

A Review of **Cosmic Anger** by Gordon Fraser for “*Physics Today*”

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“There was no electricity in the town of Jhang in those days, so I would fill the oil in the lantern as *bhaijan* (elder brother) studied for his matriculation exams”, mused Abdus Salam’s younger brother, now dead, as he recalled to me the humble semi-rural origins of Pakistan’s greatest scientist. The studious young Salam, who was to see an electric light for the first time when he left to study in Lahore, was destined to win a Nobel Prize in physics and to found the International Centre for Theoretical Physics in Trieste.

By the early 1960’s, Salam was already among the world’s top authorities in particle physics. At 31, as the youngest ever professor of theoretical physics at London’s prestigious Imperial College, Salam soon pushed Imperial into the very forefront of research. Under his prodding, group theory was applied for the first time to classify existing particles and predict new ones. One of his students, Yuval Ne’eman, was the codiscoverer of “the eight-fold way” of classifying baryons, with Murray Gell-Mann. Another, Ronald Shaw, discovered the non-Abelian gauge theory independently of C. N. Yang and Robert Mills. Salam’s own research ranged far and wide – electroweak unification, proton decay, supersymmetry, and more.

Gordon Fraser’s biography of Abdus Salam, enigmatically titled *Cosmic Anger*, is immensely engaging. Well stocked with vignettes, Fraser brings up anecdotes that will surely titillate physicists. For example, Wolfgang Pauli, the universally acknowledged Chief Justice of Physics, peremptorily rejected the young Salam’s proposal that parity could be violated and neutrinos were left-handed. His condescending advice that Salam should “think of something better” was ultimately retracted. But his apology came too late; T.D.Lee and C.N.Yang had already got their Nobel Prize for parity violation.

We learn that Salam’s Nobel winning work – electroweak unification – caused barely a ripple initially. His talk at the Nobel Symposia in 1968 was considered so unremarkable that Murray Gell-Mann, probably the smartest possible conference rapporteur, did not bother to refer to it. Steven Weinberg, who had published an essentially identical work in 1967, faced a similar situation; the Science Citation Index records zero citations for the next three years with the only citation in 1970 being Salam’s.

Until a neurological motor disease put an end to his life in 1996, Salam was relentlessly driven by three passions: an urge to excel in physics, the desire to put Pakistan on the high road to prosperity through science, and a missionary zeal to revive the sciences in Islam. With prizes, awards, seminars and meetings, the world of physics immortalized Salam. But with his country, and the world of Islam, it turned out to be very different.

In earlier years, Salam had been hugely influential in Pakistan. Seen as a kind of cultural amphibian equally at home in Pakistan and in scientific circles of the West, Salam became the chief scientific adviser to the President. He labored hard to set Pakistan on the road of high science. But 1974 marked the turning point when, by a decision of the

Pakistan's national assembly, the Ahmediyya sect of Islam was declared heretical. Salam, a strong believer, resigned his official position.

Subsequent years saw Salam fail dismally in bringing science to Pakistan or to Islam. The Islamic Science Foundation, a grand scheme for scientific advancement with a projected endowment of \$1 billion collected from oil-rich countries, came to nought after he 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 is uncelebrated in Pakistan today.

For all its marvellous anecdotes, Fraser's book has a definite hagiographic tinge. Difficult issues have been skipped.

For example, the book does not explore Salam's relationship with the development of Pakistan's atom bomb. This relationship was, in fact, deeply ambiguous. On the one hand, his public profile was that of an internationalist and a man of peace. Indeed, many Pakistanis – such as Dr. A.Q.Khan and fundamentalists of the Jamat-i-Islami party – directed virulent propaganda against Salam both for this reason and because of his Ahmadiyya faith. They alleged that he had done nothing to help make the bomb and, in fact, had actively subverted it. But the fact is that Salam had played a central role in setting Pakistan on its nuclear trajectory. His help extended even beyond 1974 although it petered away a few years later.

Some future biography should take up seriously the relation between Salam as a scientist and Salam as a believer. Did he take science and religion to be separate, or inextricably intertwined? Certainly, Salam's integrity and intelligence did not permit his beliefs to determine the outcome of his scientific work. But some of Salam's writings and speeches leave room for ambiguities. For example, in a popular essay, he refers to the *sufi* 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 $SU(2) \times U(1)$ symmetry by the stately minarets of Lahore's famous Badshahi Mosque. I can remember attending a lecture (c. 1987) in Pakistan where he talked about the world being quite probably 11 dimensional (M-theory), and then 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.

Salam's religious beliefs and cultural background deeply influenced the course of his life as he grew older. Sometime in the 80's he began signing himself as "Mohammed Abdus Salam", as in his preface to my book on Islam and science. He increasingly sought peace and tranquillity in contemplation and prayer. As the end approached, his faith grew stronger. But so did his distress and difficulty in coping with death. His former student Fayyazuddin told me: "Each of us is a dot on the fabric of time. Each of us dies alone...After seeing Salam, I had a feeling that somehow inner peace has eluded him."

This is a wonderful book about a complex, gifted man. Even if incomplete, it is strongly recommended.

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