



“Power of science is rationally asking a question and providing proof”:

Indira Nath

very much, but he asked me to come and see some leprosy patients. That was his hobby at weekends, he used to go to see the leprosy patients. In those days the leprosy patients were located all along the river Yamuna, somewhere near Shahdara, in Delhi, and it was like a colony of lepers. They were outcasts. He was part of a social group. In that social group, there was a lady who used to come and pick me up in a red Mercedes. She was the wife of the governor of the Reserve Bank of India. We would go to the colony and did simple things like bandaging their ulcers, trying to get them magazines. There were a lot of south Indian people from my community who were there. They left their villages and came because of the stigma and so the disease first hit me in that manner. You get taught very little about leprosy in the medical course, because it is

part of dermatology. Dermatology is a fraction of the regular medicine and so you can imagine leprosy sort of gets one paragraph in the textbook.

Gauhar Raza: *At that time a lot of stigma, myths, superstitions were associated with leprosy across the world. People were scared of even going close to lepers and touching them and you started working in a colony full of lepers. Were you not scared?*

Indira Nath: No, I was not scared. That part didn't affect me, the social aspect affected me. Their personality changes when people become stigmatized. So that part struck me more as a social problem. The medical problem of the ulcers not healing also worried me. But my mother used to be very worried. I went to these localities on weekends and when I

Gauhar Raza: *Let me begin by asking you: Why did you choose science?*

Indira Nath: I recall, when I was about ten, I wanted to do medicine. But when I came into medicine, I realized, pretty early on, that even if I live to be hundred, and serve patients, how many people would I make a difference to? Whereas I felt, if I did research that perhaps could make a bigger impact.

Gauhar Raza: *What inspired you to take up such a difficult research?*

Indira Nath: Well, I was fascinated by leprosy at a fairly young age. I remember while doing medicine as an undergraduate, we had a tutor in Pharmacology. I didn't like that subject

Professor INDIRA NATH (born 1938), a noted immunologist, is a world-renowned authority on leprosy. She established the Department of Biotechnology at the All India Institute of Medical Sciences (AIIMS), New Delhi. Her research focused on mechanisms underlying immune responsiveness in humans, reactions and nerve damage in leprosy and a search for markers for viability of the leprosy bacillus, which is not cultivable. Her work led to the creation of tools for diagnostics, immunotherapy and antigens for clinical investigations.

Professor Nath obtained her MBBS and MD from AIIMS. In 1970, she went to UK with a Nuffield Fellowship, where she worked in the area of infectious diseases particularly leprosy with at the National Institute of Medical Research, London. After returning to India, Professor Nath joined AIIMS and later became the founder Head of the newly established Department of Biotechnology in 1986.

She has received a number of awards including Shanti Swarup Bhatnagar Prize in Biological Sciences, Silver Banner, Tuscany, Italy, Om Prakash Bhasin Award for Bio-technology, Basanti Devi Amir Chand Award, ICMR, Clayton Memorial Lecture Award, Padma Shri of the Government of India, Chevalier Ordre National du Merite, Government of France, Cochrane Research Award, Government of UK, L'Oreal UNESCO Awards for Women in Science — Asia Pacific Region.

She is a Fellow of the National Academy of Sciences, India, Allahabad, Indian Academy of Sciences, Bengaluru, Indian National Science Academy, New Delhi, National Academy of Medical Sciences (India), Royal College of Pathology, London, Academy of Sciences for the Developing World, Trieste, Italy. She was the Vice President of the National Academy of Sciences (India), Allahabad. Mr Gauhar Raza interviews Professor Indira Nath.

returned home she wanted me to have a bath first before I entered the house.

Gauhar Raza: Don't you feel people would be naturally scared of diseases that are highly infectious?

Indira Nath: Well, leprosy is not very infectious. In fact, cold and flu are much more infectious than leprosy. The leprosy bug takes a long time to grow and it doesn't enter very quickly and even the incubation period, the period after infection and before the disease appears, takes years. So, unless you had a cut on your hand and you happen to touch the ulcer of a patient with bugs, you don't get leprosy. What is frightening for the people is the nerve damage that occurs and deformities. That's what frightens people.

Gauhar Raza: Probably more people are killed because of diseases like flu, especially when it spreads in western countries, than leprosy.

Indira Nath: Absolutely, nobody dies of leprosy *per se*. Leprosy doesn't kill. It is a clever bug. It just wants to survive peacefully in the body. While it is surviving there, the immune system is trying to kill it, and it is the immune system that is causing the damage and deformities. The bug is trying to survive peacefully so probably we should look at it kindly! These leprosy patients are not very infectious.

Gauhar Raza: So, there is no reason for the myths and superstitions associated with leprosy?

Indira Nath: Absolutely, and now with better treatment and long incubation period you don't even know if someone had leprosy and got cured. There are two or three things that are very interesting about the disease. One fascinating property is that the bug doesn't grow conventionally in a test tube. The TB bug grows and so does typhoid but we cannot grow leprosy bacillus in a test tube. So, you can't really investigate the pathogen. Secondly, you and I, we are all exposed to leprosy. But we all don't get infected. Now, of the people who get infected, one will just get a little white patch on the skin and may become alright after some time and he would not even know why he got the white patch and why it's gone. The second lot gets the patch which lasts a little longer, but this group also gets cured very easily. Then you have another group, which gets generalized disease. These people have thickened eyebrows, they are full of bugs. If we make a slight slit in the skin the bugs pour out and they are infective. So, the interesting question is, the same bug is infecting all of us, but our body reacts to it differently, why?

Gauhar Raza: This is the scientific question that you asked and probed further?

Indira Nath: Yes, we think it's dependent on the way our immune system is built. If my immune system is very poor, I get infected. For instance, it's not HIV that kills, when the immune system goes down and you get other infections like TB, the patient dies. In leprosy, fortunately, the bug is pretty mild, it doesn't really kill you. It is clever because if it kills the whole set of cells then the bug cannot survive. If the bug kills the host then it is a stupid bug. It survives within us and responds to the immune system. That's why I think it is a model for studying immunology and the immune system and investigate why certain diseases like this are caused. The other thing about this disease is that it infects the nerves. There are very few bugs that infect the nerves, and that's why you get patients with these deformities, and because it affects the nerves, leprosy continues to be a major challenge. We have got very good drugs for leprosy. Now you can cure a patient. But the nerve damage doesn't come back; that is our current worry.

Gauhar Raza: You have made significant contributions to other areas of science as well. Would you like to talk about them?

Indira Nath: Yes, currently, I am involved in the international arena on two issues. One is misconduct in science. The academies of the world have been very worried about it and now we have the Global Research Council that is worried

...you don't even know if someone had leprosy and got cured. There are two or three things that are very interesting about the disease.....

about it. I am co-chair for one of these global academies, where we were actually discussing how we could provide guidelines for young scientists. We feel strongly that unless science is conducted in a proper manner, the faith of people in science would go. Also it's a lot of waste of money. If I do bad science and somebody has to reproduce my work, it causes a lot of wastage of time and funds. It is a loss to Science.

The other aspect I am involved in as Chair is the relationship between urbanization and health. It's not just diseases this time we are talking about but 'health and well being' of people. Asia in general and India in particular is the fastest urbanizing area of the world. Africa is another one. And we are not urbanizing in a very planned manner. You know in Delhi we have just swallowed up farmlands and it has created multifold problems. Here we are using a multidisciplinary approach, which we call as Systems approach. We are trying to propagate this approach across the globe. The International Council of Science (ICSU), which is based in Paris, feels that you cannot address the problem of urbanization in isolation. Politicians particularly in our country worry about rural areas, but now it is seamless habitation. The boundaries between cities and villages are blurred completely. It has already been predicted that 80% of India is going to be urbanized in another decade or two. We have issues of urban planning, we have social, cultural and health issues to deal with.

But we deal with these issues and problems separately; we don't have a systemic approach of looking at these problems and this is what we are trying to investigate now at a global level and I hope India also becomes a part of this global effort.

Gauhar Raza: *Is science going to be the only way of solving problems of humanity?*

Indira Nath: No, I don't think so. I think, science brings in a way of looking at things and it becomes a philosophy in its own way. The power of science is perhaps in being able to objectively and rationally ask a question and provide proof; but standalone it will be sterile, unless we

involve, of course, social sciences. Physics at the highest level is almost philosophy; I think these disciplines are going to merge, definitely. Biology and engineering are already coming together. Biology is merging into Chemistry. When you are asking a major question, you need many disciplines to come together, including philosophy.

Gauhar Raza: *When you look back, do you feel your contribution has been recognized enough by your peer groups and people at large?*

Indira Nath: I don't think I have done enough at all. I still haven't answered the question about the leprosy bacillus or the immune system. We are still going stepwise for the past thirty years. Regarding awards, I think if you live long enough you just get them. I guess I was fortunate enough to live that long. May be it is because I selected topics that were unique to our country and used the state-of-the-art-technologies.

Gauhar Raza: *Which award do you value the most?*

Indira Nath: Well, the only award that I wanted to get was the Bhatnagar Prize. That was the one, I guess, I worked towards. For others I was nominated. It made a tremendous difference to my life. Because otherwise I would have been cocooned just in a medical college atmosphere, even though All India Institute of Medical Science was a much broader platform. Getting the Bhatnagar Prize somehow made me come across other sciences and other scientists and that's been enormously helpful in the way I looked at my problem, so that was a tremendous boost.

The other award is the UNESCO L'Oreal award. Well, that brought me onto the global scene and other countries started inviting me to address them on various issues, not necessarily on science.

Gauhar Raza: *Did you ever feel that being a woman was an impediment in pursuing science?*

Indira Nath: No, may be it's because I did medicine and in medicine we don't really have as much barriers. The basic sciences still have those barriers. May be I didn't hit the glass ceiling one or two time, but then may be, I was not

competent to get that job! I never felt I did science as a woman or as a man. One did science because of the questions one asked. But that doesn't mean I have not seen others suffering. I have also seen, even internationally, and certainly our younger girls sometimes face problems. When they get married and have to give up their career. Usually they marry men who are older than them and established in their career and so these girls have to fit in, with the husband.

Gauhar Raza: *That brings me to the last question: What would you like to say to the younger generation of the country?*

Indira Nath: I think the younger generation is very fortunate in that there is lot more money now in the country. There is a lot more liberalism in public funding and a lot of emphasis is being given to the younger generation to get fellowships to travel, which we didn't have. The explosion of the Internet has made accessing knowledge so much easier. We used to wait for three months before the journal came to the library and so you were already behind times. All those advantages are there. But on the other hand I see, and now I am talking like an old lady, is that they are very ambitious, very energetic, very aspirational, but with impatience. And there are certain science topics you cannot handle with impatience. It does take time. There is incremental increase in knowledge. It seems to me that some of them want fame, name, riches altogether at the same time! Maybe, that's what older people say, but may be we were like that too, when we were younger. That needs to be modulated a bit. I would say grab the opportunity, you are so fortunate.

Gauhar Raza: *Would you say that science is the career that should be taken up by the brightest of the minds. Would you recommend that?*

Indira Nath: I would say so, research I think is fascinating. It takes time. But you can make a great contribution. It gives you a high, when you get your paper into the best journals and the fact that you can ask a question, and enjoy answering it at the cost of public money. I think that's a great privilege we have and it's very exciting.

Mr Gauhar Raza is Chief Scientist, CSIR-National Institute of Science Communication and Information Resources

(The interview was earlier telecast on Rajya Sabha TV)