Those who have shall get

The total neglect of the university system in the country is reflected in two decisions taken by the current government in the last few months. The first is the constitution of a Science Advisory Council (SAC) to the Prime Minister of India and the second is the allocation of a (to use a popular word) 'whopping' Rs 100 crores to a single institution for excellence in science research. We believe the second decision is strictly not a coincidence but is a consequence of the composition of the SAC.

The SAC membership itself is full of scientists and technologists from institutions that have no real connection with science teaching. Majority of the members have been in-charge of science in India for several decades now and have benefited from their positions of power. It is difficult to imagine how they would look beyond their association with institutions from where they, as individuals, have produced quality research. It is therefore important that any such advisory council/committee must have sufficiently large numbers from the younger generation of active scientists who would benefit from the course charted out by these bodies. The more important question that we feel has never been taken up seriously and continues to be neglected is the aspect of university education. Why is it that the SAC has almost completely no representation from the university system not even through the current UGC Chairman who is a scientist himself? How does the SAC expect the quality of manpower to improve in science if the problems of universities are not taken up by members of the university system? If there is no one worth considering for such membership, then is it not a statement of neglect on the part of the individuals who have been in-charge for such a long time? We would like to reiterate that this is not a question of the competence of the members. It is a comment on the lopsided nature of the membership of the SAC, neglecting quality university professors.

The second decision that has an even more direct impact on the morale of the university-based scientists is to allocate Rs 100 crores to a single institution for further research in that institution. The Director of the Indian Institute of Science (IISc), has gone on record saying that this adds to the Rs 150 crores already available in the corpus of that institution. This in addition to other such research funding available to faculty of IISc, individually and collectively would put the total anywhere between Rs 300 and 350 crores. The Finance Minister (FM) in his statement has said that this allocation is to enable IISc to achieve a status similar to that of Harvard, Cambridge, Oxford, Stanford and other such Universities. The main problem with the statement is that IISc is not a university, it is a predominantly research institution that does not provide any undergraduate or post-graduate training in sciences. The only programme that comes close to postgraduate training in science is the integrated Ph D programme that is a post-B Sc programme that gives a Ph D at the end of the course. Students have the option of taking a M Sc degree at the end of two years. But these programmes typically admit only 8 to 10 students every year. It is no secret that the universities that FM has stated IISc should try and emulate, have very strong undergraduate and postgraduate programmes. Apart from the Nobel prizes that faculty members of these institutions have received, it is these teaching programmes that produce human resource of the highest quality that has given them the fame over the years. We, in India, have no such university since the university system has always been underfunded and neglected. The manpower for IISc comes from these very universities and it is therefore difficult to see how research of the quality that the FM expects will be produced if the basic source continues to be neglected. The country might be better served if the Rs 100 crores are invested in improving the infrastructure of a few universities that can then produce the quality of people required to produce high-quality research at IISc. The University of Hyderabad received over 1200 applications for its M Sc course in Physics, so it is evident that interest in Physics is not dying. An example of prudent investment would be to fund 500 Ph D students in Physics all over the country at the rate of Rs 5000 per month. Rs 100 crores would fund an entire generation of students at this level. What better way of celebrating the year of Physics?

After India achieved freedom, G. N. Ramachandran did the most outstanding piece of science by an Indian while he was at the Department of Physics, University of Madras. Neither the University nor the Government gave any support or recognition to keep it going. That the Institutes get all the funding is because they chair all the funding sessions. They are truly secular for they believe the Bible that says 'those who have shall get'.

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Nautical jugs or not?

Irrigation macroprojects desired by grassroots social groups and the nations' leadership alike seem to be inevitable technical fixes for India's vulnerability to the whims of weather. River linking via canals – first examined comprehensively by Sir Arthur Thomas Cotton (1803–99) and now expected to be the main effort by Indian Government macro-engineers – are but one facet of the overall solution to making the farm economy secure from drastic yearly variations of the monsoon. 'The ever-increasing water shortage problem… can be solved only by such a mammoth project' says Korse[1]. The other relevant facet, so far markedly less well considered, is water-conveyance over land and sea (and associated required water-storage).

During October 1977, Clifford R. Humphrys described the possible future use of gigantic floating plastic pods for freshwater transport. A full account of Humphrys' idea appears in ref. 2. Apparently Humphrys

was unaware of the Swiss macro-engineer, H. J. Stauber, whose UK Patent Specification 1224216, 'Method of and means for packaging and utilizing water as a movable packaged supply', was filed during 1968. Stauber detailed an inexpensive gravitational discharge of huge floating packages of any liquid, including freshwater. Staubers' patent has expired.

The International Maritime Organization (organized in 1958, renamed IMO in 1982) estimates that more than 10×10^9 tonnes of ballast water are transferred globally each year, and that more than 3000 species of aquatic flora and fauna may be transported daily by ships[3]. Deoxygenating ballast water is effective in purging all non-indigenous marine species, whether harmful or not[4]. Properly filtered oil tanker ballast water or dedicated freshwater supertankers might become useful to India's coastal-sited farms if drip-irrigation techniques were practiced with careful management by consulting agricultural experts[5]. From the macro-engineering viewpoint, however, large Stauber–Humphrys type seagoing-tug towable plastic pods seem to be a better option economically and technically.

Pure water at 3.98°C consists of H_2O alone with a density of 1.000 [1.000 g/cm^3]; freshwater is rainwater plus the salts—normally 0.2–4‰—dissolved in it. Seawater at 15°C has a density of 1.025 [1.025 g/cm^3] and contains 34.72‰ grams of salt in a kilogram. There is a 2.5% density difference, which means that freshwater floats atop seawater, whether in plastic pods or not. A Stauber–Humphrys plastic pod 200 m long, 33 m wide, with a draft of 7 m could carry 35,000 m^3 of freshwater; equivalent to a 35,000 tonne ship – but significantly cheaper to build and operate for at least a decade – mobilized by a seagoing tug could be delivered from domestic or overseas water suppliers anywhere within, say, 2500 km of the final port of call in India. Pumped loading or gravitational unloading of such fabric pods, at ~100 m^3/s, could take only about 3.5 h. One of the greatest advantages of Stauber–Humphrys ocean-worthy flexible plastic jug-like pods is that they offer end-users (buyers) an inexpensive storage system, which is one of the greatest costs affecting the price of freshwater everywhere[6]. All the bags being used nowadays have flat topsides and are generally ship-shaped lengthwise, with pointy ends. They are also equipped with radar-reflective masts. The Stauber's shape on the other hand, is mentioned here for easy comprehensibility and easy calculation of its volume. Smaller floating plastic bags carrying freshwater shipments have been used for decades in the Mediterranean – especially the Greek islands – and several shipping companies (Alaska and California based) have been testing almost Stauber-size containers. There are a few interesting sites on the internet which deal with these aspects[7]. Their commercialization plan is to harvest freshwater from pristine rivers in those two states (and, maybe, in Canada's British Columbia) for sale to Pacific islands and even to Japan and India!

In the kind of intra-national and international water market envisioned by Stauber and Humphrys in a preliminary manner, the geographically reallocated freshwater's monetary value is entirely independent of the value of land (and improvements thereon) since buyers and sellers participate voluntarily: in the context of each freshwater sale, the price is decided by the buyer and seller only. Of course, the bigger the interaction of Indian customers with overseas sellers in terms of shipped tonnage, the more likely the Government of India will somehow participate directly and, it is to be hoped, as a constructive, economic planning, overmaster. It is obvious that Stauber–Humphrys portable jug-pods would have been very helpful to coastal zone survivors of the 26 December 2004 tsunami affecting India and approximately ten other nation-ecosystems!

Farms in India situated some distance from the seashore, or regional harbours where Stauber–Humphrys pods are temporarily moored, can also receive scheduled freshwater deliveries—distributed by enormous 'self-rolling' plastic bags conveying freshwater to suitable regions of the nation's interior of the type first suggested by Pecero[8]. Such utilitarian conveyances would have little more impact on the land than does the tread of a human foot. These could not produce a crushing steamroller effect. At the very least, India's villages and sprawling city neighbourhoods suffering temporary freshwater shortages, perhaps owing to the delay or weakness of the monsoons, could draw their daily supply in jugs from a regularly delivered ultimate freshwater source[9].

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Open source agricultural biotechnology*

Traditionally, around the world, universities and other public sector research institutions have been the leaders in developing improved crop varieties which were transferred to the field through extension services. This model is currently facing challenges due to privatization and increased intellectual property (IP) protection. Research in agricultural biotechnology (agbiotech) is highly technology intensive and investment oriented with huge market to tap return on that investment. Due to this, globally, private sector is emerging as the major player in agbiotech research. The private sector naturally focuses on crops such as corn and soybeans with large markets in developed countries, which leaves development of subsistence crops important to developing countries to the public sector.

*The views expressed by the author are personal.