

'God' in the 'God Particle'

Ever since the discovery or the potential discovery of the Higgs boson or God Particle, the subject has become viral in media, especially for our TV channels. The anchors (although exasperating) would like to link it to the evolution of the universe and further extrapolate to absence or existence of God, science versus religion, etc. and there are mostly studio artists (experts), who could comment on any subject on earth! In my simplistic understanding, it seems to be an important discovery in terms of a particle that provides mass and energy to the other sub-atomic particles on contact, thus answering the question of how these particles would have acquired mass. But, I am sure that the discovery of Higgs boson particle would not have attracted so much attention, had not 'God' been associated with it! I am a practising scientist, biologist, in the profession for over 50 years and till a few years ago, I was giving talks on subjects in the realm of genes and consciousness. I have been intensely introspecting over the years on the scope of science to explain consciousness and the net result is that I stopped giving such lectures, now confining to mundane topics such as malaria and biotechnology!

Science has indeed contributed greatly to the progress and welfare of the human kind in every possible way, although there has always been a potential for misuse. In a way, material progress would not have been possible without science and its potential to address issues of deprivation in society is immense. But, I do believe that science has a limitation. One of the panelists in a TV debate was emphatic that science does not accept the existence of soul. This comment looked rather superficial, as there is intense modern research activity to explain consciousness, which is re-

ferred to as soul by believers. Almost every aspect of the life process can today be explained by chemical reactions, molecular assembly and neuronal networking, with DNA providing the blueprint and the environment bringing about epigenetic changes. It is equally clear that we cannot assemble life by putting back all these molecules. One can get heart cells to beat in culture or create an organ in the test tube or change one bacterium to another by incorporating even synthetic DNA with information from the latter. But, all these would not qualify for infusing 'life' into the target as we understand it and it is a mystery. All these experiments have to start from a pre-existing living cell as the recipient or donor. Similarly, at the cosmic level one can ask the question, what was there before the Big Bang? If all the energy was confined to an atom, how did that arise? This question can be repeated endlessly reaching to the point, I do not know. I am not able to find a rational explanation for the process of origin and execution of the thought process or consciousness. While gene architecture and neuronal networking may influence action at the level of execution, which is what one sees, free will appears to be beyond explanation. Does the veena generate music or the artist? If the string snaps, there is no music, but the artist has an alternative.

Has there been an origin and how did it come about? This is where one thinks about design. I am sure rationalists would immediately jump to debunk the intelligent design theory. But, I am not able to accept that life is by chance. At the cosmic level with millions of stars and galaxies on their own path and at the cellular level with millions of reactions taking place, there has to be perfect regulation according to design; otherwise, the

universe would have collapsed. Even a minor interference with cellular regulation leads to disease. There is a mini design at every step and a grand design overall. The question is whether there is someone up the sky doing the design. Self-assembly is an escape route, but is it directed or evolves by experimentation? The entire cosmos functions according to design. The *Gita* would define this design as 'prakruti' (or nature). Spirituality is an intense self-experience to understand this design. Individuals manifest this experience according to their level of understanding. Defining the existence of God as a myth or meditating on a personal God, or offering prayer to retrieve a situation or attending a religious discourse or trying to reach the ultimate through music, is a manifestation of one's own level of experience. I also practice music. I find that while scientific discoveries give excitement, music gives ecstasy! Science has no right to pass judgement, except when people are exploited and cheated in the name of spiritual awakening. My father told me when I was a young boy that the horizon from the seashore is about 3 miles in distance. He also added, 'whenever you reach there, it will be another 3 miles!' The method of science is explicit, whereas spirituality is an intense internal experience that cannot be transmitted. I feel science should keep away from the subject of spirituality and preachers and foundations should not mislead, trying to justify spiritual pursuit through science. I am a confused soul alright, as I still want to do science, given another opportunity!

G. PADMANABAN

*Department of Biochemistry,
Indian Institute of Science,
Bangalore 560 012, India
e-mail: geepee@biochem.iisc.ernet.in*

Teaching in Central universities

A recent editorial¹ and the correspondence² apropos the editorial discussed about the quality of teachers and teaching in universities in India. Let us begin with the final remark from the editorial¹: '... For young researchers, teaching must be a joy, not a chore to be avoided.' The

editorial, despite, not directly commenting on the teaching quality of young researchers, indicates that they like to continue their research with less teaching burden. This being true to a certain extent, there are several constraints to finding a good teacher among young

researchers in the present-level selection process. Besides producing quality students, universities also have the moral responsibility to create/contribute knowledge through novel research to the pool of wisdom. Though Muthuswami² has projected certain valid points that

teachers of the universities are facing, we find hardly any link to the editorial¹. Though we endorse all her suggestions, we disagree that the young researchers are becoming poor teachers only because they are less paid or recognized. We stand by the concept that teaching is an art that only few are blessed with.

As Muthuswami² suggested, pay disparity is a major limitation to retain the best brains in the universities. An Assistant Professor (AP) joining a Central University (CU), despite having the same rank of Scientist-C of a research institutes is paid less Academic Grade Pay (AGP) (Rs 6,000 as against Rs 6,600). There is a drastic difference in the AGP structure and track between APs of CUs and other Indian academic institutes (IISc, IISER, NISER, etc.). The disparity in the salary structure accumulates from there. I find CUs of India are unique in the university system of India, and are at par to the premier Indian institutes under

the Ministry of Human Resources and Development (MHRD). The faculties joining CUs are also at par with those in other prestigious institutes in India and are being selected through a rigorous national-level screening process. The salary structure and promotion of the faculty of CUs, therefore, may be treated like those of other prestigious Indian institutes. Although UGC has 'separate guidelines' for the salary and other benefits of college and university teachers, principally they are the same³.

UGC/MHRD may brainstorm to consider the demand of equating the teachers of CUs with those of other premier academic institutes. UGC could also decrease the number of years required for promotion of an AP to Associate Professor through CAS on the merit basis from 12 to 8 years, which is suggested for direct recruitment of Associate Professors joined in a CU. An AP with several papers and postdoctoral experience is

likely to accomplish the minimum required Academic Performance Index (API) score well before 12 years.

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2. Muthuswami, R., *Curr. Sci.*, 2012, **103**, 249.
3. Anon., UGC regulations 2010; <http://www.abpcinfo.org/govorder/UGC%20Final%20Regulation%202010.pdf> (accessed 20 August 2012).

PALATTY ALLESH SINU^{1,*}
E. PRASAD²
SWAPNA S. NAIR²
M. NAGARAJAN³

¹*Department of Animal Science,*

²*Department of Physics, and*

³*Department of Genomics,*

Central University of Kerala,

Padannakad PO,

Kasaragod 671 328, India

**e-mail: sinupa@gmail.com*

Engineered nanomaterials-based pollution in India

Recent years have seen increased scientific focus on the occurrence of engineered nanomaterials (ENMs) in the environment and their associated ecological and human health risks^{1–4}. These ENMs have become emerging contaminants (ECs) due to our improved analytical capability for detecting them in the environment, availability of preliminary information on their ecological and health risks and increasing regulatory and public awareness. Due to increased presence of ENMs in commercial products, a public debate is emerging on whether the environmental costs of nanotechnology outweigh its benefits. Similar to other countries, consumption of products consisting of ENMs has been increasing in India^{5,6}, indicating that there might be a possibility of these ENMs in their original form or in aggregated form or in derived form reaching the surface water bodies, air and soil media. These ENMs have also been reported to be biomagnified in the food chain, one of the causes of the presence of ENMs in food chain. Given these implications of the presence of ENMs in the environment, few research efforts (for example, toxicity of nanoparticles to the bacteria and cell lines; synthesis of nanoparticles and

nanomaterials for biomedical applications, etc.) are underway in India to understand this issue. However, information on the presence of ENMs in the environment in a structured manner is not available for the Indian environment², limiting any efforts towards understanding the associated risks to environment and human health. Knowledge on the occurrence of nanomaterials in the Indian environment and the associated risk management lags far behind when compared to the developed countries and needs immediate action.

Thus there is a need for concerted efforts from all the stakeholders involved (i.e. participation and action from academia, industry, government and public). Academia needs to pursue research to develop analytical methodologies for detecting and monitoring ENMs in the environment. Government and industry should encourage these research efforts in terms of providing monetary and infrastructure support for getting long-term benefits in terms of better human health and less environmental pollution. The findings of research and industrial projects need to be communicated to the public to make them aware about the benefits and costs of the presence of

ENMs in different products intentionally or unintentionally. Thus all the stakeholders need to come together for initiating research efforts and public communication simultaneously for improving risk perception of the public towards ENMs.

1. Kumar, P., Kumar, A., and Lead, J. R., *Environ. Sci. Technol.*, 2012, **46**, 7071–7072.
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3. Wiesner, M. R., Lowry, G. V., Alvarez, P., Dionysiou, D. and Biswas, P., *Environ. Sci. Technol.*, 2006, **168**, 4336–4345.
4. Westerhoff, P., Song, G., Hristovski, K. and Kiser, M. A., *J. Environ. Monit.*, 2011, **13**, 1195–1203.
5. The Energy and Resources Institute (TERI). Project Report No. 2006ST21: D5, 2009.
6. Jayanthi, A. P., Beumer, K. and Bhattacharya, S., *Economic and Political Daily*, 2012, vol. 47.

S. BARANIDHARAN
ARUN KUMAR*

*Department of Civil Engineering,
Indian Institute of Technology Delhi,
Hauz Khas,
New Delhi 110 016, India*

**e-mail: arunku@civil.iitd.ac.in*