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Adichunchanagiri University

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BG Nagara – 571448, Nagamangala Taluk, Mandya District, Karnataka, India

First Convocation

September, 15, 2021

Convocation Address

Prof. Gautam R. Desiraju
Indian Institute of Science, Bengaluru





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Indian Institute of Science, Bengaluru

Prof. Gautam R. Desiraju (born, Madras, 1952; B.Sc., University of Bombay, 1972; Ph.D., University of Illinois at Urbana-Champaign, 1976) was in the University of Hyderabad between 1979 and 2009, when he moved to the Solid State and Structural Chemistry Unit, Indian Institute of Science, Bangalore, where he remains today.

His 1989 book on Crystal Engineering and 1995 review in *Angewandte Chemie* on supramolecular synthons redefined several aspects of the subject of crystal engineering, and in particular led to a greater in-depth study of weak hydrogen bonds.

He has been on editorial and advisory boards of top journals like *IUCrJ*, *Acta Crystallographica*, *Angewandte Chemie*, *Journal of the American Chemical Society*, *Chemical Communications* and *Accounts of Chemical Research*.

He is one of the highest cited Indian scientists with 568 research papers, 61184 citations and an h-index of 95.

He has won international awards such as the Alexander von Humboldt *Forschungspreis* and the TWAS award in Chemistry.

He is a Past President of the International Union of Crystallography.

He is a recipient of honorary doctorate degrees of the *Universidad Nacional de Córdoba* Argentina and the *Royalaseema University*, Kurnool.

Recently, he was awarded the Acharya P. C. Ray medal of the University of Calcutta for Science and Technology and the ISA medal of science from the University of Bologna.

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Science Education and Research in India. A post-COVID scenario
Gautam R. Desiraju, IISc Bangalore

Distinguished dignitaries on the dais, staff, and students.

I am very pleased to have been given this opportunity to come to Adichunchanagiri University today. I thank your Hon'ble Chancellor Sri Dr. Nirmalanandanatha Swamiji for his very kind invitation. In this brief talk, I would like to tell you about the opportunity that the COVID crisis gives us in terms of how we should rethink our strategies for science education and research in India.

COVID, whatever havoc it has caused all over the world, and there is no doubt that it is a catastrophe, of a type not witnessed in our lifetimes, is also a perfect storm for deep reform in science education and research. It provides the trigger for a completely new relook into these critical sectors. The time for piecemeal solutions that are based on consensual arrangements and political calculations has long since passed. Any attempt to cling on to these old, safer, more comfortable ways of doing things will get us into serious trouble, and that too quite quickly. We must reform because preservation here is now no alternative.

The shortcomings that have led us to the brink of this abyss are far too numerous to bear repeating in this short lecture. Suffice it to say that these have been sins of omission and sins of commission and these have been committed literally non-stop by us since 1947 with the result that young people - and let us not forget that these are the intended beneficiaries of any educational system - are a demoralized and disillusioned lot. They see no connection between merit and reward, between input and output, and between cause and effect. The period after 2014 has seen the awakening of a new aspirational class. This is a welcome development but being aspirational, this large group of youngsters mostly from less privileged backgrounds and from the hinterland, are also impatient. They want education to bring tangible improvements in their lives, and too, quickly. If this is not forthcoming, there will be mass anger. This is something our politicians need to factor.

Before I get to how we can restructure education and research, I should tell you a little about how science has been done in India for the last 70 years.

Essentially science was a single silo thing. It was being administered largely by scientists, and it was mostly funded by the government. Government funding was small, but it was there and after that, the idea was to do something to the

best of one's abilities and then to hope for the best based on the limited inputs that we were getting in terms of money.

Now naturally with this kind of a thing-weak funding, do something as best as you can, and then hope for the best-the results are bound to be limited. One cannot blame scientists for the lack of tangible or quantifiable earth-shaking outputs.

If you look at the main government organizations that do science in our country, you find that there is a great vagueness and uncertainty in terms of the relationship between teaching and research in these places.

We have state universities which handle the largest number of students but have almost no funding and no research, then we have central universities which have a little more funding and a bit more research, then we have the IITs which cater to two entirely different streams of students, the B.Tech and the M.Sc./Ph.D., and then the spin-offs from the IITs the IISERs that are still too new to pass a judgement on. Then we have the CSIR system which belongs neither to the academic world nor to the industrial world but is supposed to bridge both. Too many types of institutions.

And then came COVID....

Now we know that science cannot be treated independently from the economy, from geopolitics or from the constitution. I will take up these factors one by one.

There are huge money cuts now. Considering that the salary and pension budget is almost 55% and upwards of the whole kitty, in government scientific and educational institutions, this leaves very, very little to do any kind of research. Geostrategies are also going to be very important because countries are now, post-COVID, going to become more isolationist, they are going to withdraw into themselves. The constitution also comes into the picture in a big way in any reform of the educational sector.

For geostrategy, let us take an example from the pharmaceutical sector. Till 1990, we were doing quite well in making pharmaceutical compounds in India because of the liberal policies that the various governments adopted between 1970 and 1990 and we developed good expertise in making these compounds.

By 1990, however, cheaper Chinese imports started flooding the market. The cost differential is roughly 10-30% between these imports and local products. If the government had encouraged the pharma industry and made up that balance, we would not have been in a soup today. This dependence on imports caused us to lose our scientific edge in making these drugs. We also lost the technical competence in synthesis we had. Industries took to

formulations rather than synthesis. Formulation means taking the pure drug and making it into tablets, capsules, syrups, injections and ointments. We may be world leaders in formulation but it is dangerous to depend too much on formulations. Generally the share of formulations in a healthy pharma industry is 25%. For us it is 75%. Why is it dangerous? Formulation depends on getting the pure drug from somewhere, either domestic synthesis or Chinese imports. What happens if China denies us those imports? Our pharma industry which is over dependent on formulations will collapse.

Yes, it may hurt the Chinese market to deny us their exports but tomorrow they may decide that they will cover that sum through subsidies to their industry to deny us these imports. Then where do we go? We have 70 million type-2 diabetics and probably 150 million hypertensives in this country. Where will all these people go? Chinese drug exports to India are around 10% of their total exports. Our Chinese imports account for 90% of our total imports. In short, we need them. They do not need us.

COVID caused a sudden awareness of our dangerous over-dependence on China for drugs among the political and bureaucratic classes, an awareness that was widely prevalent in scientific circles for at least 15 years. Politicians and bureaucrats simply did not listen to these strategic concerns expressed by our scientists. All at once, government initiated a program in March 2020 to develop domestic production, but the amount earmarked was a measly ₹10,000 crore in an industry which is worth ₹400,000 crore annually today. This is where the strategic interest must come into our educational programs. Our students must understand that research today must be strategically oriented. It is areas like pharma where there will be jobs and where they should concentrate. It is no point reacting after the danger has come to your doorstep.

Let us now go to the constitutional aspects of education. I will talk about three places where constitutional intervention is becoming important. The first is whether education should belong to the central list, or to the state list, or to the concurrent list where it belongs today. These are very serious questions because there are plus points and minus points of having education in each of these three categories. Let us not forget, in 1975, at the controversial time of the emergency, education was pushed into the concurrent list from the state list where it had been since 1950. Should it go back to the state list? Or should it go to the central list? Or remain where it is? These are questions I ask you to ponder.

Economy is of critical importance. We have lived in the scarcity economy and in such a scarcity economy, the accent is more on how to exclude people rather than how to include people. We have the culture of a single exam, a single job selection and a single award.

If you pass a single exam namely, the IIT-JEE or the CSIR-UGC NET Exam then

you are in. If you do not pass these exams, then you are out. A single selection for a job; if you clear that selection, you are in for 35 to 40 years but if you don't clear it you are out forever. A single award, say the Bhatnagar prize, if you get it then you are in, but if you do not get it, you are out. A few get everything. Most get nothing.

In this scenario when you have a single exam, a single job selection and a single award it would be okay if these things were administered extremely honestly. Then you would get honest people at the end. But even if any of these are slightly compromised, you have a system where people without quality come to a position of great power and privilege, no accountability, very high salaries, total job security and benefits till death. Such people take to corruption like a fish to water. I will quote Chanakya. He said, "just as it is impossible to know when a swimming fish is drinking water, so it is impossible to find out when a government servant is stealing money."

Now, in the science educational and research system in India we have this scenario. It is not the exception but the rule. And this is a hopeless situation for us, I mean especially for our young people, 50% of us are under 30.

When you have no money, you cannot indulge yourself in fancies and fantasies. If you do not have money, you cannot indulge yourself, for example, in reservations which is the second constitutional issue of importance. We have a state which today has 119% student enrolment for 100% capacity, and now with the reservations for economically weaker sections, this number may go up to 129% enrolment. Basically the reservation is at 69% instead of the 50% elsewhere. The idea underlying reservations is undoubtedly noble, but how can we implement these things within an economically sound model? And how long should reservations continue? Questions, questions and no answers.

What does it mean in practical terms? It means that you must admit 129 students with the money that you would normally use for 100 students of which 69 are already admitted because of reservations of one type or another. This sounds surreal. A reservation is no longer a reservation if it stands at 69%. And where is this money for 129 students going to come from? It cannot come from the government because government does not have that kind of money.

Clearly, there is no money. I mean, the budget of Yale University last year was \$3.4 billion. This is equal to ₹28,000 crores, and even if you convert it into PPP dollars you get around ₹8,000 crore rupees which is more than the budget of DST. So, one university in the USA has more than a whole science department in India. Money cannot come from the government. Money must come from industry, from start-ups or the private sector must be encouraged to start and run universities like this one. The private sector is not a bad word, as our Hon'ble Prime Minister has emphasized recently on the floor of the

parliament. But the private sector is not going to support science and start-ups if it is linked with reservations. What is the solution? Some state governments are saying let us introduce reservations in the private sector. Now we have come to the stage when the medicine is worse than the disease.

We need a complete re-structuring of the system and for a start we must begin a discussion on reservations. We cannot avoid it. One of the things the government can seriously think about is to have equitable reservations at the primary level because this is where a child's attitudes are shaped and to phase them out as you climb the educational ladder.

The constitution must also be invoked to take a new look at our language policy. I will state with no hesitation at all that the imagination of a scientific researcher, which is all important, can only be unleashed if the medium of doing research is the mother tongue or the local language. English can be used to communicate with those in other parts of the country and the world. Our research is imitative because we do not think boldly and imaginatively. It is like trying to walk with a pair of shoes that are too tight. The new education policy 2020 recommends primary education in the mother tongue or local language till Class 3 in all schools. This is such a wonderful idea. But does the government have the nerve to implement it? I would really like to see PhD theses in science subjects being written in Kannada. This obsession with English must go. The whole thing has given us an inferiority complex, going on still after 75 years of independence.

The western countries have shown us that good science leads to more money which in turn leads to better science. It is only because of S&T that the West has dominated the rest of the world for so long and the only way to facilitate S&T is to improve the education system. Education is all important but remember, it is a slow investment. It is not like building roads and bridges.

If your education is not proper, your S&T will not be proper and if your S&T is not proper, any good work done by the Home Ministry, the Finance Ministry, the Defence Ministry, or the External Affairs Ministry will all be pretty much useless. Education is a strategic matter, and the Minister for Education should be a member of the all-important Cabinet Committee for Security, along with the Prime Minister and these four other ministers.

Education has been neglected in a profound way in our country. I believe COVID has provided us with the moment where we as a people, must work together to put science education and research in a proper and higher place so that the vision of people like Swami Vivekananda, J. N. Tata and Acharya J. C. Bose is realized in India.

Jai Hind!



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