IIT Bombay Is Looking for Faculty

Bill Casselman

In this issue of the *Notices,* as well as in last month's, can be found a classified advertisement by the Indian Institute of Technology Bombay (IITB) for several open faculty positions. The Institute is located in Powai, just to the northeast of central Mumbai, which is the financial capital of India and now in a fascinating period of transition. Mumbai is perhaps known to mathematicians primarily as the home of the Tata Institute for Fundamental Research.

These advertisements are a small part of a long story.

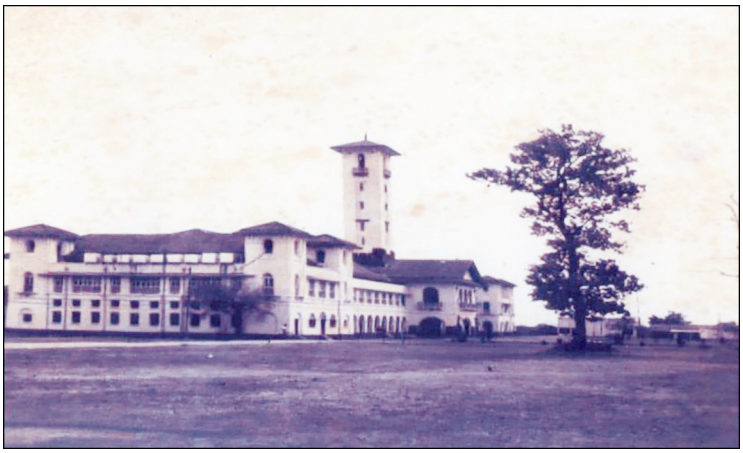
The Indian Institutes of Technology

There are currently seven Indian Institutes of Technology distributed around the country, and they are without qualification among the best undergraduate schools in the world. The number is about to be enlarged to ten, and the enrollment of the existing ones is to be expanded.

It was in 1946 that a governmental committee recommended the establishment of several institutes of technology in India, apparently with the model of the Massachusetts Institute of Technology in mind. The very first was the one at Kharagpur, in the vicinity of what was then Calcutta. This was housed in a vacant building known as the Hijli Detention Center, originally built by the British in 1930 to hold some of the rapidly growing population of political prisoners demanding independence for India. This irony was not left unnoticed by Prime Minister Nehru in his inauguration of the Institute.

Other Institutes followed—IITB, founded in 1958, was the second. It is about to celebrate its Golden Jubilee.

A degree from one of the IITs has always been a valuable possession, but in the current economic boom it has become almost priceless. Graduates of IIT occupy important positions in academia, industry, and government in India, and they are also among the founders and executives of major Silicon Valley companies. Competition for admission is conceivably the most intense anywhere in the world—in each of recent years roughly 300,000 students took exams for 5,000 positions at the seven schools. The ones who get in are both intelligent and willing to work hard—astonishingly hard, compared to the level of effort most North American mathematics faculty see in their students. Admission to these elite institutions by no means leads to a relaxing time, as it does in some countries—course loads are very heavy, and nearly all students lead a tough if rewarding life.



The original Institute building—the former Hijli detention center—at Kharagpur.

The Current Expansion

The current expansion plans contrast strongly with the pace of growth of the IITs up to now—it took sixty years to establish seven campuses, and in the next few years three more will be set up. Enrollment at the existing ones will be increased dramatically, and the number of faculty positions in many departments will be roughly doubled. This reflects a general concern of the government to improve higher education, and particularly technical education, around the country—this year's national budget for technical education is twice what it has been in previous years.

Bill Casselman is professor of mathematics at the University of British Columbia and graphics editor of the Notices.

A view of IITB from the east.

The current expansion plans have several causes. On the one hand, the economy of India is doing spectacularly well, and there is a great need for more skilled workers. But there is also a political demand to improve accessibility to higher education for that part of the population currently at the bottom of the ladder, which in India includes in particular those who once occupied the lower castes. In parts of the country this is a huge percentage of the population. Although the importance of caste classification has diminished in recent years, it still plays a significant role. There is currently in place at the IITs a quota of 22.5% for certain disadvantaged groups, and the new proposal is to add to this a quota of 27% for what are called officially Other Backward Classes (OBCs). The total enrollment at IITB would then rise by 54%. This will be an interesting experiment in affirmative action. As I write, a suit to reject the government's plans for these quotas (called officially *reservations*) has begun in the Supreme Court of India, but it seems almost certain that they will be carried through in some form.

Curiously, the political pressure to increase enrollment of OBCs does not seem to have led to similar pressure for enrollment of women.

The Role of Mathematics in the IITs

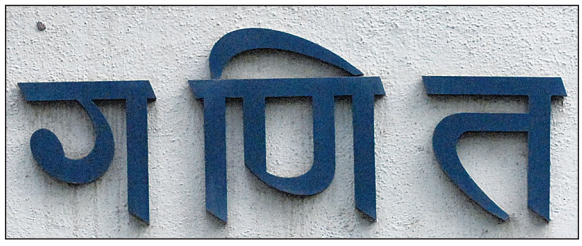
The IITs are primarily schools of engineering. Although much of the teaching effort of their mathematics departments goes into service courses, they offer a wide variety of programs aimed at both undergraduate and graduate students. At the moment there are about forty students in the Ph.D. program at IITB, and the current chairman of the IITB Mathematics Department, Jugal Verma, tells me that he considers the department now to be primarily a research department. There is currently no possibility to major in mathematics in IITB as part of the standard undergraduate program, although advanced degrees are offered in many fields of mathematics. The most popular option for undergraduates these days is computer science, and for understandable reasons—only the very best of those admitted to the IITs have the choice of majoring in CS.

At the center of the IITB campus.

Many of the faculty members at IITs who are best known internationally are in CS. This includes some who are known for their mathematical accomplishments. One is Manindra Agrawal of IIT Kanpur, who, along with some undergraduate research students, found an algorithm of polynomial complexity for primality testing a few years ago. Another is Narendra Karmarkar, well known for finding a polynomial time algorithm to solve linear programming problems, who was an undergraduate in CS at IITB.

One proposal among those currently on the table at IITB is a joint major in computer science and mathematics. For someone considering working at IITB, the prospect of teaching some of the world's very brightest undergraduates would seem a strong attraction.

The Mathematics Department at IITB is among the best in research in all of India, in addition to enjoying an extremely pleasant teaching environment. There are currently twenty-seven faculty members, and the plan is to add in the next few years thirty-seven new positions; this is proportionally more than the expected increase in student enrollment, and the intention is to bring back an enviable faculty:student ratio of 1:9 seen in former



The Hindi word for mathematics is *ganith*, displayed on the side of the mathematics building. Instruction in IITB is in English.

years. The general expansion of higher education in India, as well as a migration of talent out of the country, has contributed to a relative scarcity of mathematicians capable of teaching at the level the IITs expect. For this reason, IITB has received official permission to advertise abroad, and hence the advertisements. The difficulties of acquiring enough good faculty in the next few years has also led to consideration of an arrangement of visitor teaching programs.

The Environment of IITB

IITB is located in the Mumbai suburb of Powai, a bit to the north east of the city. The campus is fairly self-contained, physically isolated from its neighborhood and relatively attractive. Just to its north lies Sanjay Gandhi National Park, a very large and interesting place to visit—with a couple of large lakes, an ancient temple at Kanheri, and an extremely varied wildlife population. Until a new fence was recently constructed there was a problem on campus with leopards raiding the resident pet population. (This is different in degree but not in kind, I suppose, from the problems with the persistent coyote populations of some North American universities.) There is one large and pleasant lake on the edge of campus, as visitors to the official guest house will recall fondly.

Most faculty as well as staff live on the campus itself; the current plans for expansion include plans for much building construction and renovation, of both offices and residences.

References

The photograph of the Hijli detention center has been taken from the Wikipedia site. `http://en.wikipedia.org/wiki/Hijli`

Wikipedia also has a good article about the IIT campuses in general:

`http://en.wikipedia.org/wiki/Indian_Institutes_of_Technology`

The official website for the mathematics department at IITB is

`http://www.math.iitb.ac.in/`

A heron in flight over the lake at the western edge of the IITB campus.