

ately greater rewards in pay and assignments than in the United States. The teaching profession in Japan, in fact, is governed by the rule of seniority and the idea of merit pay or promotion is thoroughly alien. Salary ratios of teachers to other professionals and to production workers are more favorable in Japan than in the United States, according to the report.

If the social and economic status of Japanese teachers is higher, more is required of them. Schools in Japan operate 5½ days a week and the school year is longer than in the United States—some 210 days of instruction are required there compared to an average of 180 here. Japanese teachers are employed on a full-year basis. Japanese schools do not have the corps of specialist teachers and support staff found in U.S. schools and Japanese teachers are expected to handle a variety of supervisory and guidance functions that American teachers generally are not. Competition for teaching jobs is stiff. The report notes that prefectural schools have five applicants for each position.

About 41% of Japanese secondary school graduates go on to postsecondary education, with 29% of the total enrolling in 4-year undergraduate programs and junior college programs. The others attend special training colleges of various kinds. In the United States, about 55% of high school graduates proceed to study in 4-year or 2-year institutions.

About 37% of students in Japanese postsecondary education are women and only 40% of the women are in universities. In the United States, women now make up more than half the total of students in higher education and are fairly evenly represented in universities and other institutions. In Japan, employment opportunities for women in the professions, business, and industry remain limited; women are expected to marry and assume traditional domestic roles.

The underdevelopment of graduate education in Japan is indicated by the fact that enrollment at the graduate level is only 3% of total enrollment in universities and junior colleges. In the United States the corresponding figure is 11%. According to the report, "The major reason for the traditional resistance of Japanese students to graduate study has been the limited prospects for suitable employment upon completion of graduate work. Apart from the academic sector, relatively few jobs are available in the research laboratories of government institutes and large corporations. These positions are primarily for master's level graduates in engineering and basic sciences." Demand at the doctoral level is even lower. The report notes that firms that conduct research prefer to train their own researchers.

Although the report says that pressures for increased government support of research in universities are increasing, there has been no significant rise in actual funding in recent years. The report says that in 1983 about \$500 million in such funds were available, about a tenth of the amount in the United States. Research cooperation between universities and industry has also been slow to develop in Japan.

On the other hand, linkages between universities and government and industry employers are extremely close, particularly in the case of the most prestigious on both sides. The education system, with its Darwinian examinations, is seen as continuing to provide recruits with the demonstrated intelligence and work ethic prized in the elite.

Now under growing pressure, however, is the system under which a relatively few students from a particular socioeconomic group have had access to a small number of public schools that practically guaranteed admission to the prestigious national universities, thus gaining a decisive advantage in the competition for the best jobs. The rapid growth of the private sector in education, from preschool education to the strong private universities, represents a direct challenge to the system.

The seriousness of intentions in pursuing comprehensive reform are indicated by the government's formation of a National Council on Educational Reform with the clear implication that major changes will be made.

The Japanese report on educational re-

form in the United States has been completed but is not yet available here. The Japanese are not expected to find much to emulate in U.S. education. Indications from the start were that Japanese experts found the cultural differences too great and would treat American examples as a "reference tool."

The American report itself offers no recommendations on what might be profitably adopted from the Japanese, but an "epilogue" to the report has been added by Secretary of Education William J. Bennett titled "Implications for American Education."

Bennett, who often takes controversial positions, in this case occupies a middle ground. He says that Americans should "seek to distill lessons for ourselves from the experience of Japanese education," but warns against trying "to mimic specific practices or imitate particular arrangements." Bennett particularly admires Japan's success in achieving both equality and excellence in education and he offers a dozen "principles" he finds in Japanese education that are compatible with American values. Many of these accord with his own personal prescriptions for educational improvement—greater parental involvement in education, creation of conditions that will produce a highly competent corps of teachers, and a stronger effort by schools to instill values and encourage ethical behavior are examples. But Bennett will probably get few arguments to his assertion that the main practical reason why American reformers should take the Japanese experience seriously is that "Japanese education works." ■ JOHN WALSH

NASA Announces a Plan to Reform Management Practices

On 9 January, as part of its continuing self-assessment in the wake of the Challenger accident, the National Aeronautics and Space Administration (NASA) announced a broad new plan to strengthen its management practices.

The plan was developed as a response to the report of the NASA Management Study Group, a 16-member panel that was convened last year under the auspices of the National Academy of Public Administration at the request of NASA Administrator James C. Fletcher. "NASA is fundamentally a sound institution," says panel chairman General Sam C. Phillips, former director of the Apollo program. Indeed, he says, many of the recommended steps have already been

taken. Nonetheless, a number of issues need special attention. For example:

■ *Establish strong headquarters program direction for each major NASA program, with clear assignments of responsibilities to the NASA center involved.* Many observers saw this recommendation as an implicit criticism of the often bitter power struggles among Johnson, Marshall, Goddard, and other NASA field centers. Not only have center directors sometimes seemed to set policy like the heads of autonomous agencies, but NASA headquarters has often been led to keep the peace by dividing responsibility for high-profile programs such as the space shuttle, or the Hubble Space Telescope, in a way that suggests intra-agency pork-barrel-

ing. To guard against a repetition of such problems, NASA has already relieved the centers of authority for two major programs—the space shuttle and the space station—and has centralized top management in Washington. “The new program management structures clarify lines of communications,” says Fletcher, “identify focal points of authority, assure top management participation in important decisions, and ensure that problems are elevated to the correct level for consideration and decisions.”

In the same vein, Fletcher also promises to minimize multicenter management structures in future projects, and to tighten up the agency's internal review process.

■ *Increase management emphasis on space flight operations.* Before the Challenger accident, one often-voiced criticism of NASA was that agency officials were paying entirely too much attention to operational issues such as shuttle flight rates and shuttle pricing policy, and not nearly enough attention to the agency's research and development efforts. Indeed, it has even been suggested that NASA should spin off its operational activities to another agency, or to the private sector.

After considerable discussion, however, NASA officials and the Phillips committee both agreed that such an action is simply not feasible in the foreseeable future. “We bit the bullet,” says Fletcher. “It won't be easy, but we've accepted the fact that we have to learn to do operations well.” To that end, the agency's Office of Space Tracking and

Data Systems under associate administrator Robert O. Aller has been expanded into a new Office of Space Flight Operations. Aller's first task will be to identify just what NASA needs to do in this area.

■ *Establish a formal process within NASA to enunciate long-range goals and lay out programmatic, institutional, and financial plans for meeting them.* Like many other federal agencies, NASA has tended to stumble from budget submittal to budget submittal with no clear idea of where it is going. To rectify that tendency, however, the agency has already begun to put a new planning apparatus in place. In particular, astronaut Sally Ride is coordinating an agencywide effort to devise a new 10-year plan—“Space 1995”—which should be available later on this year.

In all, the Phillips committee made some 100 specific recommendations, which Fletcher and his colleagues have pledged to implement within a year. Phillips himself told *Science* that he was completely satisfied with the way NASA has responded so far. On the other hand, his report explicitly recognizes that much of what the agency's managers do is shaped by factors beyond their control—with notable examples being Administration policies, Congressional politics, Byzantine procurement regulations, and the annual upheavals of the federal budget. In the face of external forces like these, it remains to be seen whether this internal reform will have much effect. ■

M. MITCHELL WALDROP

NIH Finds Argentine Experiment Did Not Break U.S. Biotechnology Rules

The National Institutes of Health (NIH) has dismissed allegations that the Wistar Institute used federal funds to carry out a field test of a recombinant rabies vaccine in Azul, Argentina, last summer. The experiment, which began in July and was halted in September, initially became controversial because its sponsor, the Pan American Health Organization (PAHO), did not notify the Argentine government (*Science*, 28 November, p. 1068).

Subsequently, questions have arisen about the way the experiment was conducted and whether Wistar wanted to circumvent U.S. regulations governing the release of genetically engineered organisms. Wistar has received in excess of \$3 million in funds from NIH for rabies vaccine research since 1980. The Argentine field experiment con-

ducted by PAHO with Wistar's participation cost \$65,000.

In a 25 November letter to NIH director James B. Wyngaarden, Edward Lee Rogers, counsel for the Foundation on Economic Trends, asserted that Wistar had violated NIH guidelines governing the recombinant DNA research. Representing the foundation's director, Jeremy Rifkin, Rogers argued that because the NIH funds supported research leading to the development of the vaccine, Wistar was required to submit any plan to conduct a field experiment to NIH's Recombinant DNA Advisory Committee (RAC) for approval.

William F. Raub, deputy director of NIH, however, rejected the foundation's argument that NIH guidelines were applicable to Wistar in the Argentine rabies experiment. Although

NIH has supported underlying research conducted by Wistar, Raub says there is no evidence that NIH funds were used for the field experiment. Wistar director Hilary Koprowski in a 5 December letter to NIH stated that funding came “from two private sources.” One contributor was the Rockefeller Foundation, which provided \$32,500. The other was L'Fondation Merieux, a private French research group.

Raub's decision, which was made public on 5 January, hardly ends the dispute. Rifkin says that as the guidelines are interpreted now, institutions and researchers can segment projects receiving NIH support to escape compliance with recombinant DNA guidelines. On 9 January, Rifkin petitioned NIH to reconsider its finding that there was no NIH funding for the Argentine test. Specifically, the foundation suggests that NIH take account of the research grants made to Wistar over the past 6 years. Rifkin also asks that the RAC close the loophole in the guidelines so that experiments done abroad are subject to agency review when related research is supported by NIH.

NIH's rules and the conduct of the Argentine experiment also are slated to be examined in February or March by a House science subcommittee on investigation and oversight. In particular, the subcommittee may take up ethical questions related to American firms conducting field experiments overseas, and will attempt to determine whether the Argentine field test's protocol was followed.

In a 5 November letter to *Science*, 130 Argentine scientists charged that there was a serious breakdown in the execution of the protocol. In particular, they contend that animal caretakers were not vaccinated against smallpox and they were not under medical surveillance as required; that inoculated cattle and control group cattle were not totally isolated; and that milk from inoculated animals was consumed by caretakers without being pasteurized. Wistar officials contend that the caretakers had previously been vaccinated and that blood samples were monitored for antibody levels.

Carlyle Guerra de Macedo, director of PAHO's Washington office, declines to comment on what transpired. In a letter to *Science* dated 19 December, de Macedo wrote: “PAHO's main concern in this matter is to avoid fueling a situation where emotion, self-interest, fact and perceptions are hard to differentiate. I fear that any additional information PAHO could make available at this point may be used by some to exploit the situation and could compromise our excellent relations with the government of Argentina.” ■

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