trying to have the most stringent norms for hiring human resource for R&D.

Industry expects the prospective candidates to have the following skills:

- A sound research base, including capacity for troubleshooting, problem-solving skills and systematic approach towards any problem. They are expected to be able to come up with specific examples demonstrating each of these skills.
- Effective communication and lucid presentation skills.
- Another important desirable attribute is openness to accept or reject an idea, on the basis of sound logic and ability to put forward an idea in the light of facts and figures to make it cogent.
- Ability to work in a team or coordinate and collaborate with different institutions is highly desirable, which can be judged from the individual's role in publications.
- They are expected to be resourceful. They should have demonstrated their ability to do the job or get it done. They should have the knack for 'finitiative' that is, taking things to a logical end in a time-frame.
- They should have a drive and instinct for initiative.
- The most important characteristic that a candidate should possess and demonstrate to the prospective employer is an insatiable curiosity and a burning desire to learn and deliver.

1. http://nihongobashi.blogspot.com/2007/11/indian-youth-are-simply-unemployable.html
2. Krishnamurthy, V., *Business Line*; http://nmcc.nic.in/pdf/business_line_30apr2007.pdf

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Multiple cropping to increase agrobiodiversity and sequester carbon dioxide

The use of chemical fertilizers in the past 6–7 decades has left the soils less fertile and filled with residual pesticides and other inorganic chemicals. Before the advent of chemical fertilizers we were happy with organic agriculture. One of the main practices in organic agriculture is that this system does not believe in monoculture but strongly advices mixed crops. The advantage of mixed cropping is that it will ensure some income even if one of the crops fails due to pests, diseases, drought or any other natural calamity. If no damage occurs, additional income could be generated from the trees. A few trees planted intermittently or along the borders is part and parcel of mixed cropping and the same would provide some additional income, a boundary, and could harbour birds and other predatory organisms which could check pests. Mixed cropping also promotes agrobiodiversity[1].

Mixed cropping would also absorb more carbon dioxide as higher plant diversity in the form of trees and the main crop would mean more efficient conversion of carbon dioxide to organic form during photosynthesis, thus reducing the chances of global warming and climate change. A few vegetables, fruit-producing trees, legumes, climbers, etc. could all be grown in a unit area with trees providing a boundary. Different designs on the distribution of this kind of plant diversity can be formulated, but the basic idea is to maintain high agro-biodiversity and absorption of carbon dioxide in the atmosphere. Is it not prudent to try this method, i.e. mixed cropping with trees and other plants instead of surrendering to unwanted genetically modified crops? If we can do wonders with existing varieties, is it necessary to pump in money unnecessarily for genetically engineered crops just to show that we have a Department of Biotechnology and that it needs to be kept busy with some fashionable research activities?

1. Shiva, V., Pande, P. and Singh, J., *Principles of Organic Farming. Renewing the Earth's Harvest*, Navdanya, New Delhi, 2004, p. 189.

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Variables unaccounted for in global warming and climate change models

From a personal perspective, Balaram's editorial on 'Carbon dioxide, climate change and geoengineering'[1] resonates at several levels. There is no replacement for wisdom tempered by long experience and deep understanding. His introduction of the subject by describing the activities of Charles Keeling reminds me of lessons learned from my association with Hans Suess in the 1970s, which connect quite strikingly to Balaram's statement,' . . . based entirely on simulations'.

Suess made numerous discoveries of note. For non-exhaustive examples, he co-discovered the shell structure of the atomic nucleus, which won for his colleague, Jensen, a share of the Nobel Prize in physics[2]. In 1957, Revelle and Suess published one of the seminal papers warning of the inability of the oceans to absorb carbon dioxide at the rate being produced, thus leading to the possibility of global warming[3]. Although radiocarbon (^{14}C) dating was the Nobel-Prize winning

discovery of Libby, Suess did much to develop the technique.

Models, also called simulations, are not formulated within the framework of the scientific method, but are built upon assumptions and generally are intended to yield what is being modelled. To paraphrase Box, all models are wrong, a few are useful[4]. Underlying all global warming and climate change models are two fundamental assumptions, namely, that the sun's output is constant and that the energy coming out of the earth is also constant. There are reasons to question the validity of these two assumptions.

One of Suess' activities in developing radiocarbon dating was to radiocarbon-date wood that had been dated by counting tree rings. When Suess plotted absolute (tree-ring) dates against radiocarbon dates, measured in his own laboratory, instead of a straight line, he observed wiggles[5], especially pronounced during the so-called Little Ice Age, ca. 1560–1850. As ^{14}C is produced in the upper atmosphere from solar wind bombardment, to Suess the wiggles meant that the sun's output is not constant and that that variability is reflected in the earth's climate. Solar variability evidenced by 'Suess wiggles' is being confirmed[6].

Models of the earth, based upon the incorrect assumption that the earth in the main is like an ordinary chondrite meteorite, are widespread and have led to the assumption that the heat coming out of the earth is constant. The reason for assumed constancy is that such models are based upon the assumption that the heat exiting earth comes solely from the radioactive decay of long-lived radionuclides, which, on a human timescale, would be essentially constant. But that model of the earth is wrong.

From fundamental considerations, I have shown that the earth in the main is not like an ordinary chondrite, but is instead like an enstatite chondrite[7], which leads to the possibility of the earth having at its centre a nuclear fission reactor[8–10], called the georeactor, as the energy source and operant fluid for generating the geomagnetic field by dynamo action[11]. Unlike the natural decay of long-lived radionuclides, which change only gradually over time, the energy output of the georeactor can be variable[12]. I have also introduced the concept that the earth's dynamics is powered by the energy of protoplanetary compression[13] and suggested a process whereby such energy may be deposited at the base of the crust[14]. There is no reason to assume that the release of stored protoplanetary compression energy would be constant. Such potentially variable energy exiting the earth may contribute not only to variability in the overall heat budget of the earth, but in exiting undersea may affect change to sea-water circulation currents, which may potentially affect the global weather patterns. The degree and extent has not yet been measured[15].

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Mangalajodi wetland: Priority site for conservation

Mangalajodi village with a population of 3088 is located about 5 km from Tangi town in Khurda District, Orissa. It is one of the villages situated along the banks of the Chilika lake and most of its inhabitants are fishermen. Thousands of migratory waterfowls and resident birds visit and breed each year in the wetland marshes of the village. This area is primarily a freshwater zone with marshes, emergent vegetation and reed beds consisting mostly of *Typha angustata* and *Phragmites karka*. This village is connected to the northern sector of the Chilika lake and Kalupada Ghat by way of channels dug through the *Phragmites karka* reed beds. With a length of 1.5 km, the marshes around Mangalajodi, and the open water between Kalupada Ghat and Teenmuhani, attract a large congregation of waterfowls, especially dabbling ducks such as Northern Pintail (*Anas acuta*), Northern Shoveller (*Anas clypeata*), Garganey (*Anas querquedula*) and Brahminy Shelduck (*Tadorna ferruginea*). In addition, the wetland is frequented by Purple Moorhen (*Porphyrio porphyrio*), Asian Openbill Stork (*Anastomus oscitans*), Common Moorhen (*Gallinula coromandelicus*), Grey-headed Lapwing (*Vanellus cinereus*) and many other birds[1]. This site has been recognized as one of India's important bird areas (IBA), which are identified on the basis of a set of internationally accepted criteria. The area is classified under A1 + A4i + A4iii criteria of IBA (A1: the site regularly holds significant numbers of a globally threatened species, or other species of global conservation concern; A4i: the site is known or thought to hold, on a regular basis, ≥ 1% biogeographic population of a congregatory waterbird species; A4iii: the site is known or thought to hold, on a regular basis, ≥ 20,000 waterbirds or ≥ 10,000 pairs of seabirds of one or more species). This is a well-known recognition for the Mangalajodi site after Nalabana Sanctuary of the Chilika Lake and thus further warrants its protection. Spot-billed Pelican (*Pelecanus philippensis*), which is placed in the Near Threatened category of IUCN Red List, is also seen in this site[2].