Acculturation to Science

Becoming a Scientist in Mexico. The Challenge of Creating a Scientific Community in an Underdeveloped Country. JACQUELINE FORTES and LARISSA ADLER LOMNITZ. Pennsylvania State University Press, University Park, 1994. x, 225 pp., illus. $35 or £32. Translated from the Spanish by Alan P. Hynds.

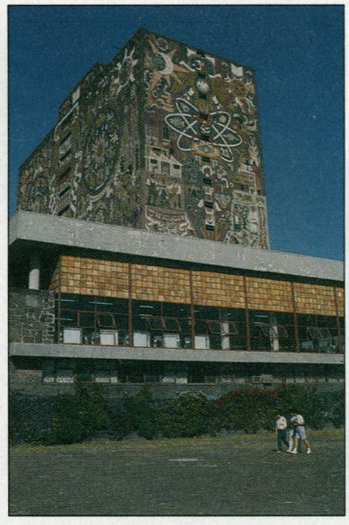
Research scientists are in short supply in Mexico. There were about 3000 full-time researchers at the National University of Mexico (UNAM) in 1979 and even fewer in 1990. The educational system is set up to turn out professionals such as doctors, lawyers, and engineers, who use knowledge but do not create it. Fortes and Lomnitz have written an ethnographic account of a bold approach to increase the number of scientists in Mexico by inculcating a select group of undergraduates with the scientific "ethos."

The UNAM is an "university of the masses" with a total enrollment of over 300,000, where students are taught in large sections in an authoritarian fashion by part-time teachers who do little research. Research is carried out in research institutes by full-time researchers. A group at one of these institutes, the Institute of Biomedical Research, began a program in 1974 to train small numbers of selected undergraduates with a completely different approach. During all four undergraduate years, they taught laboratories and seminars using only the discovery approach, with a minimum of lectures. The students were immersed in the Institute, given an extremely heavy work load, and encouraged to question and think critically.

A key goal of the faculty was to transmit and inculcate into the students the model of an ideal scientist as combining hard work, discipline, and creativity. This model was repeatedly emphasized in seminars, in the laboratory, and by example with the explicit aim of socializing students into a research culture. The program enrolled 100 students between 1974 and 1987 and graduated 65, most of whom went on to higher degrees. The program was very labor-intensive. It involved three full-time teachers and 14 researchers, in varying degrees, of whom 13 had Ph.D.'s, which is a very high proportion of doctorates for an undergraduate program in Mexico.

Fortes and Lomnitz argue that the transmission of a scientific ethos was the key component of the program because the cultural setting in the Third World, and in Mexico in particular, is not supportive of science. They argue that science did not develop naturally in countries that had been Spanish colonies, because these countries followed for centuries the anti-science ideas of the Counter-Reformation. Additionally, after independence the promoters of science in Mexico in the 1890s were the Comtean positivists, who had leadership roles in the Díaz dictatorship that was overthrown in the Mexican Revolution of 1910. The revulsion against the Díaz dictatorship also produced, as an unintended consequence, an antiscience bias in society. Beyond that, the lower middle classes are not aware of research degrees and do not see them as a means of social mobility. Fortes and Lomnitz cite a survey of 2000 university students in which fewer than 1 percent expressed interest in pursuing a research degree while almost all were interested in the traditional professional degrees.

The experiences in this program are quite interesting because it resembles the effort to increase the number of minority members in science in this country. Minorities here also do not envision science



Two views of the National University (Universidad Nacional Autónoma) of Mexico. [Photo Researchers, Inc.; © Carl Purcell]

Vignettes: Studying Science

I was thinking of whether I could graduate from high school if for the second year in a row I failed biology. I was surprised to be failing it, because I loved it; I'd loved it the first time I'd failed it too. My favorite part was gene-recession charts. I liked working out the sequence of blue eyes in families that had no characteristics except blue eyes and brown eyes. My family had a lot of characteristics—achievements, ambitions, talents, expectations—that all seemed to be recessive in me.

—*Susanna Kaysen*, in *Girl, Interrupted* (Random House)

A postlab discussion of an activity called "Experimenting with Mixtures" provided a forum for identifying the activity's successes and difficulties. Students expressed frustration over my expectation that they could inductively derive a distinction between homogeneous and heterogeneous mixtures. Students' preconceptions of mixtures were far richer and more complex than the scientific dichotomy of homogeneous/heterogeneous. "Why couldn't we just read about it before the activity?" they asked.

—*Glen Aikenhead*, in *STS Education: International Perspectives on Reform* (Joan Solomon and Glen Aikenhead, Eds.; Teachers College Press)

I think I got in [MIT] by being a nerd and getting good grades.

—*Bill Gosper*, in *More Mathematical People* (Donald J. Albers, Gerald L. Alexanderson, and Constance Reid, Eds.; Academic Press)

as a career, and programs like the Minority Biomedical Research Support (MBRS) and Minority Access to Research Careers (MARC) have the same aims as the program of the Institute of Biomedical Research and use some of the same approaches. All try to inculcate the scientific ethos by having the students actually do research and discover both that hard work is necessary to do science and that the rewards of science are not only in the results but in the search itself. A key component in both programs is mentoring by senior scientists and the feeling of belonging to the scientific community. An important difference is that the students at the Institute in Mexico were a select upper-middle-class group with professional parents, whereas most students in the MBRS program are first-generation college students who come from a lower socioeconomic level. Remarkably, despite this, the graduation rate of these minority students in some programs exceeds that of the Institute (MBRS 88 percent, MARC 99 percent at Wayne State University, according to Joseph Dunbar of the Medical School). Another difference is that whereas most of the Institute graduates went on to graduate degrees in science, there is a significant (45 percent) diversion of MBRS graduates to medical school, with only about 30 percent continuing in science. This is probably due to the much greater financial differential between M.D.'s and Ph.D.'s in the United States than in Mexico. A surprising difference was that female students in the Institute outnumbered male students by two to one.

Fortes and Lomnitz's book provides a number of illuminating views of the process and difficulties of socializing students into science. It will be of interest to those concerned with increasing the proportion of scientists in traditionally underrepresented groups.

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Books Received

The Almanac of Renewable Energy. Richard Golub and Eric Brus. Holt, New York, 1994. xvi, 348 pp., illus. Paper, $19.95.

Analysis of Vertebrate Structure. 4th ed. Milton Hildebrand. Wiley, New York, 1994. xiv, 657 pp., illus. $46.

Angiogenesis. Molecular Biology, Clinical Aspects. Michael E. Maragoudakis, Pietro M. Gullino, and Peter I. Lelkes, Eds. Plenum, New York, 1994. x, 372 pp., illus. $105. NATO ASI Series A, vol. 263. From an institute, Rhodes, June 1993.

Applied Virology Research. Vol. 3, New Diagnostic Procedures. Edouard Kurstak *et al.*, Eds. Plenum, New York, 1994. xv, 174 pp, illus. $69.50.

The Aqueous Phase Behavior of Surfactants. Robert G. Laughlin. Academic Press, San Diego, CA, 1994. xxii, 558 pp., illus. $70. Colloid Science.

Archaeology of the Southeastern United States. Paleoindian to World War I. Judith A. Bense. Academic Press, San Diego, CA, 1994. xviii, 388 pp., illus. $75;