1921, received his Ph.D. in 1924, and was elected to a fellowship of Emmanuel College. He became University demonstrator in physical chemistry in 1926. His studies for the Ph.D. under Sir Eric Rideal launched his career in photochemistry and chemical kinetics. In 1937 he became professor of physical chemistry and director of the department of physical chemistry in the University of Cambridge, positions from which he retired in 1965.

Very early he studied primary photochemical reactions of nitrogen peroxide, aldehydes, ketones, and their near relatives the ketenes and diazomethane. He found that carbonyl compounds are photolyzed by two routes. One route yields free radicals; the other, stable molecules. All these compounds have since been used as sources of free radicals for the initiation of combustion and polymerization.

Norrish elucidated the mechanisms of combustion of methane and ethylene, which involve formaldehyde as an intermediate. Ultraviolet light acting on the aldehyde intermediate in these oxidizing systems speeded up the reaction, resulting in some cases in explosions.

He made extensive studies of the polymerization of vinyl compounds and other substances, and exhaustively studied the effect of cross-linking by divinyl compounds and effects of solvents on the kinetics of polymerization.

After World War II, Norrish and George Porter and their colleagues began their study of very fast reactions, using flash photolysis and kinetic spectroscopy. The half-life of these reactions extended from the microsecond through the millisecond range. Their technique involved flashes of light of such power as to instantly dissociate the reactant species into radicals or atoms. Use of a second, weaker flash, triggered electronically at microsecond or millisecond intervals after the first, enabled them to record the spectra of the very reactive short-lived intermediates. By varying the times between the first flash and the subsequent ones they could measure the growth and decay of the free radicals and work out the reaction mechanisms.

Gases have such low heat capacities that a flash can raise them to very high temperatures. Thus an adiabatic shock can be generated which, in appropriately chosen systems, can cause an explosion in which the reactive intermediate can be studied throughout the course of the reaction. For example, Norrish and his co-workers studied in this way the explosive combustion and the pyrolysis of hydrogen, hydrocarbons, ammonia, phosphine, and hydrogen sulfide. By adding diluents to gaseous or liquid systems, they could control the temperature and observe the reactions. In this way they studied the reactions of oxygen atoms derived from ozone, and the relaxation of gaseous molecules in a high state of vibration. They successfully applied the method of kinetic spectroscopy to the study of polymerization and photolysis in solution.

Using the flash photolytic technique, Norrish has provided an interesting explanation for the effectiveness of lead tetraethyl in repressing engine knock. It seems that molecular lead oxide in the gas phase, and not smoke, is the deactivating agent. This is substantiated by the fact that tin tetraethyl yields a less volatile oxide that does not delay detonation but does produce a great deal of smoke.

George Porter was born in Stainforth, Yorkshire, in 1920. He studied at the University of Leeds and then, after service in World War II, at Emmanuel College, Cambridge. From 1952 through 1954 Porter was assistant director of the University of Cambridge's department of physical chemistry, which Norrish headed. In 1955 he moved to the University of Sheffield, where he remained for 9 years, and since last year he has been professor of chemistry and director of the Royal Institution in London.

We found it particularly interesting to visit with all three Nobel laureates at the Fifth Nobel Symposium on Fast Reactions, held in Stockholm in August 1967. All three are strikingly personable, attractive individualists, and they were the focus of many of the interesting discussions both at the scheduled meetings and at the many informal discussions around the dinner table.

The fact that all three Nobel laureates have attractive, outgoing personalities should impress those youthful students of science who suppose that in a scientific career they can find refuge from the commercial world of salesmanship. The great impact all three men have had on the field of chemical kinetics is attributable in no small measure to their gifts of exposition, which have sold many other physical chemists on the use of their perturbation techniques, as well as to their unusual talents for scientific invention.

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Research in Japan: U.S. Army Grants Cause Controversy

Who would have guessed that what the U.S. Army described as a "goodwill gesture" last year would snowball into a controversy that may undermine U.S.-Japanese scientific cooperation?

At the time, the Army's action seemed praiseworthy. The Physical Society of Japan was sponsoring an international conference on semiconductors in Kyoto last September and was short of travel funds. According to Japanese newspaper accounts, a former Tokyo University president arranged a grant of $8000 from the U.S. Army to pay the travel expenses of American participants. The Americans were able to attend, and international cooperation, it seemed, had been fostered.

But within a few months the Army's gesture had provoked a debate over military support of basic research in Japan. The *Asahi Shimbun*, the largest and most influential daily newspaper in Japan, picked up complaints from the scientific community and on 5 May published a page-one top-play story "disclosing" the Army's role in subsidizing the semiconductor conference. The paper also pointed out that the Army was making research grants to Japanese scientists. Soon elements of the press, opposition political parties, student groups, and assorted scientists, educators, and left-wing intellectuals began howling for an end to "military" research.

The ensuing controversy, though little noticed in this country, was deemed critical enough to warrant discussion at the highest governmental

levels in Japan. The cabinet, on 19 May, called for modification of the procedure of handling U.S. Army research grants, and Premier Eisaku Sato commented the following week that his government would have to intervene in dealings between Japanese scientists and the U.S. Army.

Perhaps the most significant result of the controversy so far has been a stringent new set of regulations issued by the Japanese Ministry of Education governing the acceptance of grants from outside sources by scientists at the 74 national universities and colleges and 24 national junior colleges. If applied literally as now written, the regulations would force an end to virtually all U.S. grant programs in the national schools. Ironically, the U.S. agency chiefly affected would be NIH, not the Army.

Diplomats and agency representatives from both countries are currently working to find a way around the new rules. But whatever the outcome, the episode has raised questions about the wisdom of allowing the U.S. military to support scientific research outside the United States.

In a speech last July, Senator J. William Fulbright, chairman of the Senate Foreign Relations Committee, commented on the controversy in Japan and on the fact that the Defense Department was then spending some $15.8 million sponsoring research in foreign countries. "I am not saying that the research as such is not beneficial," Fulbright said. "What I do not understand is the reason behind the military sponsorship of such projects . . . I cannot understand why our government takes the risk of bruising our relations with other countries by having the Department of Defense undertake such research."

In some ways it seems unfair that the Army's program in Japan should provoke such criticism, for it's hard to imagine how the Army could have been more circumspect in its dealings with Japanese scientists.

A special Defense Department report prepared for Fulbright states that the Army supports research "by outstanding Japanese scientists" who have "unique capabilities in ideas, facilities or access to materials." Such research is "confined almost entirely to basic medical research," ranging from fundamental studies of sensory neurophysiology to studies of diseases endemic to Japan, such as Japanese B encephalitis.

NEWS IN BRIEF

• **CLASSIFIED RESEARCH**: The Department of Defense is planning to discontinue the practice of conducting classified basic research projects at universities. The effect of this impending move remains unclear, however, since the Department acknowledges that some classified university research that is now categoried as basic could continue under other labels. The Department's decision is contained in a statement by John S. Foster, Jr., director of Defense Research and Engineering. It states, in part, "I am taking steps to assure that in the future all basic research supported by DOD [Department of Defense] at universities will be unclassified. However, because universities possess special skills unique for necessary national security activities, we will continue to support a very small number of exploratory development and study efforts at universities as well as occasional consulting arrangements." The Department reports that in fiscal 1966, it had 4152 contracts at universities, and that of these, 138 were classified. A statement spelling out details of the new policy is expected to be issued before the end of the year.

• **NSF BILL**: A measure that would amend the National Science Foundation Act of 1950 has been introduced in the Senate by Senator Edward Kennedy (D–Mass.) In April the House passed a similar bill, sponsored by Representative Emilio Q. Daddario (D–Conn.). Kennedy told the Senate his bill would "strengthen the National Science Board" and "modify and modernize the structure" of NSF. No date has been set for hearings on the measure which will be conducted by a subcommittee of the Labor and Public Works Committee.

• **HEALTH ECONOMICS INSTITUTE**: The Leonard Davis Institute of Health Economics, a multidisciplinary institute that will include both academic and research programs, has been established at the University of Pennsylvania. Davis supported the institute's establishment through gifts to the university. He is a certified public accountant and chairman of the Colonial Penn Group, a Philadelphia-based organization that was instrumental in establishing the first national health insurance plan for retired persons. Executive director of the institute is Robert D. Eilers who previously was executive director of the S. S. Huebner Foundation for Insurance Education in the Wharton School of Finance and Commerce.

• **MILLION DOLLAR CHAIR**: An anonymous donor has given Columbia University $1 million for the creation of an endowed chair in neurosurgery in memory of the late Byron Stookey. Stookey was a pioneering neurosurgeon and professor emeritus of neurological surgery at Columbia. The new chair is one of 100 which the university is attempting to establish as a part of a 3-year $200-million fund drive.

• **BUCKLEY RUNS AGAIN**: William F. Buckley, Jr., Conservative Party politician and editor of the *National Review*, has announced he will run as an insurgent candidate for the 19-man Yale Corporation to protest the university's "liberal bias." Buckley, a 1950 Yale graduate, said his candidacy is based on objections to the "almost total absence of conservatives on the faculty." He will oppose a slate of candidates selected by a corporation-appointed committee. The Yale Corporation is comprised of ten permanent trustees, Connecticut's governor and lieutenant governor, six alumni who serve for 3-year terms, and the university president. Buckley is the author of several books including *God and Man at Yale.*

• **BRITISH ABORTION REFORM**: Britain's House of Commons has approved a controversial bill that will make abortions available without cost for a wide range of social and medical reasons. Under the bill, an abortion may be permitted if any two physicians agree that one of the four following conditions might result if the pregnancy were not terminated: the life of the mother might be threatened; the mother's physical or mental health might be injured; any of the mother's existing children might be injured, mentally or physically; or that a child born from the pregnancy might "suffer from such physical or mental abnormalities as to be seriously handicapped." The new law will become effective 25 March.

The diseases are said to "affect the welfare of U.S. military personnel who are stationed in the Orient," as well as the health of the Japanese people.

The Army stresses that it does not in any way propose or direct the research projects. Instead, individual Japanese scientists submit unsolicited proposals for research—supposedly (though apparently not always) with the approval of their institutions. The research is unclassified, and all grantees are free to publish in the open journals. Generally, the Army and a Japanese institution or agency share the cost of the research. Indeed, many Japanese scientists seem to have used Army funds to enrich the meager grants received from their own country.

The program is a modest one—amounting to only about $170,000 in 24 currently active Army grants. (The Air Force chips in another $91,000 and the Navy $3,000.)

State Department officials say the Army's program was approved in advance by the American Embassy in Tokyo as consistent with "bridge-building" efforts. And the Japanese government is "aware of the intent and magnitude of the program," according to the Defense Department.

So why all the fuss? The answer seems to be that widespread revelation of the Army program struck a deep nerve of pacifism and antimilitarism in postwar Japan.

The uproar is also partly an expression of hostility to the U.S. role in Vietnam ("It is plainly criminal to cooperate with the military of a nation carrying out a brutal war in Asia," one Japanese scientist wrote to a U.S. colleague); partly a symptom of nationalism; and partly the result of political and bureaucratic infighting in Japan.

Some Japanese critics of the Army program suspect that the research, no matter how "basic" it seems, is directly aimed at strengthening U.S. capabilities in chemical and biological warfare—a charge that is denied by our Defense Department. The *Asahi Shimbun* on 18 May carried a front-page cartoon showing a Japanese scholar receiving "aid money" from a loathsome-looking U.S. Army officer and giving the officer in return a large container labeled "bacteria," a State Department press summary notes. The charge was echoed by socialist members of Japan's House of Councilors (the upper chamber) and by several scientists who specialize in biological studies.

Many Japanese scientists, although willing to grant that the Army's research seems basic and beneficial, nevertheless strongly oppose the program on the grounds that science and the military don't mix well. Seiya Uyeda, associate professor at the Institute of Geophysics at Tokyo University, told *Science* during a recent visit to this country that he opposes Army sponsorship of research "even though most, or perhaps all, of the work has practically no direct relationship to military purposes." The Army, he reasoned, might ultimately coax Japanese scientists into doing more applied research, or results of the current basic research might ultimately be found useful for war.

This last possibility was also stressed by Akira Waki, head of a government bacteriological office, who warned in the *Asahi Evening News*, an English-language paper owned by *Asahi Shimbum*: "Some scientists are doing research on hay fever germs—but hay fever germs are similar to the anthrax germs that can be used in bacteria bombs—and the results of research on hay fever germs can be applied to anthrax germs. Research is also being done on creating colitis germs that resist antibiotics—and the results can be used for pest germs." (The U.S. Army says this particular research involves diseases that represent "a serious health problem to U.S. personnel stationed in the Far East.")

Not all Japanese scientists are opposed to the Army program. Hisao Uetake, director of Kyoto University's Virus Research Institute, told the *Asahi Journal*: "I did a great deal of thinking before deciding to receive U.S. Army funds. I was certain that the research I do with the grants will never be utilized by the Army." And Tomizo Yoshida, head of the Sasaki Research Institute and recipient of Army funds for research involving cancer cells, contends that "much of the credit for the progress of cancer research in Japan is due to U.S. research grants."

Considerable debate has surged around the question, perhaps unanswerable, of what research is or is not related to military purposes. In reply to those who fear their work might ultimately aid the military, Jiro Tsuji, a mechanical engineer, wrote in the 25 May *Nikkan Kogyo Shimbun* (Daily Engineering News): "A war in our age is bound to be a total war. And in a total war, all objects of study are necessarily linked to war efforts. . . . All depends upon whether the results of scientific research will be used for war purposes or not. This is clearly a problem facing statesmen rather than scientists."

Another engineer, noting that the U.S. Army could easily use the published results of Japanese research even without offering any financial support, called the Army grants "an act close to charity."

Some critics of the Army program believe it was approved by the leading scientist-politicians in Japan. Ro Wake, chief of the First Bacteriological Division of Japan's National Institute of Health, wrote in the August issue of *Kagaku Asahi,* a popular science magazine, that the "big bosses" in Japan's medical circles had worked for the introduction of Army funds despite apprehension on the part of younger scientists that the research might aid development of biochemical weapons. He placed particular blame on the Japan Science Council's Seventh (medical) division, which, he said, had refused to ratify both the Geneva agreement opposing use of biochemical weapons and a resolution condemning use of pesticides in Vietnam by U.S. forces.

The highly emotional debate, which has split Japan's scientific fraternity, has caused a number of Japan's leading scientific and educational bodies to dissociate themselves from the "contamination" of U.S. military funds. Here are some examples, gleaned primarily from U.S. State Department translations of items from the Japanese press:

► The Japan Science Council, a high-level governmental advisory group whose members are elected by Japanese scientists, on 25 May announced a "unified view" regretting U.S. Army subsidies to last year's semiconductor conference (which the council had supported) and pledging steps to prevent a recurrence of the situation.

► Tokyo University President Kazuo Okochi, speaking for the Association of National Universities, of which he is chairman, said on 27 June that it is "undesirable" for Japanese universities to receive money from "the armed forces of a foreign country."

► Several university presidents have spoken out against the U.S. Army research program; some universities have actually taken steps to sever ties with the U.S. military; and others have tightened up their procedures for scrutiniz-

ing military grants. The list includes Hokkaido University, Kunamoto University, Kyoto University, Osaka University, Osaka Municipal University, Tokyo University, and Yokohama Municipal University, among others.

► Some individual researchers have announced that they are terminating their Army grants, or at least don't plan to renew them. The U.S. Army, however, says no Japanese scientists have yet dropped their grants.

► The Physical Society of Japan, at an emergency general meeting on 9 September, resolved that it will henceforth have "no relationship of cooperation, including aid, with all of the armed forces here and abroad," according to a U.S. State Department memorandum. The vote was 1,927 for, 777 against, with 639 abstentions and 38 votes invalid.

Afterward, Hidetoshi Takahashi, chairman of the society, told Japanese newsmen that the young members who forced the issue were "a political group." He lamented that the resolution will put a major restraint on the society and perhaps prove detrimental to the development of physics.

► Perhaps most significant of all, the Ministry of Education on 8 September announced changes, effective 1 October, in its regulations governing the acceptance of money by national universities from all outside sources—civilian as well as military, domestic as well as foreign. The regulations surprised U.S. officials (and many Japanese officials as well) by their stringency and broad impact.

State Department official say it is "impossible" for U.S. granting agencies to 'live with" a new Japanese regulation governing allocation of patent rights, primarily because the regulation conflicts with a presidential order. Conflicts have also arisen over auditing procedures, title to equipment purchased under the grant, authority of a granting agency to cancel its grant, and the return of funds that have not been expended.

If the regulations are literally enforced, officials say, all U.S. agencies will have to curtail their grant programs in the Japanese national universities. The largest such program, involving grants of $863,769 for medical and biological research in fiscal year 1967, is conducted by NIH. Next in size is the Army program, which is believed to total about $100,000 at the national institutions, while the Air Force contributes approximately $40,000 more.

The civilian programs were apparently ensnared by accident. A high official of the Japanese Ministry of Education told NIH the new regulations were aimed at the Army and at private firms that invest in research. He said the ministry hadn't realized NIH would be hit so hard.

The prospect of losing U.S. civilian grants has caused considerable consternation in some circles. The *Mainichi Shimbun,* Japan's second largest paper, warned that a "brain drain may occur" if eminent scientists lose their NIH support and feel forced to emigrate to greener pastures. At least one scientist has already threatened to leave. U.S. State Department analysts report that many Japanese scientists and national universities and the Japanese Foreign Ministry are pressing for relaxation of the rules.

Though the U.S. civilian and military grant programs are all relatively small, they are regarded as politically important symbols of cooperation. And from a scientific standpoint, agency officials say, most of the projects would be hard to duplicate elsewhere.

About the only silver lining in this cloud is a pledge by various Japanese ministries to increase their financial support of science, largely because of charges that government stinginess contributed to the "moral crumbling" of Japanese scientists when confronted with U.S. Army money.

Though the uproar in Japan is regarded by U.S. State Department officials as "an isolated phenomenon" with "no global implications," it seems

U.S.-Soviet Exchanges: Agreement Nears Expiration

Time is rapidly running out for the exchange agreement under which the United States and the Soviet Union conduct their scientific and cultural exchange programs. The agreement expires 1 January 1968 and, at this writing, no date has been set for negotiations on a new agreement. Although State Department officials stress the importance of continuing the exchanges, they are proceeding cautiously because of Soviet sensitivity about the war in Vietnam.

There is no doubt that the war is causing some foot-dragging on the part of the Soviets—but the extent of the slowdown is not clear. For one thing, the Soviets have never been in any particular haste to complete exchange agreements. The current agreement, which covers the 1966–1967 period, was not concluded until 19 March 1966, even though the agreement that preceded it lapsed at the end of 1965. Perhaps as a gesture of protest by the Soviets over U.S. foreign policy, the belated 1966 agreement cut the number of scientists who could participate in the program conducted by the National Academy of Sciences and the Soviet Academy of Sciences from the 55 previously permitted to 45 and reduced the total months of exchanges from 180 to 170.

In March of this year, a five-member delegation from the National Academy met in Moscow with representatives of the Soviet Academy. Nothing concrete was expected to come out of the meeting, and to date nothing has. Lawrence Mitchell, staff director of the National Academy's Section on the U.S.S.R. and Eastern Europe, said one of the projects that was discussed at length during the March meeting was a much-delayed symposium on the electron theory of metals. At one time the symposium was slated to take place in the United States during 1965. In March, the Soviets suggested holding the symposium in the U.S.S.R. in October 1967. After returning to the United States, the Americans countered with a suggestion that the symposium take place in the U.S.S.R. early in 1968. The proposal was made 8 months ago, but a reply has not yet been received.

Although the lack of correspondence between the national academies of both countries is not without implications, one official said the Soviets have never been noted for prompt replies. Whatever the reasons for the communication lapse, there is little optimism here that a new exchange agreement will be negotiated in the near future.—K.S.

to reflect a growing trend among scientists and educators, both here and abroad, toward noncooperation with the military. In 1965 a somewhat similar furor in Chile forced the U.S. Army to cancel Project Camelot, a study of the dynamics of revolution in foreign countries (*Science*, 10 September 1965). Partly as an outgrowth of that fiasco, the American Anthropological Association has resolved to "scrupulously avoid" involvement with U.S. intelligence activities abroad (*Science*, 23 December 1966 and 21 April 1967). And, for a variety of reasons, American scientists seem less and less interested in doing defense research (*Science*, 21 April 1967). Classified research has come under particular fire. *A Wall Street Journal* survey that was published 25 October found that "universities in growing number are spurning government contracts that call for secret research."

The full ramifications of the controversy in Japan won't be known for some time. But Allan V. Cox, a Stanford University geophysicist who has been active in the NSF-sponsored U.S.–Japan Cooperative Science Program, fears the wrangle over Army funds will undermine scientific cooperation between the two countries and may prove a harbinger of controversies to come in other lands where U.S. armed forces are supporting scientific research. Says Cox: "Participation of the U.S. military or the CIA is the kiss of death in any kind of cooperative venture. Even if the motives are benevolent, it does much more harm than good."

—PHILIP M. BOFFEY

New Towns: Geological Survey Has Key Role in Experiment

The outstanding contemporary U.S. example of a "New Town" is Reston, Virginia, a community being developed on a 7400-acre tract of rolling countryside 18 miles northwest of Washington. Reston aspires to be much more than just another residential suburb, and hopes that many of its breadwinners will work as well as live in the community. Accordingly, Reston's promoters were delighted last year when it was announced that the U.S. Geological Survey, one of the government's most venerable scientific agencies, would come to Reston and build a $35-million headquarters housing nearly 2800 employees.

However, the effect of this decision—once Congress provides the money to implement it—is likely to go well beyond that of bringing hundreds of new families and jobs to the infant community. Indeed, the Survey's most important influence locally may be to reinforce Reston's resolve not to become merely another complacent outpost of the affluent society.

At Reston's dedication ceremonies in May 1966, Secretary of the Interior Stewart L. Udall prefaced his disclosure of plans to put the new Survey facility in Reston with some cautioning remarks. If Reston were to achieve more than the limited success of earlier New Towns, Udall said, it would have to surmount two hurdles—income and color. "A true New Town," he said, "must be a cross-section of America or it must be deemed a failure, despite the brilliance of its design and the insight of its community planning. In this land of equal opportunity, *no* town can claim to be truly American if it is an enclave of the well-to-do or the private preserve of any single ethnic or racial group."

Udall was expressing more than a mere hope that Reston would be a broadly representative community. In the formal agreement by which the government accepted a gift of 50 acres of land from Reston and bought another 35 acres, Reston promised to meet the housing needs of Survey employees by building a variety of reasonably priced housing units for them. This would be in keeping with Reston's avowed policy of encouraging all who work in the community to live there, regardless of race or level of income.

To date, the evidence that Reston will live up to this policy is incomplete. Those middle-class Negroes who have been attracted to the community do appear to have received a warm welcome. But no low-income Negro or white family could afford to rent or buy the apartments and houses thus far made available. The cheapest houses have sold at about $22,500, and few have been offered at that price. Rent for three-bedroom apartments now starts at $225 a month.

According to an announcement by the new town's managers, however, Reston has just been promised a low-interest loan from the Department of Housing and Urban Development (HUD) for the construction of 200 units of low-cost housing. Another sign of Reston's good intentions is the major part it is playing in a HUD-financed study and pilot project on the use of new technology to produce such housing.

Even though still a middle-to-upper middle-class enclave, Reston cannot fairly be said to have lacked high-mindedness. On the contrary, had it been less concerned with creating an environment of extraordinarily high quality for all of its residents, it probably would not now be $45 million in debt. Reston is, in truth, the carefully reared brainchild of a man who has the look of an idealist.

Reston's founder—and, until recently, its manager—is Robert E. Simon, Jr., a 53-year-old New York real estate developer whose initials form the first three letters of the community's name. Simon bought most of the Reston tract in 1961, then proceeded to act on his vision of what a New Town should be. This vision, which borrows from a variety of contemporary and traditional sources, is, briefly, as follows.

When fully developed, Reston would be a community of about 75,000 people, who would live in seven villages of 10,000 to 12,000 population each. The village centers, offering the kinds of stores and services typically found in a shopping center, together with such facilities as a library and community hall, would be pedestrian-oriented, with automobiles banished to a parking area on the outer fringe.