The Pig Blood Booby Trap

LRF was the obvious target once TRF had been isolated, but after LRF, the object of the next lap of the race was not so evident. In a sense the third milestone was reached before either team knew what race was being run. The milestone concerned the means through which the brain directs the pituitary to produce growth hormone, the substance which in adolescence controls the body's growth and development. By analogy with CRF, TRF, and LRF, it was generally assumed that the hypothalamus controls growth hormone production with a growth hormone–releasing factor (GRF). Pursuit of GRF was a particular concern of Schally's in 1968, when Guillemin was making strides with TRF. As Schally puts it, "Because of our deep involvement [with GRF], I almost missed solving the TRH problem." Schally returned to GRF and in 1971 he published its structure, a chain of ten amino acids.

Schally had had the misfortune of falling, as Guillemin did not scruple to put it, into a booby trap. Revelation of his discomfiture came about when he asked chemists at Merck Sharp & Dohme to prepare synthetic GRF according to his structure. The Merck chemists obliged, but let him read first in print a discovery of their own: Schally's GRF structure closely resembled part of the beta chain of pig hemoglobin. Evidently blood in the pig hypothalami had been degraded by enzymes in the tissues, despite special precautions taken against this very possibility. The segment cleaved from the hemoglobin chain happened to give a false positive result in the GRF assay, and it was this segment that Schally had sequenced. It was "an incorrect claim," Schally concedes. "Guillemin attacked us viciously but he failed to point out that we published an honest finding and we corrected our own mistake. We were just too keen, I was just obsessed by it."

McCann Proved Right After All

The real GRF, though still considered to exist, has not yet been isolated. But there turned out to be another side to the story. McCann, who had been first to divine the existence of LRF, and his colleague L. Krulich announced in 1968 that the hypothalamus can specifically *inhibit* the pituitary's release of growth hormone, presumably through the agency of a growth hormone–inhibiting factor (GIF).

Both Schally and Guillemin were skeptical of the hypothesis; neither thought it worth committing his resources to a search for McCann's putative GIF. There the matter rested until the fall of 1971 when Wylie Vale and Paul Brazeau, two physiologists in the Guillemin group, started to look again for GRF. But the results seemed reminiscent of the McCann and Krulich data. Despite some skepticism they and Burgus went ahead with an attempt to isolate an inhibitory factor.

Whether because the assay and chemical techniques had been so well perfected by that time, the search for GIF was quite unlike the years of painstaking labor spent in pursuit of the earlier factors. Plentiful amounts of GIF were found in the old side fractions left over from the TRF and LRF chases. Within a few months, the substance was identified, isolated, and sequenced. The molecule is a Q-shaped chain of 14 amino acid units. Unlike the other factors, GIF has been given a new name—somatostatin—which indicates its function in staying the growth of the body.

Just as discovery of LRF made Schally's team in particular known in wider circles, so somatostatin helped put the Guillemin team on the map for physicians and other physiologists. By one of nature's curious economies, somatostatin turns out to be made not only in the hypothalamus but also in the pancreas. Since its function there is to control the two blood sugar regulating hormones, insulin and glucagon, there are prospects of using somatostatin to treat diabetics. One of the first practical fruits of the new technique of gene splicing may be that of programming bacteria to produce somatostatin in pharmaceutical quantities. A DNA sequence constituting a gene for somatostatin has already been synthesized and is ready for cloning. Schally delayed till 1976 the solving of the structure of pig somatostatin. "We were," he has written, "somewhat disappointed that the structure of porcine somatostatin was identical with the ovine hormone"—NICHOLAS WADE

Next week: The nature of the competition

NATO Science Committee: Redefining Mutual Security

Brussels. The North Atlantic Treaty Organization's science committee is the alliance's principal effort at nonmilitary cooperation. As such, the committee has been cast rather in the role of odd man in at NATO. However, at a mid-April conference in Brussels commemorating its 20th anniversary, the committee could claim not only to have survived, but to have served as one of the sturdier props of an Atlantic scientific community. Despite a relatively static budget—about $10 million a year—and the inroads of inflation, the NATO civil science program has weathered the recession in science support better than most other transatlantic scientific activities.

The general theme of the conference was the impact of science on society. Papers devoted to developments in particular scientific disciplines and to discussions of broader policy implications of science and technology formed the agenda for the 2½-day conference. The meeting also served as old home week for a number of notables present at the creation of the science committee and active in it since then. From the United States, for example, came physicist Isador I. Rabi, a founding father and influential U.S. member of the committee over its two decades, and James R. Killian, Jr., who was President Eisenhower's science adviser when the science committee was launched at a summit conference in 1958.

The science committee has operated in comparative obscurity, and part of the motivation for the meeting was obviously to call attention to the committee's good works and to make a bid for better support and a broader role.

Participants included a relatively rich mix of scientists, politicians, and diplomats for such a meeting. The U.S. delegation, for example, was led by Frank Press, the President's science adviser and director of the Office of Science and Technology Policy, who in London and Brussels was seeing his counterparts for the first time on their home ground.

As a forum on the current state of science and society, the conference offered an interesting summary of perceptions of

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Opening the NATO Science Committee 20th Anniversary Commemoration Conference were (from left) I. I. Rabi (United States), M. N. Ozdas (Turkey), NATO Secretary General J. M. A. H. Luns, and L. Néel (France).

major problems and possible approaches to solving them in Western politico-academic circles.

The science committee was a product of the galvanic reaction to the Soviet launching of Sputnik two decades ago when the challenge was seen primarily in Cold War terms of the military implications of Soviet scientific prowess. NATO's founders believed that military power depended on economic strength which, in turn, was based on scientific and technological vigor. This view provided the rationale for the science committee. In the style of most scientific institutions created at the time, the committee acted on the conviction that cultivation of basic science was most important to the health of the enterprise.

The committee by design, in fact, has been remarkably insulated from the military and political debates within the alliance. The issue of the neutron bomb and President Carter's decision not to deploy it was the top news story in Europe during the week before the conference, but the subject was mentioned infrequently during the sessions, mainly in an unheated discussion arising from the lone paper on "defense planning and western security."

At the meeting, however, it was evident that the perceptions of major problems and of appropriate responses are quite different from those of 20 or even 10 years ago when the major concern was the competition with the Soviet Union. The focus has expanded from virtually exclusive concern with the East-West rivalry to take in North-South problems as well. NATO is a collective security organization, and security was redefined by many speakers at the conference to include the constellation of problems involving energy, economic growth in the NATO countries, and industrialization in the less developed countries (LDC's). The claims of the LDC's on world material and financial resources, summed up in their demands for a New Economic Order, were clearly being taken seriously at the conference as an important factor in international politics.

In his introductory remarks, NATO Secretary General J. M. A. H. Luns noted that the present may be a "changepoint" from the era of the Cold War to a period of "confrontation on global economics" when NATO nations must act to "strengthen member countries as well as assist developing nations."

Conference speakers alluded repeatedly to the internal problems in NATO countries of unemployment, urban decay, terrorism, and pollution, with the discussion tending to center on the dilemma of economic growth.

Some issues were defined in scientific terms, like the growing concern about a buildup in the atmosphere of CO_2 and its ominous implications for the exploitation of coal as a source of energy. But more attention was given to problems whose scale and complexity exceed the powers of specific scientific disciplines or of individual nations to deal with. Many of NATO's problems now were seen, on the whole, as "soft-science" problems, as distinct from problems which could be dealt with through the physical sciences. This discussion exposed some of the cultural fault lines within and between groups represented at the conference. There were warnings about "technocratic" rather than "humanistic" responses which would exclude people from either participating in or understanding decisions which would profoundly affect them. And there were some sharp words for systems scientists on grounds that the public frequently mistakes "scenarios" for predictions, and even that systems scientists may be making value judgments which they have no business making on major policy issues.

How the science committee should react to the changes afoot was discussed in general terms as the meeting drew to a close. There was no overt criticism of the committee's program, but there was strong sentiment in favor of doing some new things while continuing to support existing programs that are going well. For example, about half the current budget goes into a science fellowship program which enables young scientists and engineers to do postgraduate and postdoctoral work in other NATO countries. Over 12,000 NATO fellows have participated over the life of the program.

Probably the most widely known of the programs because it has involved the widest participation is the advanced study institutes, held mostly in summer. These provide high-level teaching in narrowly specialized technical fields. Some 60,000 scientists have attended the institutes over the years, about 10 percent of them from non-NATO countries and even from Eastern Europe.

A research grant program provides relatively modest sums for projects intended to promote international collaboration in research, and a senior scientist program is meant to encourage particularly able scientists to spend periods of 6 to 12 months teaching or collaborating in research in other countries. The science committee has also sponsored a variety of "special science programs," efforts to promote work in fields which the science committee considers deserve special attention at a particular time. These initiatives currently include programs on air-sea interactions, eco-sciences, and materials science.

The science committee has stressed scientific quality in its programs and leaned to the basic sciences. The committee's original charter gave the group a science advisory role to the NATO council but the function was never exercised. The committee was certainly not discouraged from undertaking topics with military applications of interest to NATO, but the committee showed little inclination to pursue such a course. One obvious explanation is that NATO has a separate defense research committee which would have taken such activities by the science committee as poaching; some observers suggest that the science committee, influenced by Rabi and others, have traditionally resisted moves in NATO which might break down boundaries between civil and military science and lead to a "garrison state."

Expansion of the science committee's role has been seriously proposed in the past. A committee headed by Killian in the early 1960's recommended establishment of an international institute for science and technology based on the science committee. The idea got as far as approval by the NATO council but was blocked at the 11th hour by then French president DeGaulle, who was chronically suspicious of American technological aggrandizement. In the middle 1960's, during the period of acute European concern about the "technology gap," a proposal that the NATO committee become

the focus of a mutual effort at closing the gap also came to naught, in part because France was in the process of disengaging itself from NATO's military side.

The French withdrawal was more selective than was generally realized at the time. While France pulled out of NATO's joint military command it, for example, remained and remains an active member of the science committee, as does Greece, which more recently did a partial pullout on the Cyprus issue.

Incidentally, echoes of the technology gap were raised by A. Danzin, director of the French Insitut de Recherche d'Informatique and et d'Automatique in remarks on information technology when he alluded to an "information oligopoly" held by U.S. companies, notably I.B.M., and said that Europe will suffer economically unless it does better.

The consensus among the invited commentators seemed to be that the science committee should occupy itself more with technology, that social scientists should be more strongly represented in its activities, and that the committee and NATO should find ways to tackle complex, long-range problems facing the alliance. To do this it seemed generally agreed that more money is needed. Whether this will be forthcoming it is far too early to say. Frank Press was complimentary, but diplomatically noncommittal in his parting remarks, and the head of the German delegation, whose country is the other major financial patron of the organization, made closing comments which were taken as favorable. A clearer signal is possible, however, when NATO heads of state meet in Washington late in May.—JOHN WALSH

Poisoned Pot Becomes Burning Issue in High Places

Following a discovery that Mexican marijuana contaminated with the herbicide paraquat constitutes a major health hazard for pot smokers in the United States, the State Department recently sent a delegation to Mexico City to discuss the issue with Mexican attorney general Oscar Florez.

The visit came on the heels of a warning by the U.S. Secretary of Health, Education, and Welfare (HEW) that the herbicide persists in the smoke of a contaminated marijuana cigarette and may be inhaled by the smoker. The paraquat contamination is so serious that those who smoke as few as one to three contaminated cigarettes daily for several months risk irreversible lung damage.

Members of the U.S. delegation did not—as some American critics have sought—ask the Mexican government to cease the herbicide spraying program, which is aimed at eradicating illicitly grown marijuana and heroin. The program is overseen and heavily financed by the U.S. government (*Science*, 28 February). "We just wanted to inform them of the dimensions of this problem in the U.S.," said Richard Arellano, a deputy assistant secretary at the State Department.

A major topic of discussion at the meeting, in addition to the health hazards, was a lawsuit recently brought by the National Organization for the Reform of Marijuana Laws (NORML) to force the State Department to stop funding of the spraying until it files an environmental impact statement. Several well-informed officials told *Science* that the department is extremely nervous about the suit, which is regarded as likely to succeed. If it does, the precedent would destroy the department's claim that projects it funds in other countries are exempt from the impact-statement requirements. "The State Department regards this as the worst case that could come up," said one source, "because the spraying program is having an obvious impact here at home."

At the meeting in Mexico City on 30 March, American officials had a difficult time persuading the Mexicans that the lawsuit could prevent continued U.S. funding for the herbicide program. "The Mexicans couldn't understand how our judicial system could even entertain the suit, considering that marijuana is already an illegal substance," said Arellano.

A team of U.S. scientists is searching for an alternative to paraquat, but the federal court suit will probably be resolved before they are successful. In particular, they have been looking at formulations of the herbicides 2,4-D and glyphosate, but each possibility is said to require additional safety testing that could delay the substitution for months.

Initially, officials of the National Institute on Drug Abuse reported that paraquat posed no particular hazard, because it was thought to be converted entirely into another chemical, bypiridine, when a contaminated cigarette was burned. Bypiridine exists commonly in smoke from a tobacco cigarette and is not considered to be particularly hazardous. Recently, however, scientists at the Research Triangle Institute in North Carolina were able to analyze the smoke from a contaminated marijuana cigarette with a mass spectrometer. They discovered that roughly 5 percent of the paraquat remains in pure form after burning. Coupled with the discovery that recent samples of marijuana entering the United States from Mexico contained a concentration of paraquat as high as 2264 parts per million, this evidence was alarming. Tests showed, for example, that in a cigarette with a contamination of 1000 parts per million, 0.26 microgram of the herbicide is likely to be inhaled by the user.

An estimate of the dangers to humans of inhaling such an amount was extrapolated from laboratory studies with rats, because most cases of paraquat poisoning in humans have been caused by ingestion, not inhalation, of the chemical. The laboratory studies demonstrated that when an exceedingly small amount of the herbicide was placed directly on the rats' lungs, it caused fibrosis, or a scarring that inhibits the ability of the lung to absorb oxygen. At the low doses in contaminated marijuana, the scarring in humans would build up slowly, and it would be some time before the only probable symptom—extreme shortness of breath—would be noticed.

As yet, no instances of fibrosis attributed to the poisoned marijuana have been reported. However, doctors at the Center for Disease Control (CDC) in Atlanta, which is attempting to serve as a clearinghouse for physicians with patients who have been smoking the poisoned pot, have received reports of other ailments that may be related to the contamination. Specifically, physicians in Georgia, Iowa, and California have re-

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