the subject leave something to be desired. In its July Drug Letter, the agency asked physicians to drop it a line about any problem IUD cases they came across. The FDA listed certain kinds of information it was seeking but several important questions, including those about the patient's age and whether or not she had had a child, were conspicuous by their absence. Both of the latter two factors are thought to be particularly significant in assessing the shield which, more than other devices, has been inserted in young, highly fertile women who have not had any children.

In deciding to maintain the status quo temporary suspension of June, the panel of outside advisers only echoed the now familiar disclaimer that has plagued the "investigation" of the Dalkon from the beginning, that there is simply not enough evidence to convict or acquit the shield. The group recommended that still another committee be formed to study the problem. What this one can do in the next 2 to 4 weeks that the other panels could not do is anybody's guess.

The continuing limbo must be a disappointment to commissioner Schmidt who had been promising a definitive decision soon after the 21 August hearing. Schimdt's final verdict will probably come by the end of next week, but there is no reason to think this will be the last we hear of the Dalkon shield. As far as the 1.3 million to 2.2 million women already wearing the shield are concerned, the FDA emphasized that shields being worn without complications should not be removed. Nonetheless, with the bad publicity the shield has already received, it is difficult to imagine those women will be comforted by the FDA assurance.

—BARBARA J. CULLITON and
DEBRA S. KNOPMAN

*Knopman will be a senior at Wellesley College this fall.*

# Fermi National Accelerator Lab: Making the Users More at Home

During the protracted bargaining that resulted in the construction of the Fermi National Accelerator Laboratory (FNAL) near Batavia, Illinois, agreement had to be reached not only on the difficult issues of how much the big machine would cost, where it should be located, and how powerful it would be but also on how to guarantee a "national" character for the facility.

The Atomic Energy Commission (AEC), which pays the bills at Batavia, was committed to the principle that the lab not be monopolized by researchers from any particular institution or region and went some way toward forestalling the problem by bestowing the contract for operating the facility on the Universities Research Associates, Inc. (URA), a consortium of research universities now numbering 52. So far, the new lab's director, Robert R. Wilson, and his staff have fashioned a management system designed to provide fair access and also to avoid other pitfalls found in other big accelerator labs.

To provide formal representation for visiting experimenters (for whom the lab after all is intended), an FNAL User's Organization was formed that now has about 1000 on its mailing list. The user's group deals on most matters with the lab management, but there is also an arrangement under which representatives of the user's group meet regularly with the URA board of trustees without top lab managers being present.

Batavia is really in its first summer of operation with a full complement of university researchers and their families in residence, and many of the issues raised by the user's group relate to problems of setting up housekeeping for longer or shorter periods at Batavia.

Batavia's overseers were aware that the new lab's location on the farthest fringes of Chicago's commuting suburbs might not be regarded as a garden spot by physicists and their families, more accustomed as they are to summering on the coasts rather than simmering in a converted cornfield.

Housing was a problem because what was available on the private market tended to be distant or expensive and provision for on-site housing ran into an AEC policy of avoiding competition with private enterprise. Now, after a long period of negotiation, a compromise seems to have been reached which permits the use of some original farmhouses that were moved from locations around the lab's site to the village of Weston and the reconversion to living units of some small houses in an ill-starred subdivision the government took over as part of the 6800-acre site. Units for about 80 families and accommodations for some 100 single people are in the process of being converted for use.

URA has financed the construction of a swimming pool, and Wilson, with characteristic resourcefulness, negotiated the building of a couple of tennis courts at a cut rate by a contractor whose equipment was on the scene to build a road. A variety of activities are available, from a film series to a riding club, and a survey of wives was conducted this summer, in part to see what else can be done.

On the job, visiting researchers still complain about such things as the food in the cafeteria and the lack of transportation to and from the lab. The lab's 24-hour research day makes it more difficult to assure creature comforts, but the visitors, who make allowance for the fact that this is still a breaking-in period for the lab, seem to feel in general that the management is trying to respond to suggestions.

A more serious complaint comes from some experimenters who say that supporting services available at other accelerator facilities to groups actually "on the floor" running experiments are not available to the same extent at Batavia. As one senior researcher said, "It can be frustrating, you just can't find people to do things."

The same man questioned whether the lab management was putting the emphasis on the right support groups but attributed the problem primarily to budget restraints, saying "they're trying to do experiments on a scale not matched by funding."

A crucial matter at Batavia, obviously, is the choice of the research

proposals that will be accorded "running time" on the accelerator. The decisions are the responsibility of the director, but Wilson leans heavily on the recommendations of a program advisory committee made up mostly of active researchers in the field. Initially, Wilson named all the committee members, but the users asked for a say in the selection process, and an agreement was reached under which the users provide a list of candidates from which several members are picked.

The lab's deputy director Edwin L. Goldwasser says that Wilson rarely departs from the recommendations of the committee. There is an appeals process for those who wish to contest a decision (this involves an adversary session locally known as a "shootout"), but so far there have been no reversals.

One chronic source of friction at major accelerators has been the competition between staff and visitors for time on the machine. The old accelerator labs have had physics departments made up of a permanent group of experimental and theoretical physicists, and consequently there is a history of rivalry between the insiders and the visitors. At Batavia, one senior visitor said the attitude at Brookhaven used to be "Let the amateurs in during the

# For Particle Physics Postdocs, a School of Hard Knocks

If accelerators are the cathedrals of the scientific age, then postdoctoral fellows in high energy physics may be compared to the wandering clerks of Bologna, Paris, and Oxford in the Middle Ages. The postdocs these days, however, have poorer prospects of preferment than did their medieval analogs.

The Fermi National Accelerator Laboratory near Batavia, Illinois, the site of the biggest of the big machines (*Science*, 30 August), is the best place to observe the postdoc in his role as a humble but essential part of the research team which is the basic unit in high energy physics.

High energy physics at Batavia epitomizes Big Science today. Not only is a $250 million accelerator facility required for an experiment, but that experiment depends on the efforts of a team of a dozen or more physicists ranging in rank from a complete pecking order of professors to postdocs and graduate students plus a supporting cast of riggers, staff physicists and engineers, technicians, and scanners.

The postdocs are known as the "mules" for the most obvious of reasons. They do much of the heavy work in setting up the experiments, and when an experiment is running on the accelerator the postdocs usually work the longest shifts and oddest hours. It is the postdocs who often make the observations and even write up the results of the experiments. They do, of course, get their names on the papers, if near the bottom of the list of authors. They are lucky to be in the big league of higher energy physics, but their toehold in the profession is a very insecure one.

There was a time not many years ago when almost anyone with a "good" doctorate in high energy physics could reasonably expect to land a postdoctoral fellowship —which meant a place on an escalator that would deliver him in time to a tenured position on the faculty of a reputable university. For today's postdocs in high energy physics and the Ph.D.'s pressing up behind them, the escalator has practically stopped running and the outlook is very different.

A slump in enrollments and tight research budgets have hit physics departments generally. Competition for tenured positions seems to be particularly fierce in high energy physics. The demographics of the field are unfortunate. Increased numbers of people were attracted to the field in the 1960's, and many of them began emerging with their doctorates just as the job market in high energy physics was contracting. The commissioning of the big machine at Batavia created some jobs as well as considerable excitement in the field, but AEC policy has been to put high energy physics funds into fewer and bigger machines. Overall, this has reduced the opportunities for the newly ordained.

Pressure on high energy physicists is more severe than that on their colleagues in some other physics specialties: the particle physicist must find a place on a university faculty or accelerator laboratory staff or leave the field. Jobs in industry or government agencies do not offer the alternatives available to those in such fields as solid state physics or atomic physics, for example.

The postdoc lucky enough to land a place on an experimental team is likely to find that the terms of employment make him what one postdoc calls a "pseudoacademic." It is very common for postdocs to be hired with the understanding that they will spend all or most of their time at the accelerator. One postdoc at Batavia, a member of a research group from a Big Ten university, says he has never even seen his home campus. A postdoc in such circumstances is cut off from a full academic life and departmental politics, and his prospects are extraordinarily dependent on the leaders of his team and on the results of their experiment.

If a postdoc is on a good research team with a well-designed experiment that wins running time on the machine and produces interesting results, then he may be favorably noticed and have a future in high energy physics. A little bad luck at any stage may close out a career. Because of budget limitations and the competition for time on the machine, the postdoc's prospects may be likened to a ride on a merry-go-round with one grab at the brass ring. Senior faculty members have teaching and tenure to fall back on; postdocs do not.

The predicament of the postdocs worries many senior people in the field. There is talk of creating "senior" postdoc positions tenable for longer than the 2- or 3-year terms now customary. And some attention is being given to the establishment of "research assistant professorships," which would carry more responsibility and pay than is now accorded postdocs, but not tenure. Such moves may relieve the bind in which many postdocs find themselves, but it will do little to solve the long-term problem of making places for fresh postdocs whose work and ideas have always been so important to the field.—J.W.

summer, we'll do the real research the rest of the year."

Accelerator sociology also cuts another way. There has traditionally been a group of physicists and engineers who build and operate the accelerator; then there are those who use it, write the articles, and win the Nobel prizes. The first group have inevitably been pegged as second-class citizens.

The experience of the other labs was considered when the new accelerator was built, and at Batavia there has been a deliberate effort to reconcile the old conflicts. Deputy director Goldwasser says that from the start the idea was to create a "user-oriented lab." When a physicist was hired for the staff, it was felt he shouldn't come to the lab to do research only. At the same time, the lab would suffer if it didn't have good experimental physicists "immersed in the art."

The management adopted a policy of insisting that every physicist hired devote at least 50 percent of his time to "lab-assigned work." Goldwasser says that the average figure is more like 75 percent. To balance this, management has encouraged staff people to establish working relations with visiting research teams so that one or two members of each experimental team are Batavia staffers.

The lab does not have a separate physics department with its own research fish to fry. The staff physicists appear to find their association with the visiting groups stimulating, and the visitors, by and large, approve of the local recruits, who know their way around and can get things done.

In recruiting professional staff, management takes pains to make it clear that the lab is not a university environment. Goldwasser says they have found that "people are equally attracted to this kind of an environment."

Management generally at Batavia has a distinctive style which everyone attributes mainly to director Wilson. It appears to be based on the assumption that a physicist can do anything around a complex technological project and probably do it very well. Historical evidence for this view is abundant in the record of the atomic bomb project during World War II, when physicists proved dazzlingly versatile, inventing epoch-making theories and techniques as they were needed.

At Batavia, physicists were called on to display the same sort of adaptability during the construction phase, particularly in the period when there were major problems with the accelerator magnets and power supply and lesser problems with practically everything else. The top physicists and engineers were not only reorganized into action as problem solvers and straw bosses but were also put in charge of nontechnical operations such as procurement and personnel.

*Living quarters for visiting scientists are provided in the complex constructed from two farmhouses in the "village" at the Fermi National Accelerator Laboratory.*

To some degree, physicists are still doing key nonphysics jobs. The rationale seems to be that physicists know more about how an accelerator facility should operate than anyone else. An expert on organizing a business office would want to create the best possible business office and could bend the organization of the whole lab to that end. Or so the theory goes, and by most accounts, the theory works pretty well.

Although the place has settled into the relative calm of an operational phase, Wilson shows no signs of lapsing into conventional administrative practices. As one veteran of the crisis days says, Wilson still personifies the "Genghis Khan school of management." He has various means of preventing people from getting into ruts—most typical, perhaps, is his practice of rotating department heads. Wilson feels that it is important to have a number of people with a broad understanding of the workings of the lab, so the transfers keep coming.

It is also thought important that department heads and other top people keep active in physics. The policy, therefore, is that in a 2- to 3-year cycle a senior man may spend a period half-time as a deputy department head and half-time as a researcher; he then does a stint full-time as department head followed by a full-time period on research.

A virtue of the system, according to one of the Batavia junior chiefs, is that "when you're an administrator, you think the lab is running like clockwork; if you do research, you find out it's not."

Some people think Wilson resorts to shake-ups simply to shake people up. Others see it as an effective method of preventing the staff from losing its edge. Recently, Wilson has been pushing the staff to move ahead with detailed proposals to increase the machine's capacities, and he is doing it in his customarily demanding way. "Bob would let you sink or swim," says another veteran of construction days, "It's frustrating, but you scramble. . . . Some of the old excitement seems to be in the air again."

The visiting researchers' verdict on the place seems to be a favorable, although not final, one. If there are some complaints about the services available to the experimental teams, what seems to be a typical feeling was

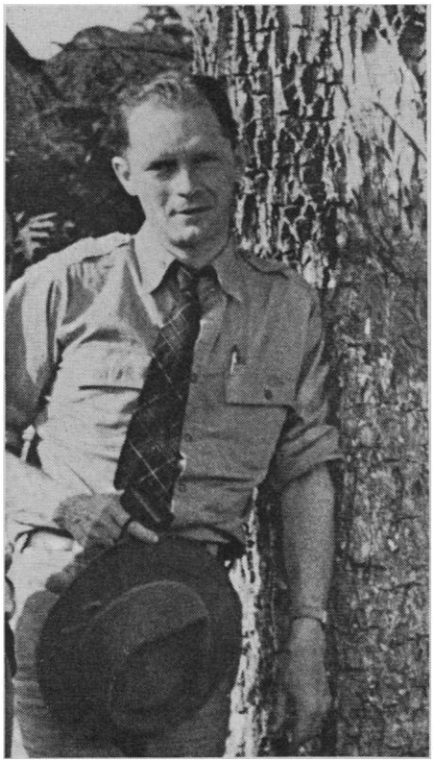
expressed by one senior visitor who said, "In general I'm more happy here than with other labs at the same stage."

High energy physicists, even the lucky ones who win time on the Batavia machine, must come to terms with lower funding up and down the line these days. Their reduced circumstances—extending to life-styles—are suggested by comparisons between the old days, when even a graduate student might have had a rental car at his disposal during visits to the accelerator and now, when the individual food allowance may be $3 a day ($4 when an experiment is running).

As the same visitor put it, "We're living in different style. It's not an optimal style for doing physics, but we're getting it done."—JOHN WALSH

# Green Revolution: Creators Still Quite Hopeful on World Food

No Western technology has more intimately influenced the life of the Asian peasant than the science of plant breeding. Farmers from Turkey to the Philippines last year sowed 39 million acres of wheat and an equal area of rice with the high-yield strains developed in research institutes created by the Rockefeller and Ford foundations. The process of replacing traditional varieties of crops is a phenomenon only 10 years old and has engendered not just increased yields but the hope that something can be done to assist peasant agriculture out of its age-old rut of no-change conservatism.



*J. George Harrar, now president emeritus of the Rockefeller Foundation, in the early days of the Mexican agricultural research program, about 1944. [Photo: Rockefeller Foundation]*

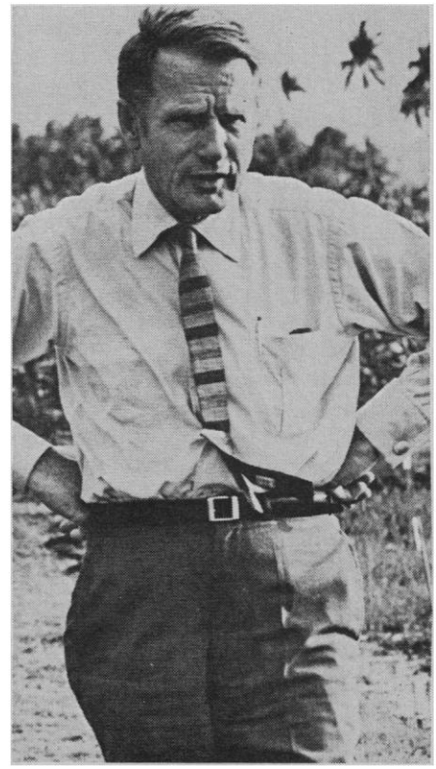
Yet the green revolution, as it is known, has attracted a crescendo of criticism. Some consider the new seeds serve to make the rich farmers richer and the poor poorer, others that the green revolution is a myth, or only successful when there is an abundance of water and fertilizer. The jump in oil prices and worldwide shortages of fertilizer have not improved the immediate prospects for green revolution agriculture.

How do the creators of the green revolution feel about the process they have launched? Many have contributed but four people have particularly aided the genesis of the new varieties: J. George Harrar, first director of the Rockefeller Foundation's agricultural research program in Mexico; Edwin J. Wellhausen, the program's corn breeder and Harrar's successor as director; Norman E. Borlaug, a forester who became the wheat breeder; and Robert F. Chandler, a soil scientist who, after work in Mexico, set up a similar institute in the Philippines which has done for rice what the Mexican program has done for wheat.

Interviewed recently both Harrar and Chandler were zestful in rebutting the critics of the green revolution, their only regret being that the new seeds had not been more widely adopted. In Asia as a whole 35 percent of the total wheat area and 20 percent of the rice area were planted with the high-yield varieties in the 1972–73 season. For Harrar, this is not enough: "I feel very frustrated. It's said that if you build a better mousetrap the world will beat a path to your doorstep. We built a better mousetrap, but people didn't come."

Harrar, now retired as president of the Rockefeller Foundation, blames the leadership of developing countries for buying "fighter planes instead of fertilizer." Some political leaders think the green revolution has accomplished its job, he complains. But so far it has only showed the way. It hasn't failed, as the critics allege, but it has not begun to reach its potential.

For Chandler, too, the major problem with the green revolution is why it hasn't been more widely adopted. Chandler retired in 1972 from the International Rice Research Institute (IRRI) that he had set up in the Philippines, but within a month of his retirement had arrived in Taiwan to create a second institute, the Asian Vegetable Research and Development Center. The center already has the world's



*Robert F. Chandler, now head of the Asian Vegetable Research and Development Center, during his directorship (1960–1972) of the International Rice Research Institute. [Photo: Rockefeller Foundation]*