The NIH group, like so many others, is anxious to send a delegation to China to learn about acupuncture firsthand. One of the great difficulties investigators face in trying to assess the use of the technique in China or to construct research protocols is the lack of published material by Chinese scientists. According to authorities, the few known articles on the subject published in China in the last few years discuss only general aspects of acupuncture. Apparently, since the beginning of the Cultural Revolution in 1966, scientific publication has ceased because of what Quinn describes as "the desire to subordinate the role of the individual biomedical worker to society's needs as a whole," and there are no known papers detailing research on acupuncture during the last 7 years.

The full scope of the NIH study, to be handled by the National Institute of General Medical Sciences (NIGMS), the National Institute of Neurological Diseases and Stroke, and the Fogarty Center, will not be decided until after two workshops are held late this fall at the Bethesda campus. However, Howard Jenerick of NIGMS said, when pressed, that grant support might run to "several hundreds of thousands of dollars" if "sound" applications come in. Already, he says, he has heard from several researchers asking for information about the kinds of investigations foreseen and the details of making a grant application. Both animal and clinical studies are under consideration.

"We need to learn what effect the needles and current have on physiologic processes," says Bonica. There are also plans to study what the ad hoc committee formally described as "factors influencing the patient's response," for example the relation of his response to his hypnotizability or previous training or preconditioning.

Bonica, an anesthesiologist who heads a group for the study of pain, points out that it is important to distinguish the psychological aspects of acupuncture from the physiological ones. "We do not know," he says, "whether acupuncture anesthesia works in China on all patients or on a selected population." Data on this question would be invaluable, investigators believe. Many consider it crucial to sort out the psychological factors in acupuncture anesthesia, believing it to be relevant to the unanswered questions of whether, and to what extent, the procedure might prove applicable for medical practice in the United States. "We are very anxious to go to China because we believe we can learn a lot from Chinese scientists," Bonica declares.

This looks like the beginning of a long venture.—BARBARA J. CULLITON

Willow Run Laboratories: Separating from the University of Michigan

They give you fail-safe directions on how to reach the Willow Run Laboratories (WRL)—and a good thing, too, since visitors tend to have trouble finding the place on the first try. The main buildings are on a back road on the huge Willow Run reservation west of Detroit, where Ford built the plant famous for turning out thousands of B-24's during World War II. After the war, the government declared Willow Run surplus and transferred ownership to the University of Michigan for the symbolic $1. It was there, about 15 miles from the Ann Arbor campus, that the university began doing most of its contract research for the military and that the Willow Run Laboratories developed.

Set back from the road, the main cluster of WRL buildings has the unprepossessing cinder-block and plywood look of the wartime era from which they date. Inside, there are none of the gold rugs and golden California blondes that adorn the West Coast research firms that live on federal funds. If the WRL decor is more temporary than contemporary, this seems to be largely a matter of Midwestern attitudes, since over two decades WRL has gained an international reputation as a center for highly sophisticated R & D, particularly in the use of radar and of infrared, acoustic, and optical techniques for remote sensing. Much of the laboratories' work is still financed and used by the military, but for the past several years WRL researchers have been working hard on nonmilitary applications of their work.

Now major changes are afoot at Willow Run; the laboratories are being separated from the parent university and are in the process of setting themselves up as an independent, nonprofit research corporation—to be called the Environmental Research Institute of Michigan.

WRL has been a chief issue in the debate on classified research within the university since the middle 1960's. Campus criticism has, in fact, sharpened in recent years as American military emphasis in Southeast Asia shifted to air operations. The reason is that WRL research has translated directly into such things as remote sensor technology for locating and targeting vehicles and troops on the ground and laser guidance for so-called "smart" bombs. In the last few years a series of moves have brought the university and the laboratories to a parting of the ways. A crucial step was taken in June, when the university regents voted to transfer the title on equipment at WRL to the recently incorporated institute. Equally important, the Michigan legislature, which has looked with favor on the separation, voted in July to make available $2 million for low-interest loans to the labs should funds be needed in the transition period. Officials were impressed not only by the potential of remote sensing technology for solving problems in the state, but also by the possibilities for Michigan industry's obtaining production contracts for hardware—both military and civilian—developed at WRL.

WRL, therefore, is hardly being thrust naked into the marketplace. The regents have approved the transfer of existing contracts and grants to the new institute, while the dowry in equipment and the blessings of the legislature are substantial aids. It is true that this is not a particularly favorable period for nonprofit research organizations specializing in work for the military, since Congress has been applying pres-

sure to the so-called Federal Contract Research Centers (*Science*, 3 December 1971). It is also true that WRL faces stiffer competition in the field of sensor development and applications from other nonprofit and industrial research organizations. But WRL is relatively small—the budget is about $7.5 million this year—and is highly regarded in its field. The military's demand seems unlikely to collapse, and WRL researchers see rapidly increasing opportunities for civilian application of remote sensing technology in agriculture, forestry, geology, geography, and hydrology. WRL's new name—Environmental Research Institute of Michigan—is, in view of the continuing preponderance of work supported by the Department of Defense, more than a little euphemistic, but it does indicate the direction in which the labs hope to move.

WRL's reputation is based primarily on such developments as "side-looking" radar and the so-called multispectral scanners, which utilize the ultraviolet, infrared, and visible portions of the electromagnetic spectrum. In order to exploit the vast quantities of data that scanners can acquire, it was necessary to find means of analyzing the data rapidly and automatically. WRL excelled in finding ways of processing scanning data by computer and in developing sophisticated recognition patterns that made it possible to adapt the system to use in a great variety of military and nonmilitary situations.

For example, not only is it possible to locate oil spills on bodies of water with multispectral scanners mounted in aircraft, but also to identify the wells from which the crude oil came and, potentially, the ship responsible for the oil spill. WRL last year participated in the corn blight watch and has worked to develop techniques for conducting inventories and detecting diseases in crops and trees. Scanners can also be utilized over urban and suburban areas, for example, to indicate those changes in the extent of paved-over ground that may create drainage problems.

Like others at Willow Run, WRL Director William M. Brown talks enthusiastically about prospects for civilian applications of the work there. As for the separation of the labs from the university, Brown sees a certain inevitablity in it, considered in the perspective of the last two decades.

Contract research requires a certain kind of dedication, he says, an emphasis on making deadlines. There is likely to be "a conflict with the priority system of universities." The relationship between the university and the federal agencies that contracted for research has also changed over the years. "As the exercise matured," says Brown, "the sponsoring agencies had problems. There was more emphasis on results."

Vietnam exerted additional pressures, and finally, in recent years, Brown says he and others concerned with WRL acted to "use the pressure from the radicals to do what had to be done": that is, to make the labs independent. When the "political opportunity" ripened as the Michigan legislature and state and elected federal officials backed the separation, Brown says, it was time to go.

Brown has been director of the labs for 2½ years. He has an engineering background, with a doctorate from Johns Hopkins in 1957. He went to the University of Michigan in 1958 and has held professorial rank since 1963. As lab director, he has had to work primarily as an "outside man" (not directly engaged in R & D work at the laboratory) during the period when the WRL's future was being settled. But his colleagues note that he was a key man in radar projects, has continued to teach at the university, and is still in touch with his colleagues technically.

Brown's current problem is to preside over the major organizational changes necessary now that the labs are on their own. Unlike M.I.T.'s Lincoln Laboratories, for example, WRL has never had a separate administrative structure and, Brown says, "is all tangled up in the affairs of the university." The new institute will have to set up its own bookkeeping and personnel structures and find ways to get over its reliance on other central services of the university.

"The real question," says Brown, "is what kind of a research center this should be, what is its role." Brown seems pretty sure he has found the answer, and, like others of his calling, he can diagram it on the blackboard. Universities, says Brown, are "people-improving" institutions. Industry is capable of producing goods, and the federal government has money and a responsibility for dealing with public problems. The same can be said of state and local governments, although their resources are more modest. Private foundations also have funds at their disposal and are problem-oriented.

A nonprofit research organization can work simultaneously for all these institutions, says Brown; it can, so to

WRL "Firsts"

The following excerpt from a WRL house history gives this partial list of the labs' scientific and technological accomplishments.

Willow Run Laboratories conceived and was the first to employ airborne "multispectral" sensing techniques, the simultaneous collection of data in a number of wavelength regions of the ultraviolet, visible, and infrared portions of the electromagnetic spectrum, and the application of automatic pattern recognition techniques to these data. These techniques now play important roles in national plans for remote sensing applications to matters of earth resources. The Laboratories also first recommended the use of and demonstrated the feasibility and value of multielement detectors; was first to demonstrate the advantages of "wide-angle" scanning techniques; was first to demonstrate rectification techniques for correcting geometric distortions in scanner-derived imagery; led in exploiting magnetic tape recording techniques to permit sophisticated data processing for spatial and spectral pattern recognition in image interpretation; was first to employ calibration techniques in scanning devices to provide the quantitative measurements of radiant power which are essential to multispectral data analysis; was first to use maximum-likelihood statistical techniques in multispectral data analysis; and was a leader in demonstrating infrared-to-visible energy conversion using single-crystal zinc sulfide. The Laboratories has been the leader in the collection and analysis of the "target" and "background" signature information fundamental to both military and civilian applications, and effectively serves as a national center in this area. It has been among the leaders in the mathematical modeling of atmospheric transmission, absorption, and scattering phenomena, and in the modeling of thermal radiation, and has played a key role in early studies of economic benefits to be derived from the use of remote sensing in earth resource applications.

speak, work "inside and outside." For government, for example, the nonprofit organization might both develop the concept of a project and then evaluate the work of industry on it. The special thing about such an organization is that it provides "a common ground."

The nature of national problems has changed, Brown notes. A few years ago they were "external problems"—that is, primarily those affecting defense and space. Now the nation is more concerned with "internal" problems, such as those afflicting transportation, health care, and the whole range of urban problems. "It gets very complicated and tangled up with everybody."

For a nonprofit organization, the problem, says Brown, is "where to connect." For the new institute, the connection has been provided by the state legislature, which has endorsed the enterprise and guaranteed it start-up money, but which will not finance it in the future. Brown expects, however, that the state seal of approval will give the institute status and will make the dialogue with state and local agencies easier. The institute's 12-member board will have the Michigan secretary of state, treasurer, and director of the department of commerce as members, and Brown expects that the other members will be drawn from other sectors of the institute's natural constituency.

Brown resists the characterization of Willow Run as a remote sensing laboratory. "We do a little bit of everything, but it is true we do a lot with sensor systems—infrared, radar, optics." H. J. Nichols, a senior administrative associate, part of whose job is to look at new R&D opportunities, says, "the future is in pattern recognition. And not just pattern recognition, but change detection," which could be applied to medicine, for example, in intensive care units and psychiatry. "It needs more theoretical work," says Nichols, and the institute is anxious to press on.

The National Science Foundation is sufficiently convinced of the possibilities to have included WRL in two RANN (Research Applied to National Needs) projects. The first is a 2-year, $700,000 program aimed at assessing the implications of remote sensing for public policy formulation. The focus is the practical use of sensor technology in land-use planning in Genesee County, Michigan, and the project will be carried out jointly by WRL, an urban and rural planning group at the University of Michigan, and Genesee county planners.

The second project is a technology-assessment effort with the more general purpose of identifying various practical uses of remote sensing. The laboratories will collaborate with lawyers and ecologists from the university in the 18-month, $140,000 project.

There is no indication that the institute will soon close out its military research effort. Of about $7.5 million in federally sponsored research on the books this year, $3 million is funded by the Air Force and $1 million by other defense agencies. NASA contracts stand at $2.5 million; contracts from other federal agencies amount to about $1 million, but represent the fastest growing part of the budget. Contracts from nonfederal sources aggregate only about $200,000 currently.

WRL's budget had dropped somewhat in recent years, but this year it recovered and Brown says that they "think it will be growing actively." Some campus critics have complained that separation from the university now makes it possible for the laboratories to accept military contracts of a type that might have been rejected under the university research review system.

For members of the laboratories' staff, the ending of the university connection will bring some decided changes. TIAA retirement and insurance programs will be continued, but there will be a loss of social, professional, and recreational fringe benefits. The laboratories now have about 350 employees, half of them professionals. About a dozen staff members have held joint appointments at the university, and those appointments will be terminated. Not all of the terms of the divorce settlement have been worked out, but laboratory officials expect that institute staff may still do some part-time teaching, and university faculty and staff may spend time at the laboratories under new arrangements. Brown says the laboratories will keep the emphasis on graduate students, but just how this will be done is not clear.

At the university, the separation of the WRL has caused mixed feelings. The departure of WRL has removed most classified research from the university but apparently has not ended the debate. The process by which WRL came to be "divested" by the university and the implications for the university will be discussed in another article.

It is really not clear yet how the separation will affect the laboratories and the university. What can be said is that WRL provided a successful example of what may be a vanishing phenomenon—the direct cooperation of university researchers interested in advancing the state of the art with military patrons interested in advancing the state of the arms.—JOHN WALSH

RECENT DEATHS

From Los Alamos Scientific Laboratory, New Mexico, on 19 May:

Bruce A. Bean, 28; engineer.

William P. Frye, 40; electronic engineer.

Johnnie E. Gallegos, 41; senior electronic technician.

John A. Gill, 43; staff member electronic engineer.

Wright H. Langham, 60; associate division leader for biomedical research.

Donald A. Larson, 46; technician.

Richard O. Niethammer, 39; engineer.

Eugene T. Teatum, 37; staff member.

A. Adrian Albert, 66; dean, physical sciences division, University of Chicago; 6 June.

J. E. Belcher, 86; professor emeritus of chemistry, University of Oklahoma; 5 May.

William D. Bliss, 85; dean emeritus, College of Engineering, Marquette University; 13 May.

William Bloom, 72; professor emeritus of anatomy and biophysics, biological sciences division and the Pritzker School of Medicine, University of Chicago; 11 May.

Windsor C. Cutting, 64; former dean, Stanford University School of Medicine; 29 May.

James T. Dobbins, 83; professor emeritus of chemistry, University of North Carolina; 12 May.

Bayard Dodge, 84; president emeritus, American University, Lebanon; 30 May.

Nikolai V. Fedorenko, 61; deputy director, A. F. Ioffe Physico-Technical Institute, Academy of Sciences of the U.S.S.R.; 2 February.

Hetty Goldman, 90; professor emeritus of archaeology, Institute for Advanced Study; 4 May.

Ives Hendrick, 74; professor emeritus of clinical psychiatry, Harvard University; 28 May.

Kenneth K. Kurihara, 62; professor

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