Grand Rapids was not entirely original —urea had been identified before as an agent that reverses sickling—but he was the first to develop a clinical protocol for administering urea in sugar solution to patients during a sickle cell crisis. After trials on more than a dozen patients, Nalbandian enthusiastically reported that urea was bringing people out of crisis faster than other therapies. His reports, which were based on uncontrolled studies, stirred up considerable controversy and he drew the wrath of many of his medical colleagues, who were appalled by the amount of attention his ideas were getting in the press. Today, investigators at several centers are conducting controlled studies of urea therapy with support from the NHLI program. Nalbandian is not among them.

In vitro, cyanate prevents sickling in concentrations much lower than those required to get any effect with urea, according to Anthony Cerami, James M. Manning, and their colleagues at Rockefeller University. Clinical trials of potassium cyanate are also planned. But in spite of the hope that has been generated by this work, many investigators remain skeptical of its ultimate therapeutic value. Few predict that either urea or cyanate will prove to be the best means of relieving sickle cell crises.

Another approach to the problem of bringing patients out of painful crises is based on the premise that there is a cofactor necessary for the induction or enhancement of crisis. Murayama, for example, is convinced that such a cofactor exists and has been struggling to isolate it. His work, he has claimed, is hampered by lack of support.

Pauling and associates of his at the Stanford University Medical Center also support the cofactor hypothesis and have gone so far as to propose what it is. Pauling and Paul L. Wolf, an M.D., have a grant of $92,000 from the NHLI to study prostaglandins in relation to sickle cell anemia. In a paper that will be published in *Clinical Chemistry*, Wolf and others suggest that prostaglandin E_2 can induce sickling under conditions of reduced oxygen tension. They arrived at this hypothesis, Wolf says, when they realized that during pregnancy and infection, two conditions known to precipitate sickle cell crises, prostaglandin E_2 levels rise. "We think it is possible that, if you can affect E_2, you can control sickle cell crises," Wolf says. Like other postulated methods of handling patients in crisis, this too has yet to be proved.

In spite of all the controversy that the national program to combat sickle cell anemia has generated with regard to screening and to therapy, persons active in the area have come to the conclusion that the positive features outweigh the negative by far. Pearson, for example, believes that one of the most important effects of the program may really be a side effect of sorts. The emphasis on sickle cell anemia, as he sees it, has made the black community far more aware of health problems in general. "We may be able to capitalize on this to get people interested in nutrition and immunization against polio and diphtheria and the like," he says.

Scott thinks that one of the primary benefits of the sickle cell program, in addition to whatever it may bring patients, will be to open doors for black people interested in getting into medicine, as physicians, nurses, technicians, or other categories of health professionals. He would like to see federal money go to black scientists and, especially, to the university medical schools at Howard and Meharry, the only two institutions with a "black identity." So far, he says, "this has not happened to the maximum extent." But Scott, an optimist, believes that, with persistence, things will change and that, when the current national fascination with sickle cell anemia declines, as he believes it will, the wave of interest will, nonetheless, have left behind a solid new base for recruiting and training black people in science.

—BARBARA J. CULLITON

SIPRI: Peace Research Institute Losing Old Staff, Pondering Role

World military spending now runs about $200 billion a year—say $50 for each man, woman, and child alive. What this cheerless statistic has to say about the character of man and the nature of international relations is the starting point for peace and conflict research, a newish discipline that is growing rapidly, if not yet quite as rapidly as its subject of study.

One of the first institutions in the field, and still perhaps the best known, was the Stockholm International Peace Research Institute (SIPRI). Despite its name, it eschews the wilder shores of peace research: indeed, its painstaking techniques of gathering and publishing information seem today almost old-fashioned. Set up in 1964 to celebrate Sweden's 150 years of peace, SIPRI is proving an enduring monument to the stolid pragmatism of the Swedes, and —so its supporters believe—its virtues of reliability and political detachment may well prove longer lasting than other, more fashionable approaches.

Although SIPRI emphasizes its internationalism, it takes much of its style from Alva and Gunnar Myrdal, the two Swedes who were instrumental in setting it up. Alva Myrdal, first chairman of SIPRI's Governing Board, was succeeded by her equally distinguished husband when she became Sweden's disarmament minister. Gunnar Myrdal declares that he can see no reason why political problems cannot be dealt with in a scientific way. "The principle is to carry out cold-blooded, hard research, based on published sources," he says. "Our value-premise is a simple one: it is to prevent war and preserve peace."

What this philosophy has produced in practice is a staff of around 15 researchers dedicated to the proposition that human beings are ultimately influenced by the truth, simply and straightforwardly told. The bulk of SIPRI's work consists of careful digging through masses of military information, sorting out fact from propaganda, and preparing collections of the information thus gathered. Only public sources are used—SIPRI is not in the intelligence

business. Information also comes from governments, but is not always believed. "A government's statement to us is a very important *fact*," says Myrdal, "but it is not necessarily the exposition of the truth. So we are frequently criticized by governments when we do not accept their figures."

The major publication of SIPRI is its annual yearbook, a compendious guide to world military expenditures. SIPRI is now in the course of publishing a six-volume study of chemical and biological weapons, and last year it published *The Arms Trade with the Third World*, a more popular, paperback version of which is now in preparation. In addition, there has been a series of shorter papers and studies, the most influential, perhaps, being the *Progress Report of the Seismic Study Group*, which showed the practicability of detecting underground nuclear explosions at a time when it was official U.S. policy to play down the possibility.

Director of SIPRI Frank Barnaby told *Science* that next year's yearbook would contain chapters on reconnaissance satellites, peacekeeping, European security, defense production in Third World countries, and questionable weapons—such as incendiary, napalm, dum-dum, and fragmentation weapons. The development of very small nuclear weapons is also being kept under scrutiny: Barnaby sees a danger that, with the development of nuclear weapons in the range of 1 to 10 tons TNT equivalent, conventional and nuclear weapons would effectively merge, with a consequent loss in security.

Barnaby is British, as was SIPRI's first director Robert Neild, and worked as a physicist at University College, London. Two years with the Pugwash movement followed, an experience that seems to have ended in some frustration. Barnaby then freelanced as a scientific journalist in Britain before taking up the SIPRI post in October 1971. He is unashamedly gloomy about the prospects for disarmament. The SALT (Strategic Arms Limitation Talks) negotiations, he believes, have been "a hoax from the very beginning. During the whole period they have been going on, the arms race has continued—and at a faster rate than it would have done without SALT." The agreements reached, Barnaby suggests, are virtually useless because they do not tackle the realities of a *qualitative* arms race, in which the absolute number of missiles can be kept stable while the striking power of each is vastly increased. The antiballistic missile agreement, he says, specifies for these missiles a level much higher than that which already exists: "And you can hardly call ceilings higher than present levels disarmament in any way at all."

Barnaby recognizes an advance in the agreement to monitor the SALT treaties by satellite, an acceptance of the "open skies" policy. But even this, he believes, is a hollow victory because nobody is interested any longer in the absolute number of launchers. What matters is the number of independent warheads each contains, a fact that can only be discerned by on-site inspections.

Other defense experts, possibly even some on SIPRI's staff, would question the pessimism of this analysis, and the radical wing of conflict research would doubt even the wisdom of making an analysis that assumes the permanence of the present international system. "We're in conflict with many peace workers," Barnaby freely admits. "They want to change the system. We say that, within the present system, disarmament is desirable and essential. If there is disarmament, then of course the system will change, in ways we can't predict, but we think that it will produce less conflict."

No Conflict with Government

The role of international good guys casts a rosy glow over the Swedish government, which supports SIPRI financially. "Certainly the Swedish authorities are pleased with us," says Barnaby, "but it's totally untrue to suggest that we are an arm of Swedish foreign policy. Our contacts with the Swedish Foreign Office are very tenuous indeed—though, as it happens, our attitude coincides with that of the Swedes. What would happen if we disagreed with them? Well, I suppose if we went really mad, we could be in some trouble . . . but as long as our work remains of high quality I see no problems."

Swedish government support is in fact on the generous side for an institute of SIPRI's size—$700,000 a year to support no more than 15 researchers. The money comes by direct vote of the Swedish Parliament, and the Governing Board of eight, appointed (like the director) by the Swedish government, serve for 5 years each. On the present board are Gunnar Myrdal, Barnaby, Nield, Hilding Eek of Sweden, Ivan Málek of Czechoslovakia, Leo Mates of Yugoslavia, Bert Röling of Holland, and John Sanness of Norway —no Americans and no Russians. The much larger Scientific Council, on which Henry Kissinger once served, is stiff with distinguished names, including Kenneth Boulding, Helder Camera of Brazil, M. D. Millionshchikov of the U.S.S.R., and—slightly surprising in this company—Earl Mountbatten of Burma.

The generous budgets have, some critics feel, prevented SIPRI from trying hard enough to make its publications pay. The yearbook sells fewer than 3000 copies, a dismal sale for what is arguably the best researched and most detailed strategic guide available. "There's been a reluctance to chase publishers, to make them sell it properly," says one critic. "So when it didn't sell, they developed the rationale that the public wouldn't buy it. In fact, there's no reason why it shouldn't sell."

More damaging is the suggestion that all of the staff members who gave SIPRI its initial impetus have now left. "The secret of SIPRI was that, by pure fluke, several people arrived who were very highly motivated," one outsider commented. "Now most of them have gone—and none of them would have left if SIPRI hadn't wanted them to go." This source mentioned no names, but it is significant that among those no longer with SIPRI are Julian Perry Robinson, an expert on chemical and biological warfare; Mary Kaldor, who is said to have provided the drive behind the arms trade book; Frank Blackaby, who edited the yearbook; and Milton Leitenberg, an American biochemist passionately involved with peace research for more than a decade.

Robinson, Kaldor, and Blackaby are still listed as consultants to SIPRI, and Leitenberg works nearby, at the Swedish Institute of International Affairs, so perhaps the damage is not as serious as it appears. Nevertheless, there have been rumblings of staff discontent, muted but not entirely silenced by Nield's departure and Barnaby's arrival. The story is told of a visiting German scientific administrator, interested in setting up a similar institution in Germany, who was prevented by Nield from talking directly to the SIPRI staff. "If I tried to run an institution in Germany like this," he is said to have remarked, "my entire staff would walk out on me."

There is, undoubtedly, difficulty in

balancing the need to hire enthusiastic people with the semi-anonymity that SIPRI imposes. No staff member is permitted to make statements or appear in any way as a SIPRI spokesman—something which, Barnaby says, does not cause problems. "We recruit very, very carefully, people of high enough quality for it not to be a problem," he says. "We would avoid recruiting an overcommitted person—nobody could *use* SIPRI to get his ideas across."

What matters more is whether SIPRI is getting its own ideas across. Like the Pugwash movement, it may now be faced with the dilemma of deciding whether to direct its information and propaganda at decision-making elites or at the public at large. So far, to judge by the sales of its publications, it has chosen the first of these. The popular version of the arms trade book now being prepared implies a recognition that this is not enough. "Our success depends on our being comprehensible in foreign offices," says Barnaby. But also, perhaps, it may depend on being comprehensible to the man in the street as well. If war is too important to be left to the generals, peace certainly cannot be left to the bureaucrats.—NIGEL HAWKES

Nigel Hawkes recently joined the London Observer *as science correspondent.*

Medicine at Michigan State (III): Conditioning for Innovation

The use of community health facilities for clinical teaching of medical students has become at least a modest trend in American medical education. In some cases, a reliance on existing facilities has been forced by the increasing difficulties of raising funds for medical center construction. But the positive aspects of going outside the walls of the university medical center are being given much greater weight these days.

The new alternative permits the kind of involvement in community health problems that activist students and faculty members have demanded. The medical school can exercise more direct influence to improve patient care in the medical territory it dominates. And, perhaps most important, experience in the community may overcome the alleged inhibitions of medical students and residents whose training is limited to university teaching hospitals and who are said to feel secure ever after only in such a setting.

At Michigan State University (MSU), multiple motives have led to the use of existing community facilities as the base for clinical education. MSU has no university hospital, and most clinical teaching is being done in community hospitals, clinics, and doctors' offices as far afield as Grand Rapids and Flint.

Novelty does not end there. MSU has not one, but two schools of medicine on its campus, and one of these a College of Osteopathic Medicine, the first such school to receive the full panoply of state support. Osteopathic medicine has a strong tradition of clinical training in physicians' offices and community hospitals, and this has reinforced the new MSU pattern. In a way, MSU is making use of existing facilities for preclinical instruction as well. Medical education at MSU does not take place in separate basic science departments within the medical school, but in departments that serve the university as a whole.

To some extent at MSU, necessity has bred innovation. The state legislature, which has supported a major expansion of medical education, began to look critically at medical school plans and programs (*Science*, 22 September). Legislators have resisted the replication of expensive clinical teaching facilities, partly because they felt, as house appropriations committee chairman William Copeland put it, "We were not getting the return on the money we were told we'd get."

Innovation at MSU, however, must be partly attributed to some dominant institutional traits. In 1855 the state of Michigan established an agricultural college that served as a prototype for the land-grant institutions created in the following decade. That agricultural college is today's Michigan State. For most of a century, however, it was a "cow college" overshadowed by the University of Michigan. Even after World War II, MSU was referred to superciliously at Ann Arbor as "Moo U," or "the udder university." MSU always took the land-grant principle of public service seriously, and in the postwar regime of president John A. Hannah it provided a remarkable display of successful growthmanship. Sometimes MSU's devotion to the solution of practical problems looked uncritical to outsiders, as, for example, with the creation of a School of Packaging. And sometimes the legitimacy of the uses to which the university was put was questioned, as with some AID contracts in behalf of the South Vietnamese government which earned MSU the cover story that brought *Ramparts* magazine national attention in the early 1960's. At the same time, however, the university was growing prodigiously in size—enrollment is now well over 40,000—and in quality. The same MSU that defined itself in the early 1950's by bulldozing its way to a No. 1 rating nationally in football, stressed in the 1960's that it was recruiting more National Merit Scholars than any other university.

Medical education obviously requires a strong foundation in the sciences, and it is here that MSU has indisputably moved up rapidly in the academic pecking order. President of MSU Clifford R. Wharton, Jr., points to two American Council on Education (ACE) rating reports, published in 1966 and 1971, which show that MSU did particularly well in the sciences. The reports reflected the evaluation of departments in major institutions by faculty members rating departments in their own disciplines. In the 1966 report, which ranked 12 scientific departments, all but one MSU department (botany) were unranked. In the second study, for which evaluations were done in 1969, 9 of 12 MSU departments were put in the top, or "distinguished," category. The MSU biochemistry depart-