Yugoslavia: Seeking To Link Science with Development

Belgrade, Yugoslavia. The Mihailo Pupin Institute for Automation and Telecommunications, housed in an imposing structure in a wooded area overlooking the Danube on the outskirts of Belgrade, can be said to epitomize the problems faced by institutes doing sophisticated research under the Yugoslav system of scientific organization. "The system requires a certain high technological basis throughout the economy to operate effectively," Milan Pavicevic, the vice minister for research in the Federal Chamber of the Economy, told *Science* recently. "And the system is still above the basis."

The "system," however, is an intriguing one. It is based on the idea of decentralization through all units of the economy. Like most other research institutes in Yugoslavia, Pupin is completely independent. It works under the system of "self-management," whereby each worker has a voice in how the institute is run. The director is elected by all those employed here —scientists and nonscientists—and Djurjha Kostic, the current director, told *Science* that he does not "run the institute in the American sense." Rather, he advises a popularly elected "workers council" on institute policy, and the final authority, he said, lies with that body, and, in essence, with the workers themselves.

Control of Finance

The council, together with Kostic, is also in charge of Pupin's financing, which is conducted on a profit-making basis. (In fact, the decentralization extends even into the separate laboratories within the institute. Each has a small, elected council that is in charge of the setting of salaries and the financing of that laboratory. But everything goes through the central council for approval and coordination.) "We are not supported by the government," Radovan Petrovic, head of the largest Pupin laboratory—automatic control—said in an interview with *Science*. "Our work is financed through contracts with the real users of the research. And, as such, we are profit-oriented."

It has not always been that way. In the years directly following World War II, Yugoslav science followed the Soviet model. Research institutions were governmental bodies; they were founded by government agencies, and their work was financed by the government. Yugoslavia's leaders, however, for various reasons, were anxious to increase the independence of all economic units and, by a series of gradual steps, introduced self-management and autonomy into the economy. With the economic reforms of 1965, the transformation, in essence, has been completed. For science, this means that all but a very few institutes, in mathematics, social science, linguistics, and other nonlaboratory fields, which are run by the five Academies of Sciences, are independent. "As a general philosophic system, it is good. In fact, I think that this system of self-management will, in the future, be the basic philosophy of the world," Kostic said recently. "Some sort of participation in management will be necessary if we wish to mobilize all the people. But practically, there are problems. There are problems putting the basic philosophy into operation."

The Pupin Institute is either the second or the third largest research establishment in Yugoslavia, depending on what criteria are used. Named after a world-renowned Yugoslav physicist and mathematician of the late 19th and early 20th centuries, the Pupin Institute started out in 1948 as a small laboratory for radio communications associated with the Boris Kidric nuclear institute in nearby Vinca. It has since expanded considerably and now has about 550 people (some 150 of whom are scientists and engineers) working in six autonomous though related laboratories—automatic control, telecommunications, digital machinery, crystals, pneumatics and hydraulics, and electronic components.

Kostic sees the aim of Pupin as "developing a general market for scientific services in this country. When we establish the market," he said, "it will be easier for us to get jobs. And then it will be easier for scientific services to help with Yugoslavia's development." Previously, Kostic said, when Pupin was financed by the government, "relations with industry were not very good. Now," he said, "the relations with industry are improving, but very, very slowly."

To finance their work, some of the laboratories at Pupin not only do research but also are active in development and production. This has beneficial effects for some labs. The crystals laboratory, for instance, finances its research by producing crystals and crystal filters for industry. The crystals people, therefore, must work closely with industry, and, like the scientists in the electronic components division, those in the crystals lab must make sure that the results of their research operate effectively.

Attitudes of Industry

In such areas of research it is fairly easy to build close contacts with industry. In fact, the industrial enterprises in certain fields have themselves seen the value of research, and have set up their own industrial institutes. Now numbering over 50, the industrial labs are a part of the industrial enterprise that creates them. As such, these institutes do research primarily on particular problems of a very practical nature, although some manage to do more basic research as well. But, as Kostic put it, "the industrial enterprises do not like to give money for work which is not based on the probability of better production tomorrow. They do not like to invest money where the probability of success is less than 50 percent." In some fields, it is fairly easy to see results from research—in some cases, even from fundamental research. "In metallurgy, agriculture, and some branches of electronics, it is not difficult to bring science into the economy," Pavicevic said. "There science has definite contributions to make."

In other fields, though, particularly those that are more advanced, industrial firms see little value in science. In Pupin's laboratory for automatic control, the jobs are harder to come by. "Many of our engineers have to be salesmen traveling across the country, trying to get enterprises to buy our services," Petrovic said. And there is another difficulty. As Petrovic puts it, "We have to persuade people without knowledge about the state of science to accept domestic solutions." Many

NIH Partly Restores Cuts in Grants

The National Institutes of Health (NIH) last week relaxed somewhat its squeeze on research grants when it reduced a 20-percent "temporary" cut in research grants to cuts in the 5- to 10-percent range. The revision was announced last Friday by Health, Education, and Welfare Department (HEW) assistant secretary for health and scientific affairs Roger O. Egeberg. Egeberg said that restoration of funds was made on the assumption that the NIH budget, which is still being considered by Congress, will be funded at the level requested by President Nixon. Should Congress reduce funds or impose spending limits as it did last year, NIH might have to apply the economy knife again.

Officials say HEW was able to bolster grant funds because the Administration decided to treat the fast growing Medicare and Medicaid programs separately. The big health-service programs which cannot be budgeted exactly were putting pressure on research and other programs.

Tight finances earlier last week led NIH to announce that it might have to stop funding 19 clinical research centers throughout the nation. The fate of the centers seems not to have been affected by the change in the budget picture at the end of the week.

NIH officials attribute the need to draw up contingency plans for phasing out 19 of the 93 clinical research centers to rising medical costs. "Inflation has eaten us up," an official said. NIH administrators say it is no longer possible for NIH to whittle down each of the 93 clinical centers without endangering the quality of the overall program.

The 19 centers selected for possible phaseout are described as "low priority." The research centers are hospitals in miniature—small clinics that utilize new drugs, equipment, and medical techniques to improve patient care; most of these research centers are affiliated with medical schools and research and training-oriented hospitals.

companies in Yugoslavia, he told *Science*, choose foreign scientific institutions to do their research for them, rather than calling on Pupin. "Because our borders are open," he said, "we must compete with foreign institutes." Such competition forces Pupin to complete each project quickly and successfully, but it also makes it difficult for a domestic institute to win contracts.

To obtain financing, Petrovic's lab often undertakes projects funded by foreign companies. Such projects, however, including a marketing study on computer applications in Yugoslavia, now being conducted in cooperation with an American computer firm, are often of more interest to the foreign firm than to Yugoslav industry. Indeed, such cooperation may lead some of Pupin's scientists to forget about the problems of their country's development. "Mihailo Pupin is better known abroad than in Yugoslavia," Petrovic said recently. And obviously it is tempting to make use of the strong foreign interest for purposes that have little relevance to Yugoslavia's development. The hope, of course, is that cooperation with foreign companies will benefit both countries, and examples of such benefit exist. Work in Petrovic's laboratory on automatically controlled prosthetic arms and legs, for example, conducted under the guidance of Rajko Tomovic (a world leader in the field, who developed the "Belgrade hand") is financed by the Social and Rehabilitation Service of the U.S. Department of Health, Education, and Welfare. Such work is obviously of benefit to both countries, as well as to the world.

Relevance to Economy

Despite the problems, many projects are carried out in the automation lab that have direct relevance to the Yugoslav economy. One group of scientists here, for example, is working on computer software for the Iron Gates (or Djerdap) dam and hydroelectric power plant being built on the Danube about 100 miles from Belgrade, in a cooperative program undertaken by Yugoslavia and Rumania. The computers themselves are being supplied by American firms, but the Pupin researchers, who outbid several foreign firms for the contract, are developing the equipment necessary to make the computers applicable to this particular project. Other scientists here are supplying computer systems and remote-control equipment to other parts of the economy, including water-supply stations and railway-transformer stations.

Another group in the automation lab is making an analysis of the operation of an industrial enterprise, "14 October"—a factory in nearby Krusevac that manufactures heavy machinery. The group is part of a small division in operations research that is one of the newest at Pupin, less than 2 years old. "For the time being, I am satisfied with the number and size of the projects we have," the division's chief told *Science* recently. "And as industry develops, we hope that there will be more demand for our work." At present, though, much of the group's research is funded by foreign firms or by the Yugoslav government. The "14 October" project, for example, is financed partly by the Chamber of the Economy, partly by the Federal Council for the Coordination of Scientific Activities, partly by "14 October" (for the work that is actually being done by people there), and partly by Mihailo Pupin, since the institute is interested in developing the operatons research group.

The financing of projects by several sources is encouraged by the government here. "We want to see another dinar for every dinar we provide," Zvanomir Damjanovic, the vice minister of the Federal Council, said recently. In basic science, the other dinars can come from the funds of an individual republic, but money from the economy is preferred. The main idea is to indicate to the federal authorities that there is interest, from some other source, in the particular research that is being undertaken.

In a broad sense, this is the main role the government would like to play in developing science in Yugoslavia. "We are interested in participation," Damjanovic said. "We want to stimulate institutes to find partners, to interact with the economy wherever possible." At this point in time the government is actually playing a larger role than it would like to. "What we put into science amounts to more than 25 percent of all the money given for research and development, and over 50 percent of the money given for research alone," Damjanovic said. "That shows the stage where the society is at present. Our contribution, ideally, should be less than 20 percent of the money for research, and nothing for development. There are nice tendencies

from industry, but the enterprises are not yet willing to contribute their share of the financing."

The government in this highly decentralized system would like to confine its financing to special projects. It would like to coordinate research, and not be its principal benefactor. What the government has in mind is illustrated by the so-called macro-projects, which are aimed at bringing several institutes together to conduct long-range studies in areas that are important to the society as a whole. The macro-projects are still in the formative stage, but Damjanovic expects the Federal Assembly (which must approve such large-scale expenditures) to approve money, before the end of this year, for projects on the resources of the Adriatic Sea, scientific and technical information, the ecology of Yugoslavia, and the "science of science," or how science is organized and conducted. Plans are in the works for many other macro-projects, but, as Kostic said, "if everything is important, nothing is important," so somebody has to set priorities. The Federal Council, however, is "reluctant to set priorities," according to Damjanovic, and so the macro-projects will be selected according to the amount of interest shown by scientists and the technical competence of the proposed plan of attack. "We would like these projects to be carried out more by exactness than by intuition," Kostic said.

The organization of scientific research in Yugoslavia is still in the experimental stage, as any scientist or science administrator here will tell you. "Nothing is so sacred that it cannot be changed," Damjanovic said in a recent interview, "and I, for one, hope that the experimental period in science lasts for a long time here." There are all sorts of proposals for increasing the contacts between science and the economy and for stepping up the interaction with foreign countries. "But Yugoslavia is the first country to try this system," Pavicevic said, "and we must take from abroad only what is good for us." There are also plans to improve technical education, which many here see as the best way to develop a scientific base. Damjanovic is excited about the future of a new program, recently approved by the Federal Council, which will provide direct grants to young scientists just out of the university.

But the role of the state in the Yugoslav system is still being defined. "The coordination from the Federal Council has not been very good," Damjanovic told *Science*, "and we want to make it better. We will continue to finance small projects, and we have been very encouraged by the response to the macro-projects. We hope to help with money, but we do not want to direct the research. The important thing is to keep the decision-making apparatus as open as possible." And, as Kostic said, "the interaction with industry will come in time, as the economy sees the need for science. Now, it is important to establish the system of participation and self-government, on which all future development in this country will be based."—ANDREW JAMISON

A Harvard senior and former Science *news intern, Andrew Jamison traveled in Eastern Europe this summer.*

Antipoverty R&D: Chicago Debacle Suggests Pitfalls Facing OEO

Early in August President Nixon made public his plans for reform of the welfare system including a major overhaul of the Office of Economic Opportunity (OEO) which had been the vanguard of the Johnson antipoverty program. The White House statement at the time said "it is in the Office of Economic Opportunity that social pioneering should be a specialty. It is the OEO that should act as the 'R and D' arm for government's social programs."

What Nixon prescribed for OEO is not a new departure but an expansion of OEO activities as a social experimenter and a contraction of its work of administering large, continuing programs. The idea is that OEO should spin off its successful experiments to "operational" agencies as was already being done with the Head Start program for preschool children.

A major question raised by the Nixon reform proposals is the fate of the community action programs (CAPs) which were a characteristic and controversial feature of the Johnson War on Poverty. Touchstone of the CAPs was the principle that people affected by antipoverty programs should have a direct role in planning, organizing, and operating such programs. The doctrine of "maximum feasible participation of residents" as it was expressed in the Economic Opportunity Act of 1964 proved to be the most significant innovation in welfare politics since the federal entry into the field during the Depression.

Nixon is following a hallowed and often politically profitable tradition of applying the new broom to an area of policy with which his immediate predecessors in office are closely identified. But in tackling the welfare system he is compelling the first real national scrutiny of a structure which has grown by a process of steady accretion since the New Deal and has come under increasing criticism. Strongly implied in the proposed reforms is a rejection of the theoretical base supplied by social and behavioral scientists and government planners for social programs, particularly those aimed at social change.

Revision rather than repudiation of basic theory is probably a more accurate way to describe what the Administration intends. In fact the Nixon proposals appear to be strongly influenced by what is being called the "Moynihan scenario," after Daniel Patrick Moynihan, an established urbanologist and now Nixon's assistant for urban affairs. Moynihan was, in fact, himself a New Frontier intellectual, having served in the Labor Department in both advisory and policy-making posts under Arthur Goldberg and Willard Wirtz, and participated in the design of the antipoverty campaign. Moynihan is author of the recent *Maximum Feasible Misunderstanding*. The title of the book is a play on the words of community action programs' charter. The book is a survey of poverty policy which, by and large, Moynihan finds deficient. Moynihan's preference seems to be for what he calls in his book an "employment strategy" rather than programs which stress organizing the poor, and the