

Q: The existence of the Higgs boson particle is a key to explaining why there is mass in the universe. What does the significance of this discovery mean for the layman?

Now that the Higgs particle has been discovered, we can say with confidence that we have a precise picture of the smallest building blocks of matter and the forces between them. There has been a long-standing puzzle about why some particles, like the particle of light called the photon, have zero mass but other particles, like the electron, do have mass. So, yes all the fuss - and the \$10 billion that went into building the world's largest atom smasher - was well worth it.

Q: What exactly was the contribution of Dr. Abdus Salam to the discovery of the Higgs-Boson particle?

Peter Higgs of Edinburgh University had discovered in the 1960's a very general principle by which elementary particles could go from being massless to having mass. But it was just a nice mathematical idea and no one knew what this had to do with the actual particles that constitute the world we happen to live in. Then, working separately on different continents, Steven Weinberg and Abdus Salam realized that if a Higgs particle of the right kind actually existed then everything about particles like the electron and quark could be understood within overarching theory. Their theory is called the Glashow-Salam-Weinberg model, or "Standard Model" of particle physics. This is just about the most important discovery in physics in the last 40 years. (Sheldon Glashow of Harvard didn't have anything to do with the Higgs particle; his Nobel Prize work was important in a different way.)

Q: What about Satyendra Nath Bose? Do you feel that he has been ignored by the international press after the discovery of the Higgs boson particle?

No, I don't feel that Bose has been ignored. He was a great Indian physicist who identified a broad class of particles in the 1920's that were later called Bose particles or bosons. But he did not have anything directly to do with last month's discovery.

Q: Now that the Higgs has been discovered, is it the end of the road? What remains to be discovered?

The discovery was nice because the last piece of the Standard Model has been found more or less where it was expected to be. But we still don't understand how the force of gravity fits into the picture, or why some quarks are heavy and others are light. We also suspect the existence of an entirely different set of particles called supersymmetric particles. There is a whole lot more to know.

Q: Why is Dr. Salam's contribution not recognized in Pakistan? Who do you hold responsible for this?

Obviously it's because of religious prejudice. Add to that the boorishness of our political leaders. Benazir Bhutto refused to meet him in 1989. I know, because I was with Salam that day in his hotel room in Islamabad. He had come all the way from Trieste and was very disappointed when Benazir's personal assistant rang up to say she did not have time. Nawaz Sharif omitted his name from the list of distinguished alumni of Government College Lahore. Curiously, Ayub Khan and Zia-ul-Haq were the only leaders who recognized Salam. Zia gave Salam the Nishan-e-Imtiaz in 1980 after he had got the Nobel Prize. Of course, Zia pretty much had to do that because India had awarded him its national prize and it would have looked very odd otherwise.

Q: Don't you think his colleagues like you should come forward and tell the nation about the great work done by Dr. Salam in the recent discovery?

Several of us have. Before it had a name, we tried to get the National Centre for Physics in Islamabad named as the Abdus Salam Centre for Physics. Its first director was Professor Riazuddin, who was Salam's student and is a distinguished physicist. He tried too but the authorities refused.

Q: Can tell me about your association with Dr. Salam. I heard that you had worked with him. Can you tell in detail?

I was never a student of Salam's but I got to know him fairly well after 1984 when I visited the International Centre for Theoretical Physics (now renamed after Salam, its founding director) in Trieste. We discussed many things, and he was kind enough to write the preface to my book on Islam and science. Later, he asked me to write the preface to a book by some other scientists on a different subject but I didn't feel comfortable doing it alone. So we wrote it together.

Q: What will it take for Pakistan to produce scientists like Dr Abdus Salam?

Nature endows certain individuals with exceptional qualities and Salam was exceptionally fortunate. His mathematical abilities were phenomenal. But less gifted people can also become reasonably good scientists given a stimulating intellectual environment. In Pakistan, unfortunately, the conditions for developing science are not good. Science is all about intellectual freedom and questioning the basis of ideas. It requires that people accept the scientific method, which puts logic and observation above preconceived ideas. These conditions are not fulfilled in Pakistan or in most Muslim countries.

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