cause it was a higher voltage machine, physicists would buy it. There are still well-respected nuclear physicists who advise moving by small steps toward larger Van de Graaff accelerators.

Whatever the reasons for the policy of dogged pursuit of the last plans of Robert Van de Graaff, it reversed, at least temporarily, a history of large profits, and forced the company to dramatically readjust its traditional devotion to pure science. Although the TU accelerator was very much what the company was about and may indeed have been "a beautiful machine," as one ex-scientist from HVEC said, its dismal failure in the marketplace to date is apparently a lesson that no legacy of ideas for research and development stays alive for very long. Bigger and bigger accelerators are not necessarily hot sales items, and filial piety may be no substitute for market research.—WILLIAM D. METZ

Spain (II): An Understanding with the Americans

In 1953 Spain and the United States signed a treaty which gave the United States use of air and naval bases in Spain. For Spain, the most concrete return on the bargain was a program of American military assistance, but the treaty also served as a diplomatic icebreaker for Spain after more than a decade of isolation brought on by the association of the Franco regime with Fascist Germany and Italy dating from the Spanish Civil War. The bases treaty has been renewed periodically, and the 1970 version has been expanded to include a variety of nonmilitary provisions, most significantly a "chapter" on scientific and technical cooperation.

The new version is titled "Agreement of Friendship and Cooperation between the United States and Spain" and in its preamble affirms the spirit of the "Treaty and Friendship and General Relations" between the two countries signed in 1902. That treaty was intended to restore amity after the Spanish-American War of 1898 which deprived Spain of the last remnants of her once great empire in the Americas and the Pacific. The Spanish really have more cause to remember the *Maine* than Americans, and the memory of that episode has strongly influenced the attitude toward the United States of many Spaniards still living today. For the military and governing classes it was a patriotic resentment of defeat and humiliation. The legacy was different for the influential intellectuals of the "Generation of '98" for whom the war brought the ultimate demonstration of corruption and incompetence in their government. For this remarkable group of writers, artists, educators, and social reformers, the war seemed a final dispelling of the illusions of empire and an imperative to deal with the problems of Spain at home. As for the United States, however, the Spanish intellectuals not only were offended by American jingoism but also saw Yankee commercial and cultural penetration as a threat to Hispanic civilization in Spanish America. It is an attitude which continues to influence Spanish intellectuals.

The postwar treaty on military bases was entered into on both sides in a largely pragmatic spirit. On the American side, with the Korean conflict and the Cold War on, the strategic advantages of acquiring bases on the flank of Europe for bombers and later for nuclear submarines outweighed inhibitions about dealing with the Franco regime. At the time there was opposition to the treaty inside the United States, and among U.S. allies, but the military carried the argument. The American attitude, and the fact that no treaty of mutual aid in case of attack was offered, offended Spanish pride and made for tough bargaining.

Hard-pressed Spanish liberals saw the treaty as a cynical political act by the United States, and many are still convinced that the United States saved the Franco regime from its economic mistakes in the 1950's. The U.S.–Spanish relationship, therefore, is a complicated one. At the official level relations have been based rather openly on mutual advantage. At the same time, Americans as individuals continue to feel a fondness and fascination for Spain and the Spanish which has nothing to do with Spain's strategic location or with its reliability as an ally.

The latest agreement assumes a fuller formal relationship between Spain and the United States and at the same time reflects Spanish concern about its competitive position. On the basis of the usual indices, Spain is still a developing nation, at least by European standards. And Spain is now entering a period when it must make important decisions about closer association with the industrially more advanced countries of the European Common Market. If it is to narrow the gap technologically, Spain must give a much higher priority to domestic research and development (*Science*, 7 July). And the United States is for Spain a logical source of aid and comfort in the R & D sector.

Up to now, U.S. assistance has been limited. Spain did not qualify for the massive technical assistance or reconstruction financing provided under the Marshall Plan and its follow ons, although the bases treaty did open the way to large loans on favorable terms. Official American aid has been restricted largely to a modest two-way traffic of academics, professionals, and technical people under the Fulbright-Hays program and other exchange programs operated through the State Department. American firms with Spanish subsidiaries and other foreign and multinational corporations operating in Spain have helped to raise Spain's technological horizons, but these operations have brought qualified benefits.

A recent report, *American Investments in Spain*, underwritten by the American Chamber of Commerce in Spain and published early this year, throws some light on the extent of current U.S. investment in Spain and its effects on the Spanish economy. The report combines a study by the Stanford Research Institute on "multinational company–host country" interactions with a survey of the views of Spanish opinion leaders on American investment.

The report puts the total value of American direct investment at the end of 1969 at $611 million. The major

sectors of investment were as follows: manufacturing, 52 percent; petroleum, 20 percent; and trade, 20 percent. United States investment grew most rapidly—from $275 million to $611 million—in the 5-year period between 1965 and 1969 although there was a distinct slowdown in growth in 1967 and 1969 attributed primarily to a decrease in profitability. In recent years, American investment in Spain has lagged behind German and Swiss investment.

The factors which U.S. companies said most attracted them to Spain were an expanding market, low labor costs, a favorable investment climate, and—particularly appealing, it seems—a stable currency and political stability. Despite the spurt in the mid-1960's, U.S. investment in Spain has been proportionately lighter than in other Western European countries. Spain has 9 percent of the population of Western Europe, but only 2.8 percent of U.S. investment in that area.

Spain's earlier, rather resistant attitude toward foreign investment was relaxed considerably after economic troubles in the late 1950's led to lighter controls. Spanish hopes from foreign investment were fairly typical—hopes to attract investment capital, create jobs, and cut imports. The Spanish government also expected to profit from a flow of new technology into Spain.

In recent years, a greater selectivity has been imposed on investment from abroad. Emphasis is being put on the export potential of new industry. The government is looking with favor on investments that will have the effect of reducing royalties and technical and management fees. And officials are stressing that they want research and development to be conducted within Spain.

Spain is not alone in being suspicious of behavior of multinational corporations summed up in the catchword "extraterritoriality." This means generally that decisions made by parent companies outside Spain will not be in Spain's best interests. In the case of U.S.–dominated companies, for example, operations based in Spain might be influenced by U.S. controls on exports to Communist countries, the extension of antitrust decisions to foreign subsidiaries, or effects of regulations to control American balance-of-payments problems. Currently, suspicions that a parent company might not want to see R & D duplicated or might prefer another European country as a research center particularly rankle the Spanish.

The report does not give a comprehensive picture of industrial R & D in Spain, but it does say that a fair amount of what is done is applied research to adapt products to the local market. Service industries report doing market research. Interestingly, the survey results showed that, when the opinion leaders were asked their feelings on the American Challenge—which translates into *Desafio en Espana*—they replied that they were equally concerned by the challenge of European economic power.

Mixed feelings on the Spanish side about the technological benefits of foreign industrial investments may well have caused Spanish negotiators to push for the science and technology agreement and other related nonmilitary sections (educational and cultural cooperation, cooperation on environmental and urban problems, agricultural cooperation) in the treaty.

NSF Is Program Manager

An American foreign aid expert no longer in government service gave this thumbnail sketch of the genesis of the science and technology provision. "The Spanish," he said, "decided they wanted help in technology and really pushed for it. Defense wrote it into the treaty and then DOD [the Department of Defense] said it's not our bag. What about State? The State Department then went to the National Science Foundation [NSF]. Incidentally, that's pretty much how NSF got its whole international program."

Whether or not the process was quite that casual, NSF is the program manager for the U.S.–Spain technical projects. While NSF's opposite number in Spain has been the foreign office, which has no particular expertise in science, the problems of meshing the two bureaucracies appear to have gone well and, in fact, the programs are ahead of schedule.

The Spanish submitted a list of over 100 projects, and U.S. technical agencies indicated the projects they felt were practicable and which they were interested in pursuing. After further negotiation, a half dozen projects were given top priority and others were lined up for implementation later.

Some $3 million in U.S. funds has been earmarked for the cooperative projects, but there is a question about future financing. The State Department and NSF are going on the assumption that, if things go well, Congress will ante up.

The projects* run the gamut from education to applied research, but the largest single grant ($800,000) is earmarked for support of an Institute of Molecular Biology at the new autonomous University of Madrid. The new institute will have a special American link in the person of Severo Ochoa, a biochemistry professor at New York University. Ochoa and Arthur Kornberg shared the 1959 Nobel Prize in physiology and medicine (Ochoa was cited specifically for the first synthesis of a ribonucleic acid). Not only has Ochoa lent his prestige to the project and participated in early planning, but he is also expected to spend some time at the new institute doing research after it opens.

Ochoa is a member of the generation of scientists who left Spain in the 1930's and made a career abroad. He was influenced to take up biology by the example and the writings of Santiago Ramon y Cajal, Spain's only Nobel prize winner in the sciences (Ochoa is a naturalized American citizen). Like many Spanish scientists of his time, Ochoa studied in Germany, working in the 1930's with Otto Meyerhof. Ochoa spent 3 years in Britain at the end of the 1930's and then came to the United States. He arrived at New York University in 1942 and has been there ever since.

Ochoa made his first postwar visit to Spain in 1952. He knew the enzymologist Alberto Sols, whose Madrid laboratory, supported by the government research council, had been a growth point for modern biology in Spain, and Ochoa did what he could from a distance to aid the development of biochemistry in Spain. By the 1960's the base was still narrow, but a few able researchers were beginning to work in small centers, for example, in Barcelona, Seville, and Salamanca.

Spanish universities have been chronically weak in graduate education, and Ochoa and his colleagues hope that the new institute will help remedy that weakness. The institute is to be located on the campus of the autonomous university on the outskirts of the city. A decision was made in recent months to build on the main campus rather than at the university's new medical

* The titles accurately convey project aims: National Scientific and Technical Information Service ($300,000); Institute of Automation ($200,000); English Teaching Project ($367,000); University Administrators Project ($609,000); Oceanographic Studies ($215,000); Urban Affairs Projects ($200,000); and Air and Water Pollution Projects ($200,000).

school where the institute now has temporary quarters. The medical school is adjacent to a big social security ministry hospital in a more congested area nearer the center of the city.

The new institute building will cost an estimated $3 million, the money to be provided by the Spanish government, and is scheduled to be ready for full operation in September 1974. Of the $800,000 in American funds destined for the institute, about $600,000 is to be used for the purchase of scientific equipment and some of the remainder will go toward the acquisition of books and back files of journals for the library. The government is expected to match the funds for equipment purchases.

The institute will operate under the joint auspices of the university and the government research council, an arrangement which is regarded as an important breach of precedent. In addition, the social security ministry and health directorate of the ministry of labor have pledged substantial sums for support.

Ochoa and his colleagues regard the establishment of independence from close university administrative control as crucial to the institute's success. A board of trustees with influential members should serve as an effective buffer, and the institute has had the backing of some energetic younger Spanish scientists including Carlos Asensio, a biochemist who is said to be familiar with the ministerial corridors of power in Madrid and who is expected to serve as secretary of the institute.

Other Spanish-born scientists are making contributions similar to Ochoa's. One is Jose M. R. Delgado, a Yale medical school professor who last year spent his sabbatical on and off in Spain. In addition to doing some teaching he spent time organizing a research team to operate at the new medical school of the autonomous university of Madrid. Delgado is an authority in the study of social behavior through transdermal stimulation of the brain. He has won support from the Spanish Juan March Foundation and says there are adequate facilities for the primates used in the research. He finds the students "highly motivated and the spirit good" and is optimistic about establishing research with possible future clinical applications at the school. He expects to maintain personal contact with the work in Madrid.

Ochoa and his Nobel prize are potent symbols in Spain. Many Spanish scientists hope that Ochoa will prevail on the government to strengthen research in the universities. Others are skeptical and suggest that the institute will be used simply as window dressing by the regime.

Ochoa says he regards the institute as a "catalyst, not a showpiece." He sees it as a graduate school of molecular biology, and he hopes that it will be an international school with ties not only to American and European universities through teachers and students, but to other Spanish universities where "nuclei" in modern biology are developing. Ochoa believes that the Spanish authorities are giving the institute a high priority and he feels that the government now is genuinely interested in all aspects of education. "You can say I'm betting on change," says Ochoa.

American cooperation with Spain can be said to have proceeded on just that basis. Two decades ago, the relationship was established on a note of tacit disapproval, but there was a tactful understanding to ignore it. The two countries were allies at arms length.

Over the years, the guidelines in foreign relations have been changing. The United States has moved away from the "legalistic-moralistic" approach crossed with anticommunism which was diagnosed as the American style after World War II. If Spain is not a parliamentary democracy, neither is the Republic of South Vietnam, nor for that matter are the Soviet Union or the Peoples' Republic of China, and the United States seems to be learning to live with them. Even the Spanish regime, whose keynote is still anticommunism, has been increasing its contacts with the Soviet Union.

While ideological strictures have been loosening, American and European influences have been increasing in Spain. The first U.S.–Spanish defense accord meant that soldiers talked to soldiers and diplomats to diplomats. Now scientists, educators, and administrators are involved in multiple contacts through official programs, while tourism, worker migration, the operations of multinational corporations, and the two-way flow of teachers and students has opened the country in an unprecedented way to outside influences. The effects are hard to assess. Spain still does not have an open economy or an open society, but these wider contacts are creating pressure for change. And probably the most significant potential influence is the education reform program, which will be discussed in another article.

—JOHN WALSH

Baker to Leave NIH for Hazleton Labs

Carl Baker, former director of the National Cancer Institute (NCI) has been named president of Hazleton Laboratories, a private research organization located in Vienna, Virginia, just outside of Washington, D.C. Discussing Baker's appointment, Kirby Cramer, chairman of Environmental Sciences Corporation, of which Hazleton is a subsidiary, said, "We are most impressed by Baker's acumen in scientific administration and planning. As president, he will be Hazleton's chief operating officer, running the labs on a day-to-day basis." Baker, who has been with the National Institutes of Health since 1949, was for many years a high-ranking administrator in the NCI before becoming its director in 1969 [he was succeeded last April by Frank J. Rauscher (*Science*, 28 April)].

Hazleton, founded in 1946 by a pharmacologist from George Washington University, is involved primarily with work in toxicology and in cancer research, with sections in microbiology and biochemistry as well. It has contracts from various institutes of the National Institutes of Health, including the NCI.

According to Kirby, the toxicology unit does independent testing for a number of pharmaceutical and chemical companies and is the largest of the laboratories on the 125-acre campus. But research resulting from cancer contracts related to projects in microbiology, virology, and carcinogenesis constitute Hazleton's fastest-growing section. The cancer division operates on a budget of about $3 million, most of which is from NCI contracts, Kirby reports.

Baker will assume his new position in early September.—B.J.C.