and is struggling to move ahead – as it will be so for excellent scientists, but there is another extreme that is more common – being lost in justifiably significant, but in truth, insignificant work being pursued for decades. If an effort is made to allow deeper reflection on the latter aspects, some who are 'lost' can indeed be 'retrieved'. I know of many who are looking deeply inside for direction, but do not get any for a variety of reasons and think that it is below their self-esteem to seek clarity from colleagues. Most importantly, excepting promotions that affect their immediate stature, there is little institutional demand for performing excellently. I am discounting long or short speeches at faculty meetings when the directors make remarks demanding excellence. It is simply not clear to anybody whether such a demand is more than statutory. This is the reason for what Padmanaban[1] described as 'laid back attitude'.

What then is the solution? The directors of institutions should – (a) interact directly with individual faculty members on a one-to-one basis for an hour or two each year, exploring the broad contours of individual research – motivation for research or development; what the peers think of this class of work; does the faculty member have difficulty in getting things published; are there any serious bottlenecks in the conduct of work within the campus and offer suggestions, when possible, to get to higher levels in the exploration of the field and all that encompasses the academic world. The fact that the director is directly interested in his/her work becomes the strong motivating factor for individual pursuit to excellence. (b) Hold meetings of small groups of academics pursuing similar subjects in a more relaxed environment along with divisional chairmen and chairmen of connected departments (senior academics overseeing progress of work and promotions) to discuss cooperative work enhancing the total accomplishments. (c) Often use the presence of distinguished academic visitors to hold similar group meetings and encourage a vibrant discussion without direct intervention. The last technique was what Kalām used; to calibrate various people, including 'experts' and academics, gently prodding people to perform better or accomplish more. The directors of institutions should deal with these subjects beyond administration, a role that seems to occupy most for most of the time.

It is realized by many directors after a while that there is some deadwood within their academic family. It is important that serious attempt be made to identify and nudge such people to get out of such situations. It is far more serious these days when full professors have an academic life of 25 years or so, and can cause havoc if they are non-functional and spread an impression that the kind of life they are living is also worth living. Such problems cannot be resolved unless dealt with directly by the director speaking quietly, gently, but surely to the individual faculty.

Further, the point made by Padmanaban[1] on the impression that 'publish or perish' attitude being dominant is denied by some directors. However, from what I have known, there is a visible broad tendency to disown developmental and technological accomplishments, even if they are truly science-based; and even if this is untrue, it is certainly true to mention that this is the public impression. It is therefore extremely important to speak about work of significance to the nation in various relevant forums, allowing the possibility for rejuvenation of broad-based academic values.

Over the years, there has been decay in the functionality of segments related to contact with the industrial world. Serious efforts must be made to keep the dialogue with industry alive on a periodic basis, both semi-formally and formally. It is also equally true that interaction of academia with DRDO and ISRO is decreasing over time. Conscious efforts must be made institutionally to keep the links with reality alive. There is no escape from reality checks for any academic work, particularly in engineering science.

Lastly, Narayana Murthy made a point that MIT provided him with a booklet indicating the list of technologies that they offered the nation during his visit. In 1996–97, when the then Prime Minister, Deve Gowda visited IISc, five technologies were presented to the nation by Padmanaban, who was the director at that time. These events have neither been followed up or preserved over a time with continued attempts to dismantle institutional segments of significance for this kind of outreach.

In summary, there is much room for raising the quality of work and projecting it to the world with academic authenticity. There is responsibility for the heads of institutions in knowing the broad contours of academic work of individual faculty members – whether it is for the cause of international science or national development, and providing the needed encouragement for their colleagues.

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Photo check – why and how?

The advent of digital photography and radiology has revolutionized the scenario in science like never before. The last two decades have seen a massive transition from photographic film and tube-based cameras to semi-conductor-based sensors in high-resolution digital cameras and radiographs[1]. They have made life easier for scientists in terms of generating records and their storage, cost-effectiveness and are frequently considered as authentic visual representation of tangible cases or situations in scientific presentations and publications. But modernity is also associated with 'greater the power, greater the abuse'. Digital abuse has surfaced in the form of digital forgery, due to excessive intentional manipulation of images with easily available image-editing software on the internet, like Photoshop, Paintshop and Picassa 3.9.

Tools for image cropping or change of contrast to enhance clarity of the desired area of interest, or to minimize occurrence of artefacts are considered acceptable, but extensive image manipulations intended for scientific misinterpretation are unacceptable and often lead to research misconduct[1].

Submission of fraudulent digital images has been reported in leading scientific journals, including a high-profile German case which was brought to light in 1997 (ref. 2). The 'publish or perish' scenario has further caused an alarm among the scientific community, and needs to be condemned[3].

This highlights an urgent need for establishing universal code of ethics for acceptable image manipulations, that can be subsequently altered for application to different branches of science. A remarkable effort in this regard has already been made by Cromey[2]. He has a background in biological microscopy, but has emphasized image-editing guidelines with broad application to scientific images of all types. These could be further modified to suit the specifications of different scientific societies and should be strictly applied by the editorial boards of various journals as well as certification boards.

We believe that a few small steps at the individual level can alleviate this menace of image fraudulence. First and foremost, a mandatory ethics class for undergraduates and researchers should be conducted. The students must be made to understand the reasoning behind the detailed instructions for authors for manuscript submission, so that they will willingly adhere to them. Workshops need to be conducted for prevention of photo forgery, where students can be taught water-marking of images or attachment of meta-data[4]. Also, the guides/mentors should be more watchful of the digitized data submitted in their name, that may curb some intentional falsification by students who are more adept at using image-editing software.

Some strategies can also be adopted at the governance level. All journals or certification boards should have specialized software for identification of intentionally falsified images to check image forgery. Even at institutional level, internal research committees that have access to these software can be formulated to monitor each manuscript before submission. Close scrutiny of digital images by zooming and recognition of any discontinuities or unexplained deviations from the normal may be the simplest way of reporting image fraudulence. Strict policies should be formulated for such scientific misconduct and researchers with repeated complaints should be reprimanded. Such manuscripts should be immediately withdrawn and the authors should be banned for a specified duration from publishing further.

Digital images are considered as the exact representation of the original research and are retained in the memory of the readers for a long time. Hence, their authentication is imperative. It is the primary responsibility of researches to present their work in original. Scientific transgression in order of its dilution, fabrication or beautification should be discouraged in order to maintain the sanctity of scientific endeavours.

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A logo for sciences

Many institutions and organizations have their representative identification symbols or designs called logos. Nations and governments characterize their logos with some fundamental principles or mottoes, e.g. 'satyameva jayathe'. Universities and academies showcase their publications, websites, etc. with eye-catching logos. Science and scientists need a logo depicting the most fundamental branches of science, showing their interrelationships. In Figure 1, all fundamental branches of science, viz. atomic physics, mathematics, genetics and biology, psychology and cosmology are represented in a logo.

Atom (of hydrogen) – Hydrogen is the most abundant element in the universe and is formed by one positively charged proton and one negatively charged electron. This can be considered as the

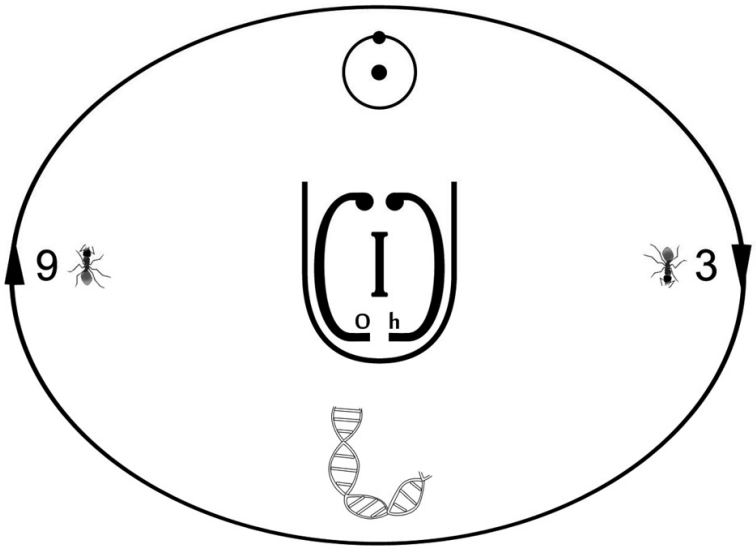

Figure 1. Logo for sciences, showing most fundamental branches of science.