Biological research in India

An interview with Dr Satyajit Mayor, Dean at the National Centre for Biological Sciences in Bangalore, India

EMBO reports: Dr Mayor, having been trained both in India and in the United States, are there differences in the way research is done in the two countries?

Satyajit Mayor: I think there are many differences, but let me first point out some similarities. First of all, the questions that are being addressed are similar. This stems from the fact that many researchers in India have been trained in laboratories in other parts of the world, in particular in North America and Europe. The differences often lie in the nature and the context of the work. Research in India often tends to be derivative of the work that has happened elsewhere. People try to explore things within a small comfort zone, which does not accrue a lot of competition but ensures publication in reasonable journals. Indian researchers are sometimes hesitant to take on certain challenges due to a lack of confidence in themselves, but also in the research infrastructure and the system. Compared to its huge population, research in India is still very under-represented and scientists might fear that their endeavours are not always fully supported by the public. Fortunately, this is changing and India is currently investing a lot of resources into building new institutes and into supporting scientific research.

EMBO reports: In addition to funding, which we will be discussing later on, what else needs to change to improve the situation for scientists in India?

Mayor: A big issue is the research that is being done at universities in India. In countries like Japan, the US or the UK, universities are places where excellent research is done. This means that undergraduates are exposed to cutting-edge science and can get excited about moving into research themselves. In India, very few universities encourage research

in biological sciences and very few are actually doing good research. This is different in disciplines like mathematics, physics or chemistry, which always had a stronger research focus in India. Research in biological sciences at the undergraduate level has to pick up if the next generation is going to be excited about doing research in this field. But there are steps in the right direction. For example, five new research-oriented universities—called the Indian Institutes of Science Education and Research—that train undergraduates at the bench have recently been established. The Indian Institute of Science is another place where they have started to set up a very exciting research-oriented undergraduate training programme. There is a huge effort to encourage research at the undergraduate level across the board, and this is bound to have a lasting impact. And then there is the pool of researchers working abroad, both Indian and non-Indian, that we would like to attract to come and do research here. Currently, the well-trained Indian scientists mostly work in North America or Europe and very few do come back to their home country, despite the good funding situation.

EMBO reports: It probably also has something to do with the critical mass. If you want to attract talented researchers they need to know that they will be embedded in an active and collaborative environment.

Mayor: That is also true, but the critical mass will have to be slowly built by people one by one, like drops in the ocean filling up the bucket. Some younger scientists may not want to be part of this 'building experiment' but it is very exciting and if it works there is a pot of gold at the end of it. But the world is also very connected these days and it is increasingly obvious that one's critical mass may be delocalized.

EMBO reports: You recently won the prestigious Infosys Prize, which is being awarded annually to outstanding scientists in six categories (engineering and computer sciences, humanities, life sciences, mathematical sciences, physical sciences and social sciences) by the Infosys Science Foundation, a not-for-profit trust, set up in February 2009. What message does it send out to young scientists considering doing research in India?

Mayor: It sends a strong message as this prize also comes from a private foundation, and has been given to very basic research conducted by my colleagues and myself in my laboratory in India. So far most funding came from the government, and private foundations are only slowly starting to step in. But they are very important, as they might be able to act in areas in which the government is reluctant to invest.

EMBO reports: What does the Indian government do to attract more people to do research in India?

Mayor: As I said, India is allocating much more money to research now, especially for basic research. During the recent Indian National Science Congress, Prime Minister Manmohan Singh stated that science funding, which is currently about 1% of the gross domestic product (GDP), should be raised to 2% of the GDP by 2017 [GDP in India was around US \$1.8 trillion in 2011]. These claims have been made for the past three Science Congresses but there are currently not enough researchers in the country that are eligible to take up these funds. When I started my laboratory 15–20 years ago the research focus was very much on applied areas because there was a sense that the country could not afford the luxury

Dr Satyajit Mayor completed his Masters at the Indian Institute of Technology in Mumbai and, after a brief period at the Tata Institute of Fundamental Research, he obtained his PhD from Rockefeller University studying glycoposphatidylinositol-anchored proteins. After postdoctoral work in endocytic transport of lipids and proteins at Columbia University, he returned to India and is now the Dean at the National Centre for Biological Sciences in Bangalore, India. His research focuses on the organization and endocytic transport of transmembrane and lipid-anchored proteins in the membranes of living cells.

of basic research. I see an opposite trend nowadays and the fact that scientists do not have to justify their existence anymore by promising that they will find a new drug tomorrow opens up the possibility of doing something totally transformative right now. Also, the living conditions and salaries are pretty reasonable for Indians working in India today, but we need to create some excitement about the opportunities in the country. While the National Centre for Biological Sciences (NCBS) is maybe among a small number of exceptional institutes, other institutes still lack this feeling of excitement.

EMBO reports: In addition to increasing research funding and to strengthening undergraduate education, are there any other specific plans of the government to support and foster science in India?

Mayor: There are many matters of small and large detail: five-year granting schemes, centres for excellence that are actively encouraging researchers to join and form groups in universities or a National Science and Engineering Board to oversee funding from the Department of Science and Technology to rationalize research-funding schemes.

EMBO reports: Both India and China are emerging as important players in scientific research. What parallels and differences do you see between the approaches of both countries?

Mayor: China has taken an aggressive approach towards attracting back its diaspora, by offering attractive packages and almost unlimited resources to individuals who have excelled in their fields in the West. India on the other hand has so far chosen to accrue young research groups and grow their science more organically. However this may change if some of the recent pronouncements of the prime minister become a reality. The Indian system is—like the Chinese system—still hierarchical, but in India this is changing very fast and perhaps in China this will not happen as quickly.

EMBO reports: From an outside perspective, what roles do international, non-Indian organizations play in helping to promote Indian science?

Mayor: In my opinion, science is an international affair and as new opportunities arise in India, international organizations play a very important role in making this

information known to scientists currently working in Europe or North America so that they might consider moving to India. In addition to informing the scientific community about the possibilities that arise here, these organizations could also engage in an open dialogue about additional needs or potential pitfalls.

EMBO reports: In your opinion, what are the upcoming fields in biology that are worth focusing on, maybe also with regards to where Indian science should be headed?

Mayor: One area with great potential is quantitative biology that could be applied to every area of the life sciences. New scientists who come to India have the exciting opportunity to collaborate not only with biologists, but also with mathematicians, physicists and chemists who are already here. In fact, historically, biological sciences in India came from that angle. Just think of G.N. Ramachandran who, as a physicist, revolutionized protein chemistry. Then there is Obaid Siddiqui who brought in genetics and, nowadays, India is very strong in behavioural and developmental genetics. The foresight of these people spawned a whole generation of scientists who are interested in making a career in India. Another area that is very exciting for research in India is looking at biology in the field—India is one of the areas of highest biodiversity and we are just beginning to map it, let alone understand any of this virgin biological territory. It is up to our new colleagues to go after this today.

EMBO reports: When NCBS was founded about 20 years ago, was there an intention of focusing on a particular area of biology?

Mayor: I think the idea was more to attract the best and brightest in different aspects of biology and to build an institute that covered the full range of biological fields, from molecules to ecosystems. One of the challenges with this sort of approach is, of course, how to reach a critical mass that is necessary for efficient collaborations. We are trying to address this by having a sufficiently large international base of invited researchers and scholars, who can spend time on our campuses and associate with our various groups of scientists.

EMBO reports: The situation was probably different when inStem, the Institute for Stem Cell Biology and Regenerative Medicine, was founded by K. VijayRaghavan in 2009/10.

Mayor: Yes, up to then, there was no institute in India that focused specifically on stem cell biology and the founders of inStem wanted to fill this gap. At the same time, there was a large group of developmental biologists at NCBS, including Vijay, who wanted to use stem cells to address questions in developmental biology. This model is different from NCBS, which comprises individual research groups. inStem follows more of a team-based approach and engages in very specific areas of biology, for example, cardiac myopathies or epithelial biology.

EMBO reports: Are there plans to establish new institutes like inStem in other areas?

Mayor: Yes. In collaboration with inStem we could in fact bud off new small centres, which, like inStem, are focused on specific themes and teams. A new initiative pioneered by Ashok Venkitiraman (U. Cambridge, UK) at inStem is about bringing a chemical biology perspective to progression of specific cancers. Another example is a new unit working on neurodegenerative disorders, pioneered by Sumantra Chattarji (NCBS, Bangalore) in collaboration with researchers at the University of Edinburgh, as the head of this effort has emerged. A separate unit focusing on physical biology of

cellular systems, including, but not limited to stem cells is also likely to emerge under this umbrella. This means that, in contrast with ten years ago, we can now actively think of shaping new institutes, centres and research programmes.

EMBO reports: Before we come to a close, let's talk about research integrity briefly, as it is a big issue, of course not only in India, but everywhere in the world.

Mayor: Indeed, this is a very important issue and an extremely critical one at this stage, simply because the research enterprise is expanding massively right now, and hopefully it expands in the right direction. Research integrity has to be dealt with at three different levels. The first is at the level of the individual research groups where group leaders have to teach their students good scientific practice and constantly search the discussion and dialogue with them, as their credibility depends on it. The second is at the level of the individual institutes. At NCBS we have a very clear policy on research integrity, which is enforced and emphasized via a committee of internal and external members as we engage with our students and colleagues in the institute. This institutional level is very important because funding agencies often leave it to the institute and institute directors to take these measures seriously or not. I think that clearer and more general policies should be instated, but at the level of the government and the funding agencies, people are still a little defensive about what this could imply in

terms of bringing a bad reputation to a particular place or a particular individual. We have also established an organization called IndiaBioscience that, similarly to EMBO, has the ability to reach out to all its member institutions. And one idea is to use this organization to disseminate some general guidelines about research integrity.

EMBO reports: Have those political and academic systems that cause people to be defensive exacerbated the problem of addressing the issue of research integrity in India? Do you see these problems as unique to India?

Mayor: The defensiveness sometimes takes on a 'nationalist' hue, where targeting or exposing an Indian scientist's fraud or misconduct is mistakenly seen to taint the entire scientific enterprise. This attitude could hamper an honest interrogation and rectification of underlying structural issues related to enforcing an effective policy for research integrity. But I am not convinced that these are issues unique to India.

EMBO reports: Dr Mayor, thank you very much for the interview.

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