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'The right people are there, now it's a matter of time'

Anthony James Leggett, *professor of physics at the University of Illinois, Champaign-Urbana, US, won the Nobel prize for physics in 2003 for his earlier work on superfluidity. Of late, he has done pioneering work in the exciting new field of quantum computing and cryptography exploring the boundary between the strange, counter-intuitive world of elementary particles and the 'classical' world that we perceive with our senses. He spoke to* ***Subodh Varma*** *recently in Kolkata where he was attending a conference on quantum entanglement organised by the S N Bose Institute for Basic Sciences:*

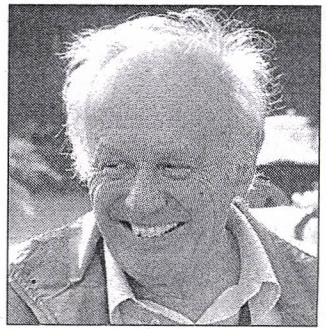
Q&A

■What is your family background?

Well, on my father's side, my forebears were cobblers in a village in Hampshire, UK. But my paternal grandfather opted to become a greengrocer. My maternal grandmother, who was Irish, worked as a domestic servant since a young age. Both my father and my mother were the first in their families to get a university education. In fact they met at university. They became schoolteachers in London. I studied in the local school and then got a scholarship to Oxford. I was interested in academics but not in science. I took my first degree in arts from Balliol College, and then later a second degree in physics at Merton College. I taught in Sussex for some time and then shifted to the US semi-permanently in 1983. I have been at Champaign-Urbana since then.

■What is the connection between superfluidity for which you got the Nobel and quantum entanglement?

It's a rather marginal connection really. In some superconductors and in Fermi superfluids like Helium-3, for instance, a Bose-Einstein condensate is formed between an entangled pair of particles. I developed an interest in quantum mechanics, especially entanglement in parallel.



■What are you working on currently?

I'm trying to understand low temperature superconductivity as well as quantum computing and topological insulators, although i haven't contributed much to the latter field. There's another project of mine with an Indian collaborator from IIT, Kharagpur. It is concerned with low-temperature properties of glass, which is a neglected subject, but it is very important.

■Is it correct that a new quantum age is beginning?

Certainly. There are a number of tasks that were earlier impossible to perform using classical means but they are possible now using quantum entanglement. Certain kinds of quantum cryptography are an example. Completely secure cryptography is now possible using quantum entanglement. Admittedly, there are other quantum mechanical schemes that don't involve entanglement but its use is particularly elegant. Even ideas like 'pseudotelepathy' and 'teleportation' are now beginning to take shape in reality, in the sense that people have done experiments and shown that these ideas work. And certainly quantum cryptography works in real life. People have used it to send election results and i would guess that it is being used quite seriously by the military.

■What is your impression of India's role in this field?

There are individuals in India who have made substantial contributions to quantum mechanics in general and quantum entanglement in particular. Many Indians are working in the field, some on the theoretical front, like Prof Arvind of the Indian Institute of Science Education and Research, Mohali, and others on the experimental front, like Prof Anil Kumar of the Indian Institute of Science, Bangalore. It is not the kind of field that requires huge resources for experimental equipment. My impression is that the Indian educational system is not that bad in selecting good people and giving them appropriate training. So, we can look forward to more contributions in the future. The right people are there, now it's a matter of time.