Attending international conferences – the funding blues

Although a lot is being said in these columns about means of promoting cutting-edge research, I would like to point out that international exposure is an important tonic for enhancing the quality of research. Specifically, I would like to bring out the fact about the enormous difficulty faced by most scientists in managing full support from national funding agencies for attending international meetings. It goes without saying that attending international meetings is the life blood for a productive scientific career, professional growth and recognition of a scientist. Recognizing this fact, some of the new institutions in Singapore provide full support to their scientists to attend two international meetings every year. After joining the Institute of Microbial Technology, Chandigarh as a scientist in 1994 I have availed of government funding on three occasions and international agencies on two. Whereas the international funding agency simply wire-transferred the award money to my bank account without any requirement of producing the receipts, the Indian agencies only provided partial support coupled with reams of paperwork, time dilation and insistence on producing evidence of having travelled in the form of boarding pass along with other bills for receiving the travel money afterwards. All this entails huge waste of time and energy. I am still waiting for the reimbursement of the travel grant approved by one of the government agencies for attending a meeting in the US last year. I was lucky to have some personal funds to purchase my ticket, but this may not be true for all scientists. Needless to say, this bureaucratic and piecemeal approach for supporting international travel discourages most scientists, and thus restricts their professional growth.

It is high time that all institutions provide their scientists full support for attending at least one international meeting every year. With ample amount of money available for science, it should not be a problem. I hope that the authorities take note of this and take remedial measures, including cutting red tape.

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Prioritizing the criteria for location of Innovation University/IIT across India

History has borne witness to India's Central Government proposing quality institutions like the Indian Institute of Technology (IIT), the Indian Institute of Management (IIM) and the new Innovation/National University, referred to as World Class Central University, in state capitals or Tier II cities which already have many other national institutions. None is being built in semi-urban rural pockets such as Bhawanipatna of Orissa.

The sole criterion for selecting locations has been the available infrastructure, mainly air-connectivity. In India, air-connectivity is not built-in unless it is commercially viable. At least 80% of the Indian population rarely or never depend on air travel because of economic reasons, unlike the USA. The Government facilitates air-connectivity for selected classes of people including bureaucrats, administrators and visitors in metros and abroad, with no concern for the students and faculties travelling to institutions in remote locations. Some time ago, a proposal for IIT Guwahati (IITG) was opposed, saying 'Nobody will go to North Eastern states' – today IITG is among the leading technical institutions.

Economists affirm that huge investments go into construction sectors while establishing new and large institutions, directly boosting the local economy. Such investments and opportunities should be equally distributed between urban and rural areas. Seventy per cent of rural India needs easy access to quality education. Limiting developmental initiatives to state capitals and surrounding regions encourages mass rural migration to cities, affecting rural economy and making metros/larger cities over-populated, polluted and stressed. Mass migration from Kalahandi and over-crowded Kolkata are cases in point.

When institutions like IIT, All India Institute of Medical Sciences (AIIMS), Indian Institute of Science (IISc), IIM, Madras University, Calcutta University, Mumbai University and Delhi University in large metros, having decades of experience in education and research, are yet to be made true world class universities – other institutions in the name of 'world class universities' should not come up in their vicinity. IIT Kharagpur, located in a semi-urban area, is still top-rated compared to the other IITs in large metros. Birla Institute of Technology and Science (BITS), Pilani and IIT Roorkee are other noted examples.

Unless equal investments are put in, the quality of institutions in Tier I/II cities and semi-urban rural areas cannot be evaluated. The Sambalpur University and the Central University Hyderabad, having different investments and functioning modes, may not be compared but Innovation universities in Bhawanipatna and Hyderabad would be.

In Bhubaneswar, there are proposals for establishing National Institute of Science Education and Research (NISER), IIT, AIIMS (of innovation stature) besides Employees' State Insurance Corporation (ESIC) and railway medical colleges and many other national institutions. Bhubaneswar is one rare location where IIT, NISER and Innovation University are all coming up in one place.

Local demand has led to the Central Government establishing two central universities in Jammu and Kashmir. A similar demand for Kalahandi was ignored. Kalahandi has more appeal for an Innovation University – its infamous backwardness, available infrastructure,

distance from the state capital, rural mass migration and 'ideal' location in Orissa. Bhawanipatna and Koraput need equal development to bring about the overall growth of Koraput–Bolangir–Kalahandi (KBK) and Western Orissa. Kalahandi is the central place among KBK districts; and Bhawanipatna is a central town within 200 km radius of KBK and other tribal and backward regions in Orissa, including Boudh, Kandhamal, Bargarh and Gajapati districts.

The Ministry of Human Resource Development has recently suggested the formation of Innovation University through private public partnership (PPP) mode. It may be possible to collaborate with the Agarwal Foundation for an Innovation University in Kalahandi – the Vedanta group would have a moral duty to establish an university in the region directly affected by its mining activities, prior to launching a Rs 15,000 crore invested world class university near Bhubaneswar for philanthropy purposes.

Among the proposed 14 Innovation universities, seven could very well be built in smaller rural towns facilitating future generations to evaluate the quality of these institutions. The present policy makers need to re-think before increasing the gap between rich cities and poor semi-urban regions in their access to quality higher education and Innovation universities.

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Short-term courses on radioactivity for technical personnel

Recent happenings regarding the improper disposal of radioactive material and equipment call for urgent measures to educate the personnel handling such material and the public in general. This is not merely for the personal safety of a few individuals, but also to prevent radioactive material from falling into the hands of extremists who would not, then, really have to raid state-controlled nuclear establishments to get material for making 'dirty' bombs. Agonizing death, not damage, caused by dispersing even small amounts of radioactive material as a fine mist can match what may be caused by a 'real' nuclear weapon.

Particularly appalling were reports that have appeared in the print and visual media that compromise the reputation of many institutions of higher learning and advanced research, and expose the depths of ignorance among personnel who, one would expect, would know better. Some examples: (i) Regarding ^{60}Co irradiation equipment: 'It was procured many years ago by a professor who has retired. We don't know why he procured it. It was brought to disposal by normal auction procedures because no one here now knows how to operate it'. (ii) 'We have our own procedure for disposal of radioactive materials. We burn it when we have done with it'. (iii) 'We really don't have to worry about it. They become harmless when their half-life is over'. These examples clearly show that there is an urgent need for conducting elementary courses on radioactivity/radiochemistry. Even personnel who are qualified enough to be appointed in universities and research institutions and who, one would fully expect to know better, seem to be ignorant about the fundamentals of radioactivity and the dangers on being exposed to active material when handled by uninformed and untrained people.

Specifically in relation to the examples given above, knowledge needs to imparted that manufacturers of equipment employing radioactive sources are usually required by law in the manufacturers' own countries to include instructions on the method of disposal once the equipment has reached obsolescence. 'Burning' of radioactive material can release active volatiles, e.g. $^{3}H_2O$, into the atmosphere, releasing the 'ashes' (a fog of nanoparticles) of still active metals, etc. 'Half-life' is NOT some measure of radioactivity that ceases at some point of time but is a rate measure, the time it takes for a given amount of material to lose half of its active content. Theoretically, such first-order decay will never end, just like the tortoise in Zeno's paradox will never reach his destination!

It is not surprising that no records are maintained in many institutions, of what happens to the radioactive material distributed for various purposes. One may even wonder if the most elementary of precautions, of exhibiting the internationally agreed radioactivity sign, is recognized for what it is and is appropriately exhibited in research institutions, not to mention hospitals that provide radiation therapy.

There is a need to institute urgent measures to educate and train all personnel concerned with these matters and this is best done by an arrangement with the Department of Atomic Energy. The education/training programmes must be oriented towards practical handling of active materials. Teaching faculty and, most importantly, technical staff that may need training would be from such institutions as universities and research institutions, hospitals, etc. Not to be left out are shipyards and factories where welded joints are inspected by X-rays, most usually generated from a radioactive source, metallurgical works, etc. One should also not forget to include personnel manning ship-breaking yards and areas where waste from industrialized countries is dumped. I hope that the knowledge will filter down to personnel manning scrap yards in all major cities.

The manner of education may consist of about a week's course of lectures on the fundamentals of radioactivity, employing video clips or movies showing what may happen on exposure and on modes of handling and disposal of radioactive materials. At least one faculty member/supervisor and one or two technical-level personnel must be *compelled* to attend the course which may be repeated every three or four academic years in order to cover newly recruited personnel. Attendance may be certified after a due test.

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