

An Interview with Prof. Pervez Amirali Hoodbhoy

Panel: Sir, please tell us about your early days, when and where were you born?

Dr. Hoodbhoy: I was born in 1950 in Karachi, so I am 57 years old now. I went to Karachi Grammar School (1955--1968) and then in 1969 I went to MIT. There I obtained a BS (Mathematics, 1973), BS (Electrical Engineering, 1973), and MS (Solid State Physics, 1973). Thereupon I returned to Pakistan and started teaching at Islamabad University (now known as Quaid-e-Azam University), but left in 1975 to begin my Ph.D in nuclear physics at MIT. I completed the degree in 1978 and returned immediately to my job at QAU.

Panel: Why did you switch your career from engineering to pure physics?

Dr. Hoodbhoy: As a boy, I had a great fascination for everything to do with electricity and magnetism. So I'd play with batteries, coils, springs and make various gadgets. Although few young people today know what they are, Meccano sets were popular 40 years ago and they absorbed my remaining free time. So my interest developed to the point that I made my own crystal receivers, then constructed super heterodyne receivers, radio transmitters, etc. I went to MIT to pursue this passion of mine. But there I was in for a surprise. The world was much bigger and more interesting than I had ever thought. There I encountered teachers who were at the very cutting-edge of science and who had developed great ideas which are nowadays contained in text books. Electrical engineering, or any engineering for that matter, began to look so small and unimportant compared to pure physics. One exceptionally inspiring teacher was Prof. Philip Morrison, who had polio from childhood. He came to lectures in his wheel-chair. He was among those scientists who had discovered how stars get their energy, why they blow up, why some turn into pulsars and black-holes etc. When he spoke on the nature of space and time, nothing seemed grander than physics. Slowly engineering slipped out of my mind. I came to realize that physics is beautiful: beautiful because it is simple. One is able to write down fundamental laws governing every kind of physical phenomena in the form of just a few equations. Though they are complex and difficult to solve, nevertheless the very thought that the whole universe can be reduced to a few equations gave me an idea of the

enormous power of physics. I was faced with a choice: should I spend my life understanding electrical devices and learning to make better ones? Or did I want to learn about something really grand? Ultimately I decided that that my life would be better spent doing physics.

Panel: Why do students in Pakistan not pursue careers in pure sciences like physics, mathematics, chemistry, biology? We see that the best students go into medicine, engineering and civil services. How can this trend be changed?

Dr. Hoodbhoy: Yes, it is indeed a sad truth that the best students go that way. Generally those who cannot get admission elsewhere come to pure science. This tells you what the image of pure science is, and how unattractive it has become. I think this is due to the terrible way we teach science at the elementary and secondary level. The emphasis is on remembering facts, not learning. But science is all about questioning, solving small and big problems, and being able to understand as well as apply laws and principles. To become a successful scientist, science has to become a part of an individual's mental machinery. If you only teach solved examples, then the student cannot solve new problems. Our teachers make science such a boring thing that students do not find it challenging or exciting. Hence the science-phobic generation we see in Pakistan today.

Panel: How do you explain science?

Dr. Hoodbhoy: Science is the search for causes that underlie physical phenomena. It seeks to establish a quantitative relationship between cause and fact. Prediction is fundamental to science. Unless one can say something new – such as predicting the appearance of a hitherto unobserved comet or the result of knocking out a sequence from a DNA molecule – everything is woolly woolly. (At this point Dr. Hoodbhoy explained his concept of science with a very interesting example on development of the ideas of expansion of the universe, and how experiment corroborated the predictions of Einstein's theory).

Panel: How do you define science in a single word?

Dr. Hoodbhoy: Science is the process of acquiring a body of knowledge under a very definite set of rules that combine reason and logic with observation and experiment. It is about “going from the known to the unknown”.

Panel: You have put a lot of efforts in creating awareness about science among the general public and youngsters by utilizing the electronic media. What do you think about the idea of a television channel dedicated to science and issues regarding it?

Dr. Hoodbhoy: I think it is an excellent suggestion, but I would be happy to have even one hour on the present channels. The reason your idea won't work is that we have no expertise in production of science video materials. I wish there was because I think our youth really wants and deserves knowledge oriented media. They don't really want to watch dramas and movies all the time. Programs made in Urdu – not simply dubbed ones such as National Geographic and PBS – are especially important because they would be understood all over the country. Foreign documentaries and programs simply don't have the impact of locally made ones. I also wish that professors would go to colleges and schools to enthuse children about science. In India there is a huge popular science movement that is energetically spread into villages for creating awareness among the masses about science. Until and unless we do the same, Pakistan will not have a flourishing society and science will be restricted to just some institutes and universities.

Panel: University and college teachers are not given their due place in our society. They are not well respected. What do you say about the situation of teaching, and of teachers in Pakistan?

Dr. Hoodbhoy: Respect has to be earned – it cannot be simply dished out. Our teachers are not respected because most really do not care about their work, or have a good enough understanding of their subjects. Teacher salaries in Pakistan are high (even if one discounts the huge recent increases) compared to the South Asian region (India, Bangladesh, Iran, China etc). But in terms of quality, I think the average here is lowest in the entire region. The reasons are complex: lack of checks-and-balances, toleration of academic corruption, overemphasis of religious ideology, and absence of good academic leadership.

Panel: Why did you come back to Pakistan even when you had prospects of a brighter career abroad? Any regrets?

Dr. Hoodbhoy: No regrets at all. I came back because I was very angry at America. I simply did not want to live there. Forty years ago I was witness to the huge political upheaval in the US. American students were staging protests against their own government over its war in Vietnam. As a politically naïve middle-class Pakistani youth, it seemed totally unbelievable to me that the people of a country should protest against their own government and that too when it was at war. I had never seen people follow their conscience in this way. The anti-war movement made me realize that the US was an imperial power, and had to be resisted. On the other hand, there was the slaughter in East Pakistan being carried out by the West Pakistani army which also made me very angry. Then, around the same time, there were also a socio-political movement in Pakistan that promised justice for the masses. It was initiated by Zulfikar Ali Bhutto, who brought revolutionary politics to Pakistan. What happened to him, and how he reneged on his promises, is another story but those were times of hope. I was one of the very many who came back to Pakistan, dreaming of changing everything and replacing feudalistic and capitalistic exploitation with socialism. Although those dreams remained dreams, but I still have hope. Better fighters will surely emerge one day:

QATL GAHON SE CHUN KAR HAMARE ALAM
AUR NIKLAIN GE USHAQ KAY QAFILAY....

(Looking at the picture of Faiz Ahmed Faiz, Dr. Hoodbhoy recited this poet's verse. Another picture that hangs on his office wall is that of the great public intellectual, Dr. Eqbal Ahmed.)

Of course, I do have some regrets: The environment for doing science is immensely better outside Pakistan, and I miss that. Here I have insufficient time for reading, studying, and research because of so many other involvements.

Panel: You have given almost 35 years for the development of science in Pakistan. Where do you see us in the field of science and where do you see yourself?

Dr. Hoodbhoy: Our condition has surely deteriorated. Standards are much lower relative

to when I first started teaching at QAU. But I don't think that the years which I have spent here have been wasted. I have managed to do some physics research and publish papers, although I wish I could have done more. A few of my former students have become excellent researchers and teachers. Some chose to remain the US or Europe. Others may not have done spectacularly well, but they are nevertheless productive and respected members of society. For example, one of my former Ph.D students now teaches science at the primary school level, but in a way that makes science much more interesting for the children. As a teacher, I may not have succeeded to the extent I wanted but I haven't failed either. I think that that is good enough for me.

Panel: What was the story behind your turning down the Sitara-e-Imtiaz?

Dr. Hoodbhoy: (Pondering....) I read in a newspaper that I had been awarded the Sitara-e-Imtiaz. It did not take me long to decide that I must turn it down. So I politely declined it. For me it was a matter of principle. But my reason had nothing to do with the fact that the Sitara had been offered to me by a military government. I was offended by the procedure by which this medal was, and still is, given. An award for professional accomplishment is meaningful only when the decision is taken by those from the same profession. What does a bureaucrat, or someone from a different discipline, know about an individual scientists' achievements? For example, I could say nothing about the work quality of a biological researcher. It is a joke to give out prizes and awards in this way. So the reason for my rejecting the Sitara-e-Imtiaz was simple: *It is wrong for someone out of the field to assess achievements in that field.*

Panel: The Large Hadron Collider (LHC) is the hot topic in Particle Physics throughout the world. What is the contribution of your department, if any, in it?

Dr. Hoodbhoy: Yes, the LHC is the most exciting experimental development so far in this century. This particle accelerator will help to discover the missing Higgs particle as well as super-symmetric particles. We in Pakistan have no direct part in the project, although the National Centre for Physics has some peripheral involvement. Sadly, particle physics is at the very verge of extinction in QAU, as well as in Pakistan. There used to be some

very good particle physicists in QAU when I joined the department in 1973 but most left, retired, or died. I am now the only one left in this field at QAU. My research is neither on Higgs boson nor on super-symmetric particles. Instead, I am trying to understand how the existence of space-time dimensions, other than the usual 4 in which we live, can be important in determining the properties of hadrons. There is some hope that the LHC might indicate the existence of the six extra dimensions. (Quantum mechanics and General Relativity lead to string theory which predicts that the world has a total of 10 dimensions.) But the LHC is unlikely to be powerful enough for looking at the short distances needed for detecting the six extra dimensions. So we will eventually need accelerators much more powerful than LHC. It may be that these would have to be built in space because the earth is too small for such giant projects.

Panel: What would you do if you are made the chairman of HEC?

Dr. Hoodbhoy: Let me divide my answer into three parts:

- i First, I would give funding priority to colleges over universities because most students study in colleges. These colleges are in terrible shape and lack basic infrastructure such as labs and libraries. The average spending on a college student is six times less than that on a university student. On the other hand, many universities, such as QAU, have been given so much money that they do not know what to do with it. There is huge wastage on useless equipment, and many madcap projects. For example, there is a HEC project for setting up nine new engineering universities in collaboration with European countries, wherein half of the faculty would be from those countries. The cost is staggering (4.7 billion US dollars) but it would still be worth it if the plan was viable. It is not! The Europeans are terrified of coming to Pakistan. The Pak-French university in Karachi, which was scheduled to start in October 2007 has already flopped because the French refused to come. Who can blame them, given that there have been 35 suicide bombings so far this year?
- ii Second, there must be national entrance examinations for choosing the best students for entrance into public universities. Equally, university and college teachers should go through tests for basic competence before being selected. We have far too many teachers

who have big degrees but know nothing. They must be relentlessly weeded out of the system because they are the cause of degeneration of standards.

Thirdly, there are a large number of administrative reforms that must precede any increase of funding. For example, many university vice chancellors are incompetent because they have been chosen on political, not academic, grounds.

Panel: You have emphasized a lot on the development of pure science but don't you think that for a country like ours, more emphasis should be on applied and engineering sciences?

Dr. Hoodbhoy: Yes, you are right to an extent. But although it is natural to emphasize engineering and applied sciences, pure sciences must be given some space as well. Their importance is well understood. For example, teachers with a strong knowledge of the pure sciences can teach engineering and applied sciences better than others.

- There is also another factor: pure science is something that fascinates students and brings out the best and the brightest from amongst them. Quite a few may think that designing bridges or making circuits is okay, but working out the mathematics of black-holes and stars is really a lot more interesting.
- One must also note that the distinction between pure and applied sciences has blurred. What is being taught as pure science today becomes applied science tomorrow. The time lag has reduced greatly in the modern age.

We noticed a lot of books which were not related to physics in Dr. Hoodbhoy's office arranged on a few shelves so we asked him about his collection of books and he replied as follows:

Dr. Hoodbhoy: As Freeman Dyson said, the world is infinite in every dimension. An individual should seek to acquire depth in his

specialization as well as know as much as possible about the world around him. So, in addition to one's own field, one should also read history, philosophy, literature, politics, poetry, and other areas of human endeavor.

Panel: What are your hobbies?

Dr. Hoodbhoy: I don't get much leisure time but I would like to read a novel if I am free.

Panel: Your favorite book?

Dr. Hoodbhoy: You read a book and you move on to the next (laughs). There is no particular book which I could designate as my favorite book but I have enjoyed different works of literature at different times. I like the work of classical English and French writers. In Urdu I liked "Udas Naslein", "Aag Ka Darya", etc.

Panel: How would you define an ideal student?

Dr. Hoodbhoy: An ideal student must have the ability to organize his or her thoughts rationally, to express them coherently, and be able to make decisions based upon a reasoned consideration of alternatives. This ideal student should also be capable of engaging in sensible conversation on a variety of topics including art, science, politics, and contemporary issues. Finally, I would like to see an engagement with society and a sense of caring for others. Both academic accomplishment and social responsibility are what any society needs from a graduate. Of course, perfection is never possible but to get close is.

Panel: Any message for the students of UET?

Dr. Hoodbhoy: The best engineer is the one who can identify and solve new problems, and discovers pathways for cheaper and better solutions. He or she must be socially responsible, which means that one must continually examine the impact of one's work upon the physical and social environment.