Rajesh: Professor Sudarshan, you have been fortunate in receiving a very good education in your formative years; which in those days many couldn't afford to have. Could you tell us about your initiation into science and research?

Prof. Sudarshan: My education was initiated at Pudupally, a small town near Kottayam of Kerala, South India. My education started at home. My mother was a school teacher. She was pregnant, time to deliver my younger brother nearing. Confined to home and with little else to do, she started teaching me, beginning with the alphabets and later mathematics. Then people started telling my mother: “Look this boy has an abnormally big head, if you teach him all the maths, it might grow even bigger and the boy would not be able to hold his head straight on his neck.” But nothing of that sort happened. The maths that my mother taught me: multiplication and division between lakhs, is all fresh in my memory.

But I was initiated into science by my father. He decided that one way of amusing me was to open the clock, a big clock that we had, and show to me all the wheels. We know in a clock that keeps striking there are two sets of wheels, one set of which moves just to make the time pass by and it continually keeps shifting. The other set doesn’t come into operation except when it is time for striking the hour bell; and then suddenly there is a great deal of excitement like the railway station when the train is about to come. There would be all kinds of movements. In fact, it controls how many times to strike and then how to keep quite after that. But for all this it is necessary that the pendulum be there and the spring be wound together.

So the first lessons in physics were really this question of potential energy being converted into kinetic energy, then the wheels within wheels moving. But when people talk about the physical world being dead, without life: that is not true. First of all, all living things are subjected to physics. Even the processes of life depend on physical processes. But the more important thing is that there are things that go beyond physics and biology, namely, our nature. Who are
we? When you wake up (from sleep) you start wondering who am I? Did I sleep well? Yes, I slept well because I saw this beautiful dream. Only thing is that the person who saw the dream is no longer there. Yet the memory of it remains and I say I saw the dream.

There is this morning devotion in Sanskrit (Dawn chants by Sri Shankaracharya, 8th Century A.D.):

“Pratah Smarami Hrdi Samspurat Atma Tattvam
Sat-Child-Sukham Paramahamsa Gati
Turtyam
Yat Swapna Jagara Sushuptam Avaiti
Nityam
Tad Brahma Nishkalam Aham, Na Cha Bhuta Sangha”

I am not a collection of dead matter. I am not subjected to all the rules governing dead matter. But I am simply that one particular thing who is there in awakening, in sleep, in waking, in dreaming and in talking and then in thinking of all these things and then you realise that you belong to a divine order. That I am not a collection of dead matter: “Na Cha Bhuta Sangha”.

Rajesh: Much of your higher studies and research was abroad. Do you think we still lack facilities for doing good research here?

Prof. Sudarshan: Most of the people misunderstand the situation. It is not the facilities abroad. It is a place where scholars are there. If you are a scholar you want to be with other scholars, someone who appreciates what you do. Now it may be that one person goes abroad, the other stays put and they are both doing very well. But generally what one is looking for is somebody who is scientifically competent.

Everybody talks about things abroad because there are good laboratories. I don’t need a laboratory. I just walk around with my hands in my pocket, occasionally take out a pencil and write something on a piece of paper. So it is not that. It is having people of a certain kind coming and making statements that people are going abroad and that is affecting the country; that is not true, because if they do not go abroad they will create problems.

You know in the big scientific establishments the people sitting at the top are like kings of old days. But science is successful when you are doing things and you want another person who is a scientist to challenge you. If he agrees that what you say is good, you feel good because he will not say it unless he has to. So it is that which is attracting people. Of course there was a problem that there was no job in India for qualified people. But the point is what job you wanted. You wanted a job where you are taken care of in terms of ordinary things. But those who came and joined the universities suffered.

Rajesh: Professor, once your name was synonymous with ‘Tachyons’. Now we don’t hear much about it. Could you tell us about tachyons and what is its application?

Prof. Sudarshan: It is not true to say nothing is being heard about tachyons. Two years ago there was a big stir that some particles are being produced and they arrived before light signals could get there; and people said oh! Now it is the beginning of the end, now physics will collapse. Actually what I did with tachyons was to say that there is no great disaster. If it is there it is there and if it is not there, not there. There is nothing which says that if it is there the world will come to an end; because people have simply misunderstood certain things. So far no one has found it but it could be found day after tomorrow.

There were many who thought about the existence of particles faster than light. Usually as per theory of relativity if you give more and more energy to a particle it can move faster and faster but can never reach the speed of light. It will always be a little below the speed of light. So people said this is an absolute barrier and no particle can cross this limit. What I said was that let us ask this question: if there are particles which can travel faster than light how will they look? Well, many things will look alright. Some things go wrong.

I used to illustrate it with this example. While you go for a walk, if a dog is following you and if you think the dog is not very well intentioned towards you, then you try to walk faster, eventually you start running. The dog will follow you but it will not catch up with you. That is the idea of running. But suppose if the dog approaches you faster, then it would be very awkward. The question is we haven’t yet come across such a dog. But you could have such a situation and that doesn’t violate any laws of physics.

Now one big problem was that Einstein had said some place that nothing can move faster than light. I said he was an old man that time and he said many good things and said this one thing which is wrong. So what? But the situation has not changed. The question is can one find such a thing faster than light. And my statement is yes. If you find it of course that will have very unusual property. Just like light itself. Light always travels at the speed of light. If you try to catch a light beam, run towards it, the light will still be moving at the speed of light. If you run away from it will still be moving at its own speed. But that is not to alter anything unusual.

I used to give this analogy: people go to Himalayas, supposed to be a very sacred place, Kailash and so on. It becomes...
It is not the facilities abroad. It is a place where scholars are there. If you are a scholar you want to be with other scholars, someone who appreciates what you do.

Glashow, Salam and Weinberg did the next step to what I did.
Without the first step they couldn’t have done it.

Rajesh: Do you have a message for the aspiring young scientist who is at the threshold of a research career, thinking which way to take?

Prof. Sudarshan: I started out as a particle physicist. High-energy things etc. all very crisp things. But then I used to have friends who were doing optics. I had studied optics as a student and so I tried to tell them about some of those things and eventually I became quite involved in optics: the quantum theory of light. And I did some very fundamental contributions for which they gave the prize to Glauber. But I did the work.

How did I do it? Because I was surrounded by these people and it depends to a very large extent on luck. And as they say luck is the fruit of those people who deserve it but who don’t know how they got it. Not everybody gets lucky. If it is a lottery ticket you can say it is pure luck. But with regards to scientific achievements that depends on a lot of things.

When you make the discovery you find the discovery came to you; you did not make the discovery. But why doesn’t it come all the time? The thing is that you have to wait for a long time. There is this meeting of Isaiah with God. He waited for a long time. There is this threshold of a research career, thinking which way to take?

Rajesh: You were nominated for the Nobel Prize several times. What do you think is delaying it? As you have been awarded the Dirac Medal recently, do you expect another Nobel nomination to follow?

Prof. Sudarshan: Oh! Things have now become much more complicated. Because those days, there was one Bohr, one Heisenberg, one Schrodinger and so on. But now there are so many people and there are so many who got Nobel Prizes. Every year they give it to two or three people. So there are a lot of people who are Nobel Prize winners.

I don’t like to ask somebody. It is very much like when you go to someone’s house you don’t ask for a cup of coffee unless they are very good friends. If somebody offers, that would be nice. Similarly, my feeling is that a prize is something that you don’t demand. You are awarded. You are honoured. And if the right people don’t do the right thing that’s alright, what can be done?

What I did for my PhD thesis in 1957 was probably one of the most important things in physics and they should have nominated me at that time. If not then ten years later. They didn’t. Instead they gave the prize to somebody who did something on top of it. I usually say if you want to award somebody you take the person who built the ground floor, not someone on the second and third floor. That is what they did. Glashow, Salam and Weinberg (Nobel Prize in Physics 1979 “for their contributions to the theory of the unified weak and electromagnetic interaction between elementary particles, including, inter alia, the prediction of the weak neutral current”) did the next step to what I did. Without the first step they couldn’t have done it.

But money is theirs so they have the right to decide whom to give. When I received the Dirac medal (that was the tenth year of the medal) many people had received it before me. Almost all of them received Nobel Prize subsequently. So this is an auspicious sign. I think it would be nice. I will enjoy it very much. But my life is not dependent on it.

Very difficult as you go nearer and nearer and people say my God nobody has gone beyond this point. But if you had gone beyond the point you would have seen a number of Chinese saying the same thing about going south.

Well, the immediate application of tachyons is that communication can be speeded up. At present we are limited by the light barrier, if you want to communicate with another star, it is impossible. But if you have things like this (tachyons) you can. You would like to communicate faster than light because otherwise we are like frogs in a pond. It would be a very practical thing that we could communicate to places which are inaccessible to us now.

Secondly, if you have tachyons you can do things at a distance faster than light can travel. That means your range of doing things is extended. So it will be a richer world if these things are done. It will be a strange world because it is like in a world where all trains go at a speed of thirty miles an hour and no more; you have an express train which goes at two hundred miles an hour. That would be disastrous. People can’t relate to it.

But unfortunately most of the people did not believe in it. Most of them think that nothing can travel faster than light, despite my writing so clearly that it can be done and it doesn’t violate any laws of physics.

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