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EXCITEMENT IN PHYSICS : MYTH AND REALITY

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U.S. Kushwaha has highligthed in his article[1] the ways and means to make teaching and learning of physics exciting. Surjeet Singh has given a different version[2] of excitement in Physics by quoting lyrics based on theory of relativity. Personally speaking, I was also motivated to opt for physics after reading a popular science book 'The Universe and Dr. Einstein' by Lincoln Barnett during first year of my college days.

Both Relativity theory and Quantum Mechanics are revolutionary theories in form and content. The twentieth century physics is nothing but the impact of these theories on explaining natural phenomena in a conceptually new frame of reference. The genius of P.A.M. Dirac combined both these theories into Relativistic Quantum Mechanics and opened new vistas in physics, what we call antiparticles/antimatter. The search for Elementary Particles became a challenge for experimental physicists in the beginning of this century with the discovery of electron and proton by Sir J.J. Thomson of Cambridge university. There was a 'golden rush' for discovery of predicted particles during sixties when accelerators started smashing protons and nuclei to create exotic particles. So much so, it was a joke to predict new particles and then to discover them within a week in cosmic rays or in accelerator laboratories. There was so much excitement in physics during the last 50 years of this century. However, this excitement is phasing out at the threshold of twentyfirst century. Let us look into the reasons thereof.

Twentyfirst century belongs to Life Sciences (Genetics & Biotechnology, in particular) and Information Technology. The scenario has changed rapidly and Physics is loosing ground to these emerging thrust areas. In a way, physics has reached its plateau both in theory and experiment. Almost all predicted elementary particles are discovered and the time limit for discovery of Higgs Bosons is already fixed up: 2005 at LHC accelerator at CERN, Geneva. Standard Model, with its limitations, will explain the structure of matter. We had almost reached the limit in exploration of space. Nuclear energy is already a saturated field. Innovations are possible only in Material Science but it belongs to technology. So, the younger generation no more feels attracted to pursue Physics as a career.

How to rectify this situation? Some sane voices[1-4] are heard in IAPT Bulletin. It is heartening to learn that all those who qualify in Physics Olympiad will be offered scholarships upto M.Sc. level. They will be recruited to BARC Training School directly, if they keep up their performance upto a mark. The role of IAPT in Physics Olympiad is well known and the credit goes to Prof. Arvind Kumar of Homi Bhabha Centre for Science Education for getting this concession from Dr. R. Chidambram, Chairman, DAE. I have pleaded in my articles[5,6] to remove the anomalies in the pay scales of research scholars and lecturers at the college and university levels. A JRF with NET qualification gets a salary which is only half of a lecturer's salary and there is no job guarantee even after completing his Ph.D. degree. *Unless we raise the status of researchers in this country, Science education will remain in doldrums and India will not be able to compete with developed countries.*

To be fair to our students, let us look into some of the de-excitements in teaching and learning of physics. I have highlighted some of these notions in my previous article[7]. In general,

physics is considered dull and boring, i.e., abstract and beyond the reach of an average student. It is so much loaded with mathematics that the beauty of physical concepts and discovery aspects are over-shadowed and eclipsed by complex mathematical equations. I was comparing Physics text books of a Canadian High School and those prescribed by Indian School Boards of various states. There is a lot of difference in presentation of textual material without involving mathematics. Of course, our teaching methods also need a revolutionary change as suggested by Kushwaha[1] & Popli[3].

Our system is extremely rigid and examination oriented. It kills initiative, innovation and creativity of the students. There is little to choose by students to cater to their needs and tastes. All are bound to study the same prescribed syllabus & courses. For example, as a student, I was very keen to study Relativity theory and Elementary Particles but I hated Classical Mechanics and Electronics. In my research career, I used only a fraction of my knowledge gained at M.Sc. level. We are teaching too much; almost choking our students at school, college and university levels and they are hard pressed to cram and mug up all without digesting properly. IAPT need to take up cudgels to retrieve the situation.

References

1. U.S. Kushwaha, IAPT Bulletin 17(1), 11, 2000.
2. Surjit Singh, IAPT Bulletin 17(2), 56, 2000.
3. R. Popli, IAPT Bulletin 16(9), 261, 1999.
4. Surjeet Singh, IAPT Bulletin 17(3), 95, 2000.
5. H.S. Virk, Current Science, 74(5), 397, 1998.
6. H.S. Virk, University Today, 18(4), 7, 1998.
7. H.S. Virk, IAPT Bulletin, 6(10), 267, 1989.