

A Rule-Based War

Dr Mashelkar's Message: Patent, Publish and Prosper



Dr R.A. Mashelkar

The trajectory of Dr R.A. Mashelkar's life from his poverty-stricken childhood to being a world renowned scientist and Fellow of the Royal Society is a story of grit, determination and confidence. It is these attributes that he brought in to effect radical attitudinal changes in the Council of Scientific and Industrial Research (CSIR), which he currently heads. Dr Mashelkar came into international prominence when he questioned the award of the US patent on turmeric. The battle was won, the patent was scrapped and Mashelkar came to be looked upon as a representative of the Third World, championing the cause of our traditional intellectual wealth in an international arena.

Mashelkar began his career as a researcher in chemical engineering in universities at Bombay and the United Kingdom. The change in his involvements over time from research in pure science in universities to Research and Development (R&D) management and policy making give a clue to his dynamic and multifaceted personality.

In fact, it was through his change in emphasis that he realized that

much of scientific research in India went unnoticed in the world because Indian scientists were not market-savvy enough to file for patents. At CSIR, he changed their slogan from "publish or perish" to "patent, publish and prosper." In his efforts to globalize Indian R&D, he has helped to create databases of traditional community knowledge and indigenous innovations. His campaign for patent literacy and documentation of traditional systems of knowledge brought him several honours including the Padmashri Award in 1991, the Shanti Swarup Bhatnagar Prize in 1998 and the Padmabhushan in 2000. Mashelkar's optimism is indeed infectious. His confidence about a bright future for India in a world economy that is increasingly knowledge based has struck a deep chord in our country and galvanized the Indian scientific community as never before.

Beneath an awe-inspiring achiever is a person who believes in being a family-man, a struggler who is still in close touch with his roots. He proudly recollects the lonely struggle of his widowed mother who worked as a domestic help in Mumbai to fund his education, almost till the time he began his post-doctoral research. He attributes his success to her devoted encouragement of his efforts, keenness for his obtaining ever higher levels of education and the immense sacrifices that she made to make her dreams a reality.

He warmly acknowledges the support of his wife who accompanied him back to India in 1975, when he chose to put an end to a flourishing career in England and serve his own country. Mr Y. Naydamma, the then director general of CSIR, had been entrusted by Mrs. Gandhi with the task of winning the best Indian brains back to the country. It was on his persuasion that Mashelkar joined the National Chemical Laboratory (NCL) and thus began a career which has brought him many honours and public acclaim because of his attempt to take science out of laboratories and put it at the service of society.

In his conversation with **Madhu Kishwar**, Dr Mashelkar opens up to questions that range from his personal life to his concerns about the future of Indian R&D. He demythifies concepts such as international patents and intellectual property, voices his concerns about the neglect of traditional knowledge systems in the developing world and projects, a scenario of vast opportunities for wealth generation; all this in a manner that is down-to-earth, enthusiastic and optimistic.

□ *Why is it that India has not yet made up its mind on how it intends to relate to the World Trade Organisation (WTO) and the international patents regime?*

I personally believe that India's preparedness in terms of intellectual property protection and patents in particular, is nowhere near what it should be. As far as patents are concerned, the problem has to do with our physical and intellectual infrastructure as well as our public awareness.

One might ask, why focus on patents? A patent guarantees the inventor the right to get some gains out of the intellectual property that he or she has created.

And when does one apply for a patent? When one has intellectual property that needs to be protected, by which I mean, when one has produced something novel, non-obvious, and useful. If you were to look at our industries, you would find that our industries have always been protected with tariff barriers. Industries were not really being innovative—and they got away with it.

When do you innovate? You innovate when you have the danger of losing your market share because somebody else has displaced your product by innovation. Because that danger did not exist in India, industry did not feel the need to innovate. Thus, we fell behind. With competition coming in, however, you can already see that the drugs and pharmaceutical industries, which earlier hardly invested anything in research and development, are now investing quite a lot. Firms that didn't invest even one per cent on research some four or five years ago, are today investing

five per cent of their sales turnover.

□ *What is the average proportion of their funds that a multinational corporation (MNC) would invest in research and development?*

Ten to fifteen per cent of their sales turnover. Among Indian industries, the average is 0.7 per cent—which is extremely low. I would say that the lack of R&D investment is largely due to protectionism and a non-competitive market.

□ *But the conflict around this whole issue has been most fierce regarding seeds. It is asserted that our farmers' produce will be stolen from them and somebody else will patent them.*

First of all, there is a misconception that products resulting from a naturally occurring plant such as the *neem* will be patented, that the turmeric plant will be patented. Let me clear up this misconception.

Anything that already exists in a natural state cannot be patented. The problem is that in a few instances, patents have been awarded incorrectly. I'll give you

an example. For a long time we have known about and used the wound healing properties of turmeric. But suddenly, we find that the United States of America (USA) has awarded someone there a patent on the wound healing properties of turmeric.

□ *Without any processing of it, just plain turmeric?*

Yes, just plain powder. At that point I got into action and opposed the award. This was about three years ago. I still remember many people asked me why I fought this turmeric battle. People now call it the new Haldighati battle. But in this case we won. We believe we got far more credit than we ought to have received. But then the strong public reaction just goes to show how strongly and how intensely Indians feel about what is theirs.

I would just like to tell you a little story, which had made an impression on my mind when I was the Director of National Chemical Laboratory (NCL) in Pune. I remember one summer afternoon my

mother, wife, son and myself were sitting outside our house. Suddenly a bird came in front of us. It had injured its legs and one of its wings. I remember my mother ran inside the kitchen, brought some *haldi* powder, made it into a paste and applied it.

Sadly, it died after a couple of hours. But within those two hours, we had fallen in love with that bird. When we buried it in the garden, we all cried. The important thing was that it made a deep impression on me that the same herb that was applied to a human being was also applied to a bird. My mother must have picked up that knowledge and approach from her mother, and she from her mother, and so on.

When the US patent on



“ ALL THESE BELONGED TO MY ANCESTORS BUT WE ARE WAITING FOR A PATENT BEFORE WE CAN START USING THEM.”

SIMRAT GULATI

turmeric was awarded I felt it was not correct. It was a pioneering case in a “rule-based” war.

The rule is that the applicant has a right to patent innovations only after demonstrating the novelty, non-obviousness and usefulness of an article. The use of turmeric is not novel because it is a part of our people’s prior knowledge. So all that we had to do was to gather a lot of information. I got a lot of useful texts translated from Sanskrit, Pali and Hindu and, of course, formal papers from journals such as *The Indian Journal of Medical Research*, and we went to the US Patent Office and said, “Look, this use of turmeric in wound healing is clearly the consequence of prior knowledge.” Of course, we had to follow the usual legal procedures. We are happy to say that we won that particular battle—the patent was scrapped by the US Patent Office.

What is the significance of this victory? First, I believe that although it was a small step, it was an important one because that was the first time the Third World raised its voice and the US Patent Office listened.

Second, it gave confidence to this country that if we engage in a rule-based war, and follow the rules, then we have a chance to win. Third, it showed us that it is important to keep records of our knowledge. We just cannot keep information in our heads and say that it is something “we have always known,” because that is not the way the modern world works. And fourth, we developed a good strategy in the course of the struggle. In even more serious cases like the Basmati case, a very valuable national export crop is at stake.

What happened in this case was that a company in the USA had crossed a Pakistani variety of Basmati with a US variety of rice and

made something like 18 claims to the patent office to have the name Basmati assigned to them for the hybrid. In these 18 claims, they said that the new variety contains all the properties of Basmati plus additional advantages. They claimed that this Basmati can be grown in North America, Central America, South America, and in the Caribbean. To give an instance, when we talk about aroma, we say that rice smells good. They said that the aroma is because of the presence of a specific range of values of the chemical, two acetyl one pyrolidone. Their claims are based on a quantification of the qualities of the plant.

□ *So if any of our farmers don’t produce exactly what they have patented they can’t call their rice Basmati?*

Yes. And what we have to do is gather data on the Basmati varieties that we have in India and demonstrate that all the varieties that we were producing already had those qualities at the time they asked for the patent.

However, doing this takes quite a while. The turmeric data could be obtained only in four months, while the evidence for the Basmati case also took couple of years to gather. We have filed this particular case about two months ago in the US Patent Office. At the moment, this US company holds the patent but we are going to prove that the patent is not valid.

I am quite confident we can get this patent quashed. There are some other cases too which we are contesting. You must have heard about the battle over *baingan* (eggplant) and *karela* (bitter gourd) patents. We have known for a long time that *karela* can be used as an anti-diabetic nutrient. Wrong patents were given and they will continue to be given unless something fundamental is corrected.

Now you may ask what needs correcting. Let me illustrate by describing our work in the World Intellectual Property Organisation (WIPO), located in Geneva. It has 171 member countries. They have set up what is called the Standing Committee on Information Technology (SCIT). I was asked to represent India, and I am proud to tell you that this Indian was elected the first Chairman of the committee. I used that position as the Chairman to make a case for the Third World, particularly for the developing world, which is so rich in traditional knowledge.

We worked to establish a dialogue with the US Patent Office. We wanted them to address the damage that they have been causing by giving wrong patents. What the US Patent Office said in reply was very interesting. They said that it is not that they want to give wrong patents. When a patent examiner looks at the patent application, what he or she does is scan the electronic databases to check if prior knowledge exists. In the case of turmeric they also did a scan. They would punch into the computer search categories like “turmeric”, “wound healing”, “powder” and so on, and see what comes up. Since India’s data of its traditional knowledge systems is not available in the computer, and therefore not accessible to the rest of the world, wrong patents are bound to be given. The US Patents Office has said that if this is corrected, they can assure protection of our patents.

I have tried to ensure that the SCIT and the WIPO give consideration to traditional knowledge bases in the International Classification Patents System, which at present recognizes only industrial property. I have insisted that traditional knowledge

bases also have to be recognized. As a result now, all of the available tradition-based knowledge is going to be put on the electronic file.

Has the process started?

The process has already begun. I have started a centre called the Unit for Research and Development in Information Products in Pune. What they have done, as a first step, is to look at our ayurvedic heritage. They have looked at the 50 most-used plants in Ayurveda and have collected something like 20,000 pages of information on them.

This information has been collected by CSIR. The entire information is placed on a CD-ROM which was released by the Prime Minister on January 3, 2000, when he came to inaugurate the first Science Congress of the new millennium. We have made this CD-ROM widely available.

It can be used as a database, so that if anyone scans for “turmeric,” “wound healing” or “powder,” then the entire Indian database comes on the screen. We have already sent it to the US Patent Office and the European Patent Office.

So you have blocked that loophole, for now at least. What was the brinjal case?

The brinjal case was about anti-diabetic properties. It was an admixture—brinjal, *karela* and something else. The main point is that our success with the turmeric battle has created a bit of confidence in India. It has also given the US Patent Office some apprehension that as a professional body, they have not done the right thing. Secondly, it has awakened the developing as well as the developed world to the rightful place of traditional knowledge. Thirdly, we have found a way out. There is a problem, but there is also a solution. We can create an electronic database, make it accessible, and wrong patents will not be given. And



Dr. R.A. Mashelkar speaking at the inauguration of R&D Laboratory of Herbert Brown Pharmaceutical and Research Laboratory.

fourth, at last a step in the right direction has been taken.

Shailaja Chandra, the secretary of the Indian System of Medicine (a special department created to research on traditional knowledge) has embarked on a big mission now. Bringing together her department of Indian System of Medicine, CSIR, National Informatics Centre and Department of Industrial Policy and Promotion, she has set up a Task Force for creating a Traditional Knowledge Digital Library (TKDL). The technical and financial proposal to create TKDL is now ready. This is a very significant step, since this will show the developing world the way ahead in protecting their traditional knowledge. As you must have heard in the Finance Minister’s speech, the allocation for the Indian System of Medicine has been increased this year by 50 per cent to 20 crores.

Isn't it still peanuts.

It is indeed a small amount. I understand that, but at least they have doubled it and I am sure more funds will be made available in future. I think the Indian System of Medicine is being recognized formally now and I am very glad. It is extremely important

that we have a holistic policy with regard to the Indian system of medicine, which has several facets—cultivation of medicinal plants and exploitation being one of them. We must use the same principle as has been successfully applied in environment and ecology—the exploiter must pay.

I recently met a woman who is the Vice-President of a pharmaceutical company that is doing research on many herbal prescriptions the company learned of through investigations in tribal communities. They are getting patents for these herbal medicines in the company's name. When I asked if they are doing something for those people it seems it hadn't even occurred to her as late as February, 2000 that she and the others owe something to them. What do we do about it?

I agree entirely. What we have to do is duplicate what Dr. Pushpangadan accomplished in Kerala when he was working with the Tropical Botanical Garden Research Institute (TBGRI). He is now the Director of the National Botanical Research Institute, (NBRI) based in Lucknow.

He visited the Kani tribe in Kerala and found that when they went for gathering forest produce, they could go without food for long periods and yet be full of energy because they were taking some herb. It took him a long time to convince them to share that knowledge with them—that too after he promised that they would be made partners in whatever commercial use that herb was put to. The scientists then found that an active ingredient of a plant called arogyapacha, is *Trichopus Zeylanicus*. This acts as an energizing tonic and boosts the immune system. The scientists then isolated and tested the ingredient and incorporated it into a compound called “Jeevani”, giver of life. They conducted proper clinical trials going even beyond the WHO guidelines for herbal medicines. The tonic is now being manufactured by a major ayurvedic company in Kerala.

As promised, a Trust created by the 12,000 member Kani tribe was given 50 per cent of the license fee amounting to Rs. 5 lakh. In addition, they get 50 per cent of the 2.5 per cent royalty being given to TBGRI on all their sales. This is the first time in the world that such a formula for sharing profit with the community which provided patentable knowledge has been evolved.

There is no patent on this herb because, as a plant product and as something widely known, it cannot be patented. The patent is only on the process through which they created this product. This is a good case of knowledge transfer as well as of profit sharing.

□ *In this case, one particular group provided the information about this herb. This information was probably available to many more tribal groups but only one group benefited from profit sharing. It's just chance that*

he got it from this particular area, from this particular group. Had he gone into another area he might have learnt about it from another set of people; for that matter, the beneficiary could have turned out to be just one individual.

As a matter of fact, that is the central and the most difficult issue concerning our community knowledge. We cannot usually identify individual innovators. And even if we identify one particular community, it may be that several communities already have this knowledge.

□ *For example, turmeric is common to your mother, to my mother. So which of them gets the credit for having knowledge about its wound-healing powers?*

There's no solution to that. This is a complex issue, I don't think we have experimented enough to find out what would be the best approach to adopt. A few models have been suggested, however. One suggestion is that the benefit goes to the individual who imparts the knowledge. A second idea is that the reward should be given to the community; a third is that returns should go towards development in and around the region where information was collected, in terms of building roads, getting drinking water, schools, health facilities, etc. The fourth suggestion is that such returns should be pooled and redistributed over larger groupings in the area.

□ *Then it would actually fall into the pockets of the bureaucracy.*

That's the last thing we should let happen. The benefits must reach the people. As far as indigenous innovation is concerned, we have to recognize that innovation is not a prerogative of just the people who work in formal laboratories. Indigenous innovators—a farmer or an artisan, for instance—could be

as innovative as a laboratory scientist. For this reason, the Finance Minister announced the creation of the National Innovation Fund in the last budget with an initial grant of 20 crores. Now a National Innovation Foundation has been set up. I have the privilege of being its Chairman with Professor Anil Gupta from Ahmedabad, one of the greatest champions of indigenous innovators, as its Vice-Chairman.

There is a provision in the bylaws of the Foundation that not only government but anyone can invest money in the Fund, whether the investment comes from the corporate sector here or international funding agencies. In fact, we are going to discuss and decide the way ahead—perhaps creating a national register for keeping such information accessible in a permanent format. For instance, in Gujarat, people have developed a tilting bullock cart, and many other things. The problem is that—first of all—such innovations have not got diffused. That means that innovations made in a Gujarat village tend to remain there—Bihar, Uttar Pradesh and Kerala, for example, never learn about them.

The second problem is that these innovators have not received rigorous training in science, engineering and technology. They have used their intuition, which is, of course, invaluable, but modern science and engineering can help them fine-tune innovations, and make them more user-friendly. What the foundation also plans to undertake, is to recruit people who have formal training as engineers, and have them work with the original innovators so as to improve the original design. Third, only a few of these innovations reach the market. The foundation will also help in getting them to the market place, as well as, get these innovations patented.

We have started work in Gujarat. But we want to spread throughout the country and acknowledge all those innovators who are never recognized, who remain nameless.

□ *Please explain the scientific issues underlying the terminator controversy.*

If you look at our average farmer, he has his crop and he saves the seeds extracted from this crop for the next season. In this particular case, the new varieties had seeds that would not reproduce again after the first season.

Ordinary hybrid seeds can be reused whereas these terminator seeds shut off completely. They will simply not germinate. And the word ‘terminator’ was used in that sense. Monsanto (the company promoting terminator seeds) said that they themselves were never involved in developing such seeds, that it was another smaller company, which had actually done it.

When people talk about the patenting of gene sequences, I believe that the issues of morality and ethics have to come first. Society needs a very serious debate on this topic.

□ *And what is your response to these hybrid terminator seeds that are coming into the country? Do you feel that they are a problem?*

I do not think the problem exists at the moment, since terminator seeds are not coming physically into the country. Right now the problem is with genetically modified organisms—GMOs, as they are called. It is uncertain whether or not they are safe. Unless we know for sure, we cannot go in for that kind of technology. The conflict is over the safety of genetically modified foods.

□ *But isn't all cross-breeding genetic modification?*

But it is natural.

□ *What is the difference between natural processes and what you do in the lab?*

In the natural process, there is a time scale over which it happens. Five years, 10 years, 100 years, and so on. Here, we are doing it artificially, quickly, and in a manner not necessarily acceptable to the nature of the product. This is the difference.

□ *Why is it that this big misinformation campaign against the WTO and intellectual and plant patent rights has been so successful?*

First, patents are a technical issue indeed, a techno-legal issue, to be precise. Even learned scientists are sometimes unaware of exactly what can be patented and what cannot. If they are confused, I imagine that others may be as well.

□ *But who are these others we are talking about? There is, for instance, a whole Third-Worldism school of thought that has portrayed the WTO and patent-regulation the latest means to enslave and to rob us.*

Well, I personally believe that such mis-information is something that our people pick up because they like to believe in it. About seven or eight years ago, a political leader was addressing about 5,000 farmers, saying “Agar patents aa jayenge to gaye ka bacha gaye ka doodh nahin pee sakega.” [If the patents regime is implemented, calves will not be allowed to drink their mother’s milk without prior payment.] The people applauded and believed him.

□ *People like Vandana Shiva have been saying two things. First, that*

“We’ll not just be beggars and borrowers of knowledge, we will be exporters of knowledge to the Western world.” I told our people that flights of imagination would carry us.

nobody will be able to use product like neem ka datun without having to pay royalties to some American company. And second, that Kisans will not be able to use their own seeds for sowing. Surely it cannot just be a case of ignorance, because some of these people are actually scientists.

I do not know what their agendas are. As a scientist, I have concluded that natural materials cannot be patented. So *neem ka datun* cannot be patented. My own CSIR is leading the campaign. We are insisting that our Indian innovations must be protected not only here but all around the world. CSIR has the highest number of patent portfolios from India.

□ *What do you mean by “patents portfolios”?*

Supposing you take the petrochemicals—petroleum and so on. It’s a trillion dollar industry. At the heart of this trillion dollar industry are catalysts. They are substances that take a chemical and convert it into another chemical. For instance, polyester requires a raw material called paraxylene. That paraxylene is produced through what is called a catalytic process. That means you take mixed xylenes and convert them into paraxylenes. Now at the heart of this process is the material that converts it, the catalyst. And that catalyst is a kind of highly proprietary, knowledge-based material that used to be the monopoly of multinationals. And they would keep that monopoly by taking one key patent and surrounding it by large number of patents. That is what I mean by creation of a total portfolio of patents. CSIR has now broken that monopoly. We not only manufacture but also export catalysts. It took ten to fifteen years. It was a long journey, but now we have launched ourselves on to a new trend.

I remember when we took over National Chemical Laboratory (NCL), which has now practically become an International Chemical Laboratory—I said, “We’ll not just be beggars and borrowers of knowledge, we will be exporters of knowledge to the Western world.” I told our people that if we let our imagination fly there would be no limit to the distance we can traverse. The only limit to innovation is the flexibility of your thought processes. That is what I said in 1989, when I took over and we started addressing the issue of patents. After 49 years of NCL’s existence, we did not have one single US patent. That meant that none of our inventions were protected in the US.

□ *But NCL had been making discoveries?*

Yes! And we started patenting them. Last year, the NCL filed 100 patents. Out of that, 35 were filed in the US. If you give the scientific community a challenge, they often do rise to meet it. Awareness of the worth of such innovations are spreading so far and so fast that it is unbelievable. In Pune’s Yeravada Jail there are something like 10,000 inmates. They have invented an improved version of the dough-making machine they use for making rotis. I understand they approached the Jail Superintendent and asked him to help them to get a patent on this innovation!

□ *Tell us about your “Patent Literacy” slogan and campaign.*

I first used the term “patent literacy” about six years ago at a Science Congress in Calcutta. Literacy means the ability to read and to write. I noted that we have not been able to read patents, and we are not able to write patents. What does reading patents mean? It means that you read it in such a way that you can bypass someone’s invention, writing patents means writing it in such a way that nobody can bypass you.

Patent writing is a very clever business. Suppose you are making a formulation and use the words “comprising,” “consisting of,” “consisting essentially of.” They all look the same in English, but mind you, using the wrong word can cost you a billion dollars because someone will be able to bypass you if you haven’t protected yourself properly. Using the right word is a difficult art; it is a science, as well. We lack the ability to understand patents, patent information, and ways to protect our innovations. That is what our literacy campaign aims to correct. I have also changed our slogan, which used to be “publish or perish.” I now say “patent, publish and prosper.”

I say this because India has suffered a lot by not realizing the significance of patenting. Look at Sir J.C. Bose—the great scientist. He was the individual who should have been credited with creating wireless technology. But who is instead credited? Marconi, who holds the patents on wireless. But J.C. Bose was the one who had the original concept for one of the core prerequisites of wireless technology. He discovered it in 1898, but never patented it. It was Marconi who patented it, and thus, people call Marconi the father of wireless technology. In 1998 we began the Basmati Patent battle. The period from 1898 to 1998 can be described as a trajectory that stretches from Bose to Basmati. There must be hundreds and even thousands of innovations that we just failed to protect. You can imagine not only the wealth that this country would have created, but also the value systems we might have had in place by now.

□ *When there is no proper incentive, people hide their knowledge. That is what happens in this country. People die with their knowledge. They don’t pass it on. It is guarded like a secret.*

That is very true. And in fact, I think you’ve raised a key point. We held one-day sessions on traditional knowledge in a few places, including Andaman and Nicobar. It was fascinating. Somebody told us that there was an old lady who knew the use of 69 rather unique herbs and that she was dying. Nobody ever would have access to that knowledge. That is why I am a great admirer of Anil Gupta. He has conducted very interesting experiments. He has gone to the interior of Gujarat villages and set up competitions among children there. Let us say that the oldest man in a particular village knows the use of something like 200 herbs, for medicinal and other purposes. Anil was telling me that he has set up a competition challenging children to memorize and identify these herbs. And he said that in one village a twelve-year-old was able to identify some 80 per cent of them. What does that mean? At the age of 12, a child has completed 80 per cent of the intellectual journey that the old man has, and that knowledge has now been retained for another generation.

What we need to do throughout this country is to try out more such innovative methods for preserving our traditional knowledge. I have proposed that we offer to send young children from urban public schools to villages, during their holidays, for two or three weeks. Let them look at the innovations being used there. They could do three things, in my judgement. First, the existing innovations can be documented, so that we will have a register of prior knowledge. Secondly, the children will learn how village people innovate to survive. Third, these visits can help build a bridge of respect and mutual appreciation between the people of the villages and those who live in urban areas.

Artificial distinctions between forms of knowledge and different

types of workers have to be broken down. Therefore, when we build curricula, let us not make them uniform and into rigid pigeonholes of knowledge. Let the knowledge about local flora, local fauna, culture, and customs be integrated so that as young children learn, they start to assimilate in themselves rather naturally, and fundamentally.

Documenting knowledge or passing of special domestic swadeshi Intellectual Property Rights laws are not really required, the need is for a more fundamental change. Nearly 45 per cent of our population is less than twenty years old. That is an impressionable age. Still, we are not doing anything to help them think creatively, that's the real problem.

□ *One of my own maternal grand uncles was a very eminent vaid. But in those days, when ayurveda was not given even a part of recognition it gets today, he was obsessed with setting up a research institution and publishing his knowledge. But he never found any support. Trunks-full of his manuscripts just rotted and got lost after his death. He had written an encyclopedia of medicinal herbs—he knew 17 languages including Sanskrit. But this genius of a man died heart broken because no one paid attention to documenting what he was eager to impart to them.*

The Vishwa Hindu Parishad has a *go-shala* in Nagpur where they do a lot of work on urine-based therapies. I visited them and actually saw some remarkable innovations. For instance, one of their prescriptions seemed to result in improvements in patients with diabetes and certain skin diseases. I found that they had done remarkable research. They wanted to patent their work, which is why I had paid them a visit

□ *But how can cow-urine be patented? It is not manufactured.*

How can you patent something that is not manufactured?

Use-patent. Its use towards these particular purposes is its novelty.

□ *But how do you patent something that's used in every household? The idea behind patenting, I thought, was that anyone who manufactures a product has rights...*

No, actually, it is not raw cow urine, as such, that they wish to patent. They put the urine through a special process that distils the essential active ingredients. Also, if it is to be used widely, it has to be done in a special manner on a larger scale.

□ *Bottling, for instance?*

Yes, but, more importantly, the main point is that indigenous innovations need to be protected. The essential issue is that people feel their innovations are important enough to be protected, even if they sit in Yeravada Jail.

□ *Is there any difference between the chemical properties of Indian cows' urine and that of Jersey cows? Why is it that nobody is breeding Indian cows to see if this is so?*

That must be the first question: why do things work the way they do? There must be specific enzymes, especially proteins, that are determined by the genetic make-up of a particular type of animal.

□ *Is anybody doing such research?*

No, it has not even begun. We have started a programme called Technopreneurs Promotions Programme. That provides support for technological entrepreneurship. Normally, the government funds all these big schemes only in formal institutions. We wanted to create something different, so we announced this programme last year, through which any housewife, any farmer, any artisan, any schoolboy, any person on the street can come and seek support from us, without the interference of bureaucracy.

Decisions are taken within three months. Support from 50,000 to five lakh rupees is available. Thus far we have supported something like 25 innovations, and I hope that further promising proposals are submitted.

We need to change our value system. I can assure you that the Mashelkar with whom you are speaking in 2000 is not the same Mashelkar of 1995. When I came to CSIR, for instance, I was thinking only about industry, globalization, liberalization, "the strongest will win, the weakest will die"—all of that. But frankly, coming here has made all the difference. I saw 40 laboratories. Right from the bottom of the Himalayas to Trivandrum, from Jorhat (Assam) to Piloni in Rajasthan. And when I was visiting all these places and seeing real India—I must say, it was like a magical transformation in my mind. I believe, I discovered India for the first time.

□ *Our educational system drives us away from our roots, from our own traditional knowledge systems. How did you come to be receptive to this form of knowledge.*

I was born in a very poor family. I have seen what poverty is, yet I had no understanding of India. I have only begun to understand through my faith, my belief in our potential. I would not have thought in terms of a Technopreneurs Promotion Programme a few years ago. I would have continued to believe that science and technology are confined to formal laboratories. But when I saw what farmers and artisans have invented, how innovative and creative they are, and what they do to survive, I realized the value of indigenous discoveries.

For example, my guru, Mr M.M. Sharma, had severe health problems. People had given up on him. He had swelling on his hands and was unable to walk or move. And it was a *nadi-vaidya* in Pune who saved him. In another incident Dr Tilak, who was the

director of NCL, developed symptoms similar to those of tuberculosis, but he didn't have tuberculosis. He went to Boston, where his daughter lives. She made him undergo the most comprehensive tests offered in the US, but no one could diagnose what was wrong. Jaslok Hospital couldn't diagnose his ailment. Finally, it was the *nadi-vaidya* in Pune who looked at him and said, take a hot glass of water before you go to bed and a hot glass of water after you get up in the morning. I still remember, everybody had given up on him. But he was fully cured with that simple prescription.

Scientists in our country are not ready to experiment with, and thus learn which of these traditional healing regimens can produce cures. Their curricula, their examination systems, their value systems, what they have been practicing—unlearning all that stands in the way of objective research is going to require a big change in their approach. “Boundaryless thinking,” as I call it—seamless thought—has yet to be regularly practiced among our scientists.

□ *Now, tell me more about the patents regime. What do you see as its advantages for a country like India?*

People describe India as a rich country, where poor people live. However, if you look at the herbal products market, it is worth 65 billion dollars a year today. Out of this, last year we exported merely 500 crores while China exported something worth 1,400 crores from the same industry. We need to think as to why have the Chinese done better? One of the reasons is that the Chinese have brought science together with herbal-based knowledge in their laboratories. Two, they have standardized product composition. That is something we have not done. Three, they have patented their products. Do you know that between 1994 and 1998—I know



Dr R.A. Mashelkar (left) and Mr P.K. Warriar of Aryavaidyashala, Kottakkal, signing Memorandum of Understanding.

these numbers by heart—the number of patents on herbal products was 1889, out of which the 889 were of Chinese origin. India did not even have 10 patents.

□ *And our herbal tradition could not be less rich—in fact, it's likely to be richer.*

Of course, it is richer. The world is going digital, the world is going herbal. And these are the two areas in which we want to win. We already have the IT superpower dream. In my judgement, we need to have a similar dream with respect to herbals.

We can be a herbal super power. You know, people say that by 2020, the herbal market will be five trillion dollars. Even 10 to 20 per cent market share for India would make a huge difference to our economy. But we cannot accomplish this goal unless, first of all, we bring science and old wisdom together; second, we use science to understand how and why we do what we do; third, we standardize our products; and fourth, we protect our innovations.

□ *Let's return to the question of who gets the patents.*

Let me give you an example. The Regional Research Institute in Jammu

asked a very fundamental question. Why does Ayurveda have what is called the Trikala—three substances, one of which is black pepper? They investigated for some seven or eight years, and found that there is a chemical called pepperine, which acts as a bio-enhancement. What is a bio-enhancement? Suppose, you now take eight tablets for tuberculosis. If you have an effective bio-enhancer, you may only have to take four and the drug will be equally effective. They patented it in the US. An Indian company in Ahmedabad is going to manufacture pepperine out of pepper and is going to sell it in the world market. We have proven its effectiveness with tuberculosis as well as in cases of leprosy.

□ *What about plain pepper? What if you eat plain pepper?*

Plain pepper is not as effective—pepperine acts more effectively. In this particular case, there is synergy between a specific chemical in pepper and the drug used in curing TB. So there is a chemical interaction. This bio-enhancing property was essentially derived from our traditional knowledge. There are hundreds and thousands of such things to be

studied. That is where I believe science needs to be brought in. Triumph of knowledge over unthinking empiricism is really the key.

We are creating many more new linkages not only with people who use traditional knowledge, but also with people in the pharmaceuticals industry. We have signed a memorandum of understanding with Aryavaidyashala of Kottakkal. What we'll do for them is, first, help them to understand why the plants they use are becoming extinct. They are being overused—even exploited—but nobody is growing replacement crops. Therefore we will have to develop modern agrobiotechnologies for them to survive. Secondly, the practices that they use for growing these herbs are very archaic and inefficient.

□ *Don't you think that these practices are necessary to ensure the potency of the herbs?*

No. It may not be necessary. We are trying to use modern process engineering. If this industry is to grow, we have to bring modern science, engineering and technology together. At first, the *vaidis* were not willing to talk to us. That happens. We were mutually suspicious of each other—modern science is suspicious of old practices and old practices are hiding information from modern science.

But the barrier was broken by Dr M.S. Waliathan. He brought us together. I had gone to Kolakar to sign a cooperation agreement, and on that day, I still remember, he said "Today is a holy day and this is a holy place because the two rivers are meeting. One is a river that has flowed for thousands of years full of traditional knowledge, namely Ayurveda, and the other is the river of modern knowledge, represented by CSIR." That day, my only question was why has it taken so long to meet.

CSIR is building new innovative models by forging unusual local partnerships, by reaching the unreached in the remote corners of India. A place called Athani, on the border of Maharashtra and Karnataka, is the place from where Kolhapuri chappals come to us. They were till recently made by age-old traditional technique. Our scientists from Central Leather Research Institute (CLRI) studied this and helped them to reduce the processing time from 30 days to 10 days through application of some good science, the stamping process was standardized, certain innovative changes in design, based on computer aided techniques, were made to give more comfort to the wearer. But this was not a top down process. The oldest man in the village was consulted, he was convinced that the age old traditions must change. Today several hundred artisans have been trained by CLRI. This has not only enhanced the family incomes of the villagers but also changed their perception of science, development and change—in short a

micro social transformation. CSIR has realized that in this innovation chain, it is not just techno-economics alone, but also socio-economic and socio-cultural aspects, which the institute needs to be conscious about.

□ *All this enthusiasm about patenting sounds very encouraging but what I would like to get from you is a sense of what concrete steps have been taken upto now to scientifically test the efficacy of these traditional practices. Have you instituted a system of rigorous field trials and lab tests to back the claims of their healing property with solid scientific evidence?*

That is precisely the work we need to undertake. CSIR has launched a major program on discovery of bioactive molecules based on our traditional medicine. Twenty laboratories with around 500 scientists are involved in this. Part of this effort will be to give a scientific validity to the claims. However, this is just a beginning. Considering the vast reservoir of knowledge that we have, a lot more needs to be done. □

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