities that will mentor and not police[3,4]. This will tell our younger scientists that we believe in their potential, and will hopefully create in them a self-belief. Such a self-belief is essential before they can actually challenge established bylines and established ideas. This is one step that we can take without worrying about bureaucracy.

The second step we should take is to change our assessment benchmarks. Our young scientists do wish to receive peer approval, and strive to do well according to the benchmarks they are presented. It is widely disseminated that when we presently assess a researcher, we try to quantify his/her research output in terms of the number of publications, the impact factors (IFs) of the journals in which these publications have appeared (and then sometimes combine these two by weighting each publication by the corresponding IF to get one number), and in terms of the *h*-index of that researcher. Much has been written globally about the pitfalls of each of these as assessment criterion. I briefly state how each of these will negatively influence what young Indian researchers will aim for. I shall then present an alternate (non-quantitative?) criterion and discuss how it will influence our young researchers to be more academically ambitious.

The problem with the number of publications is that it is easier to publish from a lesser-known Indian byline if the submitted paper is generally in agreement with current thinking than if its conclusion is drastically different from current thinking. I would sum this up as 'me-too' papers are easier to publish from lesser-known Indian bylines, than path-breaking papers. Using the number of publications as a criterion, we push our younger researchers towards choosing problems that use an established group's paper as a template; towards supportive rather than path-breaking research. We do not encourage them to plan tough experiments that could also fail, and influence them to be satisfied with much less than their potential. Easy funding results in availability of commercial state-of-the-art equipment which help follow experiments done with similar equipment abroad, following their ideas. We must give importance to the hurdles faced in getting path-breaking papers published, and should mentor our young researchers on convincing skeptic referees. One effort made earlier was to develop Indian journals where we would publish such papers. In view of the emphasis on publishing in high IF journals, this is no longer a likely solution. The number of publications must not be a criterion, and must not be publicized as a

measure of success. We must rather publicize tangible path-breaking contributions, new keywords that have been generated, and how research in that field has been affected.

Emphasis on publications in high IF journals is wrong because it does not count the long-term citations (beyond two years) that path-breaking papers receive. Supportive papers receive quick citations, whereas path-breaking papers are usually cited after a gap because of initial disbelief. Further, by putting a premium on publications in such journals we are asking our young researchers to be more compliant to the thinking of the reviewers and editors of that journal. This causes our scientists to refer to specific papers and support specific ideas, to dilute their conclusions and make them more in line with those suggested by the referees, etc. It lowers the level of our research output by dilution at the publication stage. We need to discuss these problems in order to be able to mentor our young scientists accordingly.

h-index is just a count of every paper that cites us, but on a binary 1/0 scale. It does not distinguish between our paper being cited as one number in a group of numbers, and our paper being used as a template with extensive citation over a few sentences each at a few places in the paper. One number in a group of numbers implies a supportive 'me-too' paper, and our *h*-index will improve if we do that kind of research. The Indian experience with path-breaking papers also speaks against the *h*-index criterion. As colleagues have confirmed their experiences, an Indian path-breaking paper has to first wait for acceptance from an established researcher abroad, who will probably cite it extensively. Subsequent publications that accept the new ideas prefer to cite this established researcher than the original work of a lesser known Indian scientist.

I have tried to explain why we should not advertise (or use) these three benchmarks because they are biased in favour of running citations and supportive papers. Our young scientists are being told that they become creators of new knowledge. But unless the (self-)assessment parameters are correct, they will not know if they are on the right path. We easily comprehend that technology innovators cannot be assessed by the number of patents they get registered; their contribution is assessed by how extensively a patent of theirs is being used. We must similarly have measures of good research. When I was the Director of UGC-DAE Consortium for Scientific Research, I (along with other eminent members of our Award Committee) had stipulated that the scientists short-listed for our annual 'Scientific Excellence Award' should submit all the extended citations that their papers receive. Extended and repeated citations in a paper would have drawn the attention of the reviewers of that paper, something that cannot be said of a running citation. While such extended citations are not too many, the ones I saw gave a lot of satisfaction and a fair idea of the impact of the scientist's work. More important was the changed attitude I saw when this criterion was advertized!

To sum up, I suggest that senior scientists should suitably display their belief that younger scientists can do better. The 'plagiarism cells' I have proposed[3,4] to help young researchers who become victims of 'idea-plagiarism', would also help display this belief. Such self-belief is essential to challenge existing ideas with newer ideas. Second, we should create the right benchmarks and standards for (self-) assessment, since existing criteria favour supportive research. The 'gold standard' will be when our research changes, in some way, how research is done in a given field. Indian research should create new keywords!

1. Joseph, M. and Robinson, A., *Nature*, 2014, **508**, 36–38 and references therein.
2. Roig, M., *Nature*, 2012, **481**, 23.
3. Chaddah, P., *Curr. Sci.*, 2014, **106**, 349.
4. Chaddah, P., *Curr. Sci.*, 2014, **106**, 927–928.

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Peer review: single-blinded or double-blinded?

Recently, we made a simple survey on the preferred peer-review policies of academic journals and collected feedback from the scientists in our university. More than 60% of them supported the double-blinded peer review, while about 25% felt that the single-blinded policy is beneficial. The others remained indifferent.

Majority of the participants approved the double-blinded policy as it provides a fair chance to share scientific ideas. Many scientists worry that a full disclosure of the author identity would affect the peer review, owing to the potential biases of individual referees against specific institutions or authors. In contrast, some others believe that single-blinded policy actually helps the referee to quickly seize the idea of the manuscript, because the research background and prototype work, is easy of access. Then the referee can explore the previous archival contributions, if necessary, to have a deep understanding of the manuscript under review.

Most of the scientists included in the survey were willing to discuss their findings, directly or indirectly, with the referees. To a certain extent, scientists themselves regard the double-blinded policy as extra protection against biases rather than an indispensable process of peer review. They hope that academic journals can help cross the hurdle of policies and contribute to build pure communications platform accelerating advances in science.

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