

My Encounters With Abdus Salam

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The year was 1972 and all the big guns of physics had turned up to hear Professor Abdus Salam speak at a joint MIT-Harvard seminar. It was rare for so many of the famous to come, but this was no ordinary seminar and here was no ordinary speaker. Salam confidently navigated this arena, the graveyard of many a bold idea, presenting his work and easily disposing of the questions which followed. I understood little of what he said; as a mere master's student in physics, I was far too unknowledgable. After the applause had died down and the seminar was over, I momentarily thought about introducing myself but could not summon the courage.

My second encounter with Salam was no less daunting. I had just finished my Ph.D. in nuclear physics and was visiting the International Centre for Theoretical Physics in Trieste, Salam's proud creation. One day we happened to be in the same elevator. After introducing myself, I asked him for advice on a physics matter that was occupying my mind then. "Go read it in a book", was his curt reply. I was mortified. People told me later that asking him easy questions was looking for trouble.

It was not until many years later – 1984 to be precise – that I approached Salam again. This time it was different. Perhaps he had mellowed, or maybe I was slightly less ignorant now. I could now discuss with him many issues, ranging from scientific ones to philosophy and Pakistan's scientific development. He didn't insist that I always agree with him, but clearly preferred that I did. One day he asked me if I would like to co-author an article with him. I instantly accepted, feeling much honoured.

Strong, assertive, enthusiastic, vibrant, bluntly authoritarian, and with a mind sharp as a razor's edge, Abdus Salam was a most remarkable person. Born in a lower middle-class family in a village near Jhang, he went to a perfectly ordinary Urdu-medium school. One of his brothers, who now lives in Islamabad, says that as a boy Salam had never seen an electric light until one day he was told about it by somebody, at which point he was wonderstruck. Subsequently, he was delighted to go to Lahore and have the exquisite pleasure of studying under an electric light. An unsophisticated home and environment notwithstanding, this child prodigy mastered his

studies and rapidly outpaced his teachers who recognised and respected the young boy's talent, and bore him no grudge.

Salam's talent for physics and mathematics soon brought him fame and recognition after he set off to England on a scholarship. In 1949 he earned a first-class degree in physics from Cambridge University in just a year. Then in 1950 he solved an important problem in renormalisation theory and instantly became a minor celebrity. In 1951 he returned to Government College, Lahore, but found to his disappointment that research was not encouraged, even frowned upon. Without a library or colleagues to talk to, he reluctantly went back to Britain in 1954.

By the early '60s, Salam was already one of the world's top particle physicists with an enviable reputation in this most difficult and fundamental area of science. In all he was to win 20 international prizes and honours. Salam started to skilfully use his growing reputation to push his European and American colleagues into supporting his dream of a major centre for physicists from the developing world. With his unhappy period at Government College at the back of his mind, Salam wanted a place where third world physicists could practise the advanced science of the West without being forced to become part of the brain drain, as he himself had been. In 1964, supported by the International Atomic Energy Agency, Salam succeeded in setting up the ICTP in Trieste, Italy.

How great a scientist was Salam? This is an important question because in our country one has to chart a delicate course between the Scylla of adulation and hyperbole, and the Charybdis of stupidity and prejudice. An honest answer is made still more unlikely because there is no community of scientists in Pakistan which can understand and sensibly evaluate his work.

The truth is that Abdus Salam was not Isaac Newton or Albert Einstein or Richard Feynman; he never claimed otherwise and would have felt deeply uncomfortable if someone else had claimed this for him. But his achievement of unifying two basic forces of nature has had greater impact upon the development of physics, and is deeper and more profound, than the works of most other Nobel prize winners in this century. Today unification theory is a touchstone of modern physics. Although it is not Salam's only

important work -- the full spectrum is much too broad to cover here -- it certainly is his most important one.

It took me many years to appreciate the delicate complexity and marvellous mathematical symmetry of Salam's theory. It is difficult to explain it in ordinary language for the reader. An analogy, however, may help. Over a century ago the Scotsman, James Clerk Maxwell, showed that the two apparently different phenomena of electricity and magnetism were in fact just different facets of the same basic force, which he called the electromagnetic force. Maxwell's discovery led to an unending stream of other discoveries, such as the existence of radio waves, which have had profound consequences for human civilisation.

Somewhat similarly, Salam was able to show that two apparently very different forces which govern nature have the same mathematical origin. One is the electromagnetic force mentioned above. The other is the "weak nuclear force" which, among other things, is that force which causes the sun to convert its hydrogen into nuclear energy. Although there were suspicions that the two were somehow related, nobody could pin-point in mathematical terms the precise relation until Salam (from Trieste and London) and Weinberg (from MIT), working independently of each other, came up with a sound explanation almost simultaneously. Now called the electroweak force, it has been tested in dozens of clever experiments and has passed with flying colours in each. Today the search for the "Higgs" particle, predicted by Salam, is considered the number one priority in the world of physics. Billions of dollars continue to be spent on building accelerators with energies high enough to produce this highly elusive particle. Its discovery will be a key to understanding the universe in its early stages of birth.

What relation did Salam see between his work as a scientist and his religious faith? Did he perceive the two to be inextricably intertwined? Or did he see science as a secular activity which could comfortably go about its own merry way?

Considerable confusion exists on this matter among admirers of Salam. This is partly because many non-scientists wishfully look towards Salam's writings and speeches, reading into them what appears to support their own beliefs, prejudices, and desires. Also confusing is the fact that Salam, who was a believer not just by birth but also by conviction, often

quoted profusely from the Holy Book in addressing lay audiences and sometimes used religious symbolism in his descriptions of scientific concepts and discoveries.

Several of Prof. Salam's writings and speeches leave room for ambiguity of interpretation. For example, in one of his important essays for a popular audience, Salam refers to the concept of *wahdat-ul-wajood* while discussing the unification of forces. Then, in a television interview he speaks of how he was inspired into the concept of field symmetry by the stately minars of Badshahi Mosque. I can remember attending a lecture that Salam gave at General Talat Masud's invitation in Wah (1987?). He talked about the world being quite probably 11 dimensional, and then perhaps hinted that 7 of these dimensions might belong to the *ghaib*. Time has effaced the words from my memory, but I do recall feeling quite uncomfortable. Being a rather simple person – simple-minded perhaps – attempts to marry scientific discovery with spiritualism or religious concepts always leave me very worried. Was this one such attempt?

If it was, then it could have scarcely come at a worse time. During the Zia-ul-Haq years, every pseudo-scientist and crackpot in this country had taken a shot at proving that all discoveries of science were to be found in the Holy Quran. Some had made “discoveries” about the speed of a receding Heaven, others estimated the temperature of Hell, and one even suggested capturing Jinns to solve Pakistan's energy problem. While they roundly despised Salam for his Ahmedi faith, these scientific nonentities were nonetheless delighted that they had found an ally in a Nobel Prize winner who also believed in the unity of science and faith. Or so they thought.

Clarification became very important. Over the Zia-ul-Haq years, I had written a book which emphasised the wholly secular character of modern science, detailed absurdities of the so-called new “Islamic Science”, and made the case that the long and glorious period of Muslim science was ultimately terminated by the rise of an inflexible religious orthodoxy. Would Professor Salam write a preface to this book and comment upon a viewpoint that was so different from his? What was the relevance of his belief in *wahdat-ul-wajood* given that Steven Weinberg, the co-discoverer of the same Electroweak Unification theory, was an ex-Jew and a declared atheist? I presumed that Salam would react against many parts of my book,

although not the whole, but had suggested that his dissimilar views would be welcome as a means to balance an otherwise one-sided analysis.

Professor Salam's response left me pleasantly shocked. *"I do not disagree with anything that Dr. Hoodbhoy has written in this book"*, he wrote in the preface, and then went on to state in the clearest and most unequivocal terms the irrelevance of religious beliefs to scientific discovery: *"Dr. Hoodbhoy quotes Steven Weinberg's and my research and says that it made no basic difference to our work whether I was an "avowed believer and Weinberg an avowed atheist". I can confirm that he is right. We were both "geographically and ideologically remote from each other" when we conceived the same theory of physics for unifying the weak and electromagnetic forces. If there was any bias towards the unification paradigm in my thinking, it was unconsciously motivated by my background as a Muslim."*

Certainly, Salam's integrity and intelligence did not permit his beliefs, or matters of personal preference and ego, to determine the outcome of his scientific work. The creator of Electroweak Unification never, for example, claimed that this theory was the last word; he spent much of his years after 1968 seeking routes for a more complete vision of physics. But his religious beliefs and cultural background deeply influenced the course of his life. These became more important as he grew older. Sometime in the 80's he began signing himself as "Mohammed Abdus Salam". At the one level he sought peace, tranquillity, and inspiration, in contemplation and prayer. He became persuaded that the Holy Quran demands man to seek scientific truth, and that man has been uniquely empowered to solve the deep mysteries of the universe. At another level, he became an intrepid fighter for the cause of even those who would have nothing to do with him.

Intensely proud of the Muslim contributions to science and civilisation, and upset at how they are usually forgotten or side-lined, Salam would gently but eloquently admonish Western audiences for their ignorance. Significantly, he began his Nobel Prize speech about the travel of the Michael the Scot to Muslim Spain in the search for knowledge; in those days the lands of Islam were the sole repositories of learning. Before Muslim audiences he would make passionate exhortations that Muslims should re-enter the world of science and technology before they became utterly marginalized. Nothing hurt him more than the stony barrenness of

the intellect in Islamic countries today. He was deeply mortified, he recalled, when a Nobel Prize winner in physics said to him: “*Salam, do you really think we have an obligation to succour, aid, and keep alive those nations who have never created or added an iota to man’s stock of knowledge?*”

Salam’s epoch-making achievements as a scientist stand in stark contrast with his dismal failure to bring science back to Islam. It was not for lack of trying, but nothing ever really worked. The Islamic Science Foundation, a grand scheme for scientific advancement with an endowment of \$1 billion collected from oil-rich countries, came to nought after Salam was banned from ever setting foot in Saudi Arabia. Kuwait and Iran did give some money for supporting their scientists at the ICTP, but the amounts were niggardly. Promises by kings, princes, and emirs remained promises. Salam’s efforts did contribute towards creating at least some of the score or so organisations whose *raison d’être* is to accelerate science and technology in Muslim countries. But these organisations provide nothing but cushy jobs for those who sit at their helms, and they are no more than litter on the landscape today.

Salam died on the 20th of November 1996. He was buried, according to his request, in Pakistan. No minister or high government official attended his funeral. For the Islamic world, deep in medieval slumber, it was a non-event.

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