periments involving recombinants made with the monkey virus SV40. He will lose 5 or 6 months, he estimated, in switching to the mouse polyoma virus. It was an experiment with an SV40 recombinant that aroused Berg's first scruples about the technique some 3 years ago.

It is too early to judge how the guidelines will appear to those outside the scientific community, but the committee is likely to receive some criticism on the grounds of vested interest and lack of public representation. The guidelines may look like a document of "byzantine complexity," as one observer termed it, tailored to fit particular experiments that are already on the drawing boards. It contains such apparent inconsistencies as that shotgun experiments with higher plants (which no one at present plans to do) are rated more hazardous than those with many types of animal genomes.

Yet those who argued in favor of lower containment levels were reflecting not just a personal bias but a widely held view that the hazards are being overemphasized. As evidence that it rose above its own interests the committee can point to the fact that its final guidelines are more stringent than those of Asilomar.

There are at present only a few positions in which the committee is outflanked by more conservative critics. Four scientists calling themselves the Boston Area Recombinant DNA Group has argued that *E. coli*, because of its ability to infect man, is an unsuitable host for recombinant DNA experiments and should be phased out of use within 2 years. Committee member Wallace P. Rowe (NIH) also feels strongly that *E. coli* is the wrong host but thinks people would not wait for a new host to be developed. Rowe also headed a group which recommended much higher containment levels for all shotgun experiments on the grounds that the expected hazard does not vary with the species. He, however, accepts the La Jolla guidelines.

The committee did not quite come to grips with a point raised by Brenner, that as the containment levels for an experiment are lowered, the number of laboratories attempting it will proliferate; moreover, an experiment that may be safely performed at Stanford may not be contained so well in less skilled establishments. Physical containment levels up to P3 are vulnerable to human error: of the 5000 laboratory-acquired infections in the last 30 years, one-third occurred in laboratories with special containment facilities. Even in the P4 conditions of the Army's biological warfare laboratories at Fort Detrick, there were 423 cases of infection and 3 deaths over some 25 years. Argument can thus be made about the P level assigned to any experiment, but the committee's levels are as strict as most.

Congressmen tempted to write legislation on the subject might pause to consider whether they would really do a better job. On the basis of an as yet purely speculative hazard, scientists have for 18 months held off from the use of the new technique, an act of self-denial unique in their own and perhaps most other professions. If the experiments now to be conducted make the hazards seem any more tangible, the same sense of responsibility will presumably continue to be manifested.

—NICHOLAS WADE

European Physics: New Accelerator Likely to Assure Lead in the 1980's

Hamburg, Germany. Large particle accelerators are not essential for energy research, do not contribute much to industrial productivity, and have not produced many spin-offs. Yet Europe—following a policy opposite to that of the United States—continues to support high energy physics generously. The immediate goals appear to be fundamental knowledge, rather than economic benefit, and the international prestige that goes with excellence in basic research. The Europeans would clearly enjoy the chance to surpass the United States in a field that the Americans founded and that represents in many respects the summit of technological achievement.

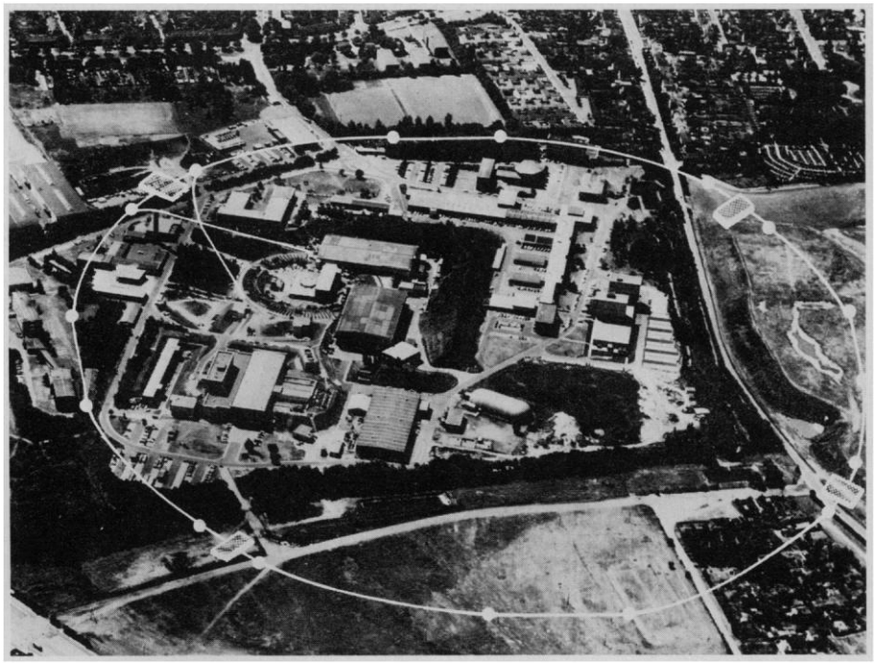
The latest European commitment to high energy physics was made this fall, when the West German government provided funds for a large new electron accelerator facility in Hamburg. Construction on the project is starting immediately, assuring a considerable lead over a similar American proposal, which is facing an uncertain future in Washington. The West German decision may make it possible for Europeans to excel in all kinds of particle physics research, and virtually guarantees that Hamburg will be one of the world's leading physics research centers in the 1980's.

For many years the showplace of European expertise in high energy physics research was the Centre Européene pour la Recherche Nucléaire (CERN) in Geneva, which has been competing successfully with U.S. laboratories for 15 years and has achieved some notable firsts. CERN is not only a first-rate scientific organization, it also enjoys enormous political support because it is the most successful example of pan-European cooperation on technical projects.

But in the last few years, the vagaries of basic research have shifted the focus of particle research on both continents away from the large proton accelerators, exemplified by CERN in Europe and the Fermilab in the United States, to electron storage rings, such as those in Hamburg and Stanford (*Science*, 8 August 1975). Since advanced electron facilities cost only about one-tenth as much as the latest proton accelerators, like the $600 million "super proton synchrotron" that begins operation at CERN next year, the shift of research emphasis to electron phenomena made it possible for a single European country to build a particle research facility more powerful than any existing one, and to build it quickly.

To ease the way for the electron project, the European Committee for Future Activities (ECFA) began laying down ground rules for the new electron laboratory (there should be only one and it should be open to all scientists), while various countries began vying to have the facility built on their soil. Italy proposed a 12-Gev electron storage ring, but dropped out of the running early, leaving Britain and West Germany to fight over rights to the project. Britain proposed to build a 15-Gev storage ring at Daresbury, but the government said it would support the project only if other countries helped fund it. West German scientists proposed to build a 19-Gev storage ring, and argued vigorously for the superiority of their proposal.

Either machine was acceptable to other European scientists, who wanted a powerful storage ring, but the members of the coordinating committee (ECFA) declined to decide between the British and West



Path of new 19-Gev storage ring being built in Hamburg.

German designs. When the West German government decided this fall that it was prepared to support a storage ring alone, the British proposal was effectively scuttled.

Scientists here at the Deutsches Elektronen Synchrotron laboratory (DESY) are clearly elated to have an early start on the storage ring, and hope to maintain what they consider to be at least a 9-month lead over the American project, which will be built at Stanford if it is approved. The project, which will be built at the present site of the DESY laboratory, a few kilometers outside Hamburg, is due to be completed by late 1978 or early 1979 at a cost of $40 million, not including inflation or salaries. Named PETRA, the storage ring will be an eight-sided quasi-circular device, 2.3 km in circumference, built underground. When completed, an existing accelerator will be used to fill it with two beams, one of electrons and the other of antielectrons, circulating in opposite directions. Already scientists from Japan and the United States, as well as western Europe, have approached officials at DESY, seeking a chance to work at the new storage ring. Experiments are expected to begin in mid-1979.

The go-ahead for the West German project occurred through a funding procedure that would be difficult to imagine in the United States. The Social Democratic government moved last summer to inject $5.8 billion into the economy of the Federal Republic, specifically to spur the sagging building industry. When the time came for the science ministry to get its share of this windfall, which was distributed in addition to the regular science budget, the advisory committee designated to consider big science projects, including PETRA, had not finished its work. However, the committee apparently hinted that it was favorably disposed. So in early October, H. Schopper, the director of DESY, found himself in the happy situation of receiving construction money for PETRA even before he received official approval of the project.

Not only do the special funds cover the cost of buildings for the storage ring and the four experimental halls in the original plan (see photo), they also provided for two more experimental halls and a large new guest house for visiting scientists working at the laboratory. The two extra experimental halls should go a long way toward ensuring widespread international participation in the program, according to Schopper. Foreign scientists who come to work at the new facility may be asked to make some financial contribution to the research program, but the idea of a designated national research hall has been ruled out, not only by Bonn but also by ECFA. Two months from now, scientists from all the countries represented in ECFA are meeting in Frascati, Italy, to discuss selection procedures for the first experiments.

While high energy physics in Germany is benefiting handsomely from government actions to prime the economic pumps in a recession, high energy physics research in the United States may be cut back even more than before (*Science*, 23 August 1974) by the Ford Administration's response to the same economic situation.

The director of the Stanford Linear Accelerator Center, Wolfgang K. H. Panofsky, could easily find some reason to envy the good fortune of his colleague, competitor, and administrative counterpart, Schopper. Although Panofsky has a reputation as a skillful advocate of big physics projects, the U.S. storage ring proposal ran into trouble in Washington last fall when it was eliminated from the 1976 budget by the Office of Management and Budget (OMB), and it is now slowly threading its way through the Congress as a piece of legislation that the executive branch does not want. It may face worse prospects in 1977, because the Administration's plan for a $28 billion budget cut makes it unlikely that large amounts of money will be available for new projects.

After the U.S. storage ring proposal was rejected by the OMB, Panofsky and his colleagues convinced the California congressional delegation to support the project, which was jointly proposed by Stanford and the University of California at Berkeley. The proposal was reinstated in the 1976 budget by the Joint Committee on Atomic Energy. The authorization bills only cover $11.9 million of the estimated $75 million cost, so in any case the project will have to be submitted again in subsequent budgets. The appropriations being considered in the current bills are even lower. A $2.9 million bill was passed earlier by the House, and just last week was approved by the Senate.

The reason that OMB turned the project down in the first place was that the White House found it a "high priority item, but one which can be deferred in a time of recession." Very little has happened that would change that assessment. Even though Congress has appropriated money for the project, the OMB could defer the allocation of funds, and few observers see anyone on Capitol Hill who is likely to stand up and fight the Executive over the issue.

Even against such legislative obstacles, Panofsky is optimistic. He says it is possible to start construction next year if money is appropriated, and that the Stanford storage ring could be completed by early 1980 and conducting experiments. According to Panofsky, DESY is ahead in the conventional construction, but "we think the status in the technical areas is comparable." He declines to characterize the situation as a race. "This is a very rich field of research," says Panofsky, "and we think the project should go ahead."

Governments might question whether the world needs more than one 15-Gev electron storage ring. In the past, physicists have successfully argued that competing facilities have had very beneficial ef-

fects on research. The question of unnecessary duplication of facilities was raised, in the case of PETRA, by the German big science advisory committee which urged DESY to explore international financing and ways to minimize overlap with the Stanford project. But as one respected scientist in the Federal Republic said, West Germany has just missed the boat in a number of key scientific areas, and the committee apparently did not want to see that happen with storage ring physics. Since it insisted that the recommended negotiations should not change either the design or the timetable of PETRA, the committee's admonition appears to have little force.

At the present time, both Stanford and DESY have smaller 4-Gev electron storage rings, with circumferences of a few hundred meters or less. Until the PETRA ring is completed, the two smaller storage rings will be the paramount facilities for studying the perplexing discoveries that have resulted from electron physics, including the new psi or *J* particles that were discovered last year. Stanford did an experiment that hinted at new surprises in 1973, discovered the psi particle at the same time as the U.S. Brookhaven laboratory, which named it *J*, and subsequently found two more related particles. But after the initial round of dazzling discoveries, DESY is proving more adept at the experiments that sort out the various possible explanations of the new phenomena (the favorite one is called the charm hypothesis).

Visits to the two laboratories make it clear that even now they are not competing on equal financial terms. Whereas Stanford has one magnetic particle detector to use in conjunction with the storage rings, DESY has three large magnetic devices, one like that at Stanford and two others that are more sophisticated. Such elaborate experiments generally cost $2 to $4 million each. According to William Wallenmeyer, at the high energy physics office of the Energy Research and Development Administration (ERDA), "The West Germans have spent three or four times as much money at the DESY storage rings as we have at Stanford, and I think it is amazing that the people at Stanford have been able to compete so well."

In the more conventional area of research with proton accelerators, which has been eclipsed by the research with electron machines but has by no means lost its intellectual appeal, the disparity between the American and European expenditures is even greater. The annual budget for CERN, $245 million in 1975, is more than the budget for all the U.S. accelerators together. In 1975, the CERN budget provided $155 million for operating funds and the rest for completion of the super proton synchrotron, which will be a 400-Gev accelerator. The operating funds for the three proton accelerators in the United States, including the 400-Gev one at Fermilab, is only about $90 million. For all high energy physics activities, both national and international, the annual European expenditure is approximately double the American budget of $175 million. If such a funding differential continues, there is little doubt that CERN and PETRA together will represent research capabilities in the 1980's that the United States will hardly be able to match.

On the other hand, if Stanford is successful in pushing its storage ring appropriations through Congress quickly, the European lead may be held to a minimum. But even a small advantage could be a big benefit. As stated in the monthly magazine of the high energy community, the *CERN Courier*, "The new particle discoveries hold out the tantalising prospect that the first of the [storage ring] machines to come into operation could cream off some spectacular physics."—WILLIAM D. METZ

Habitat: U.N. Conference to Face Crises in Human Settlements

Throughout the world, but particularly in Asian and South American nations, the rural poor are rushing to cities like lemmings to the sea. And the cities cannot cope with them. In phenomenal numbers, landless peasants are becoming landless squatters on the edges of the world's metropolises. In 1950, there were only 16 cities with populations of 1 million persons in developing countries. By the year 2000, there may be 200 cities in the teeming million person club. Two-thirds of all the people on earth will be crammed into cities. Concern over imminent worldwide urbanization lies behind an international conference on human settlements that is scheduled to take place in Vancouver, Canada, next spring. Called "Habitat," the conference is intended to be a "happening," a "consciousness-raising" event that will alert governments all over the world to the impending crisis of cities and the urgent need for planning of human settlements. Habitat is meant not only to instill awareness of the problem but also to offer solutions that nations might adapt to their individual needs.

Habitat is only 6 months away—and it is in trouble, both in Canada which is supposed to be its host and in the United States which is expected to make a major contribution to the proceedings.

In the first place, Habitat, a consciousness-raising event, is hardly part of the public consciousness. Indeed, it is hard to find anyone who even knows what the term means, other than individuals who are directly or indirectly involved in its preparation. In the second place, those participants or would-be participants who do have Habitat on their minds are not exactly happy about the way preparations are going. Margaret Mead, for example, a leader of "Non-Governmental Organizations" associated with Habitat, recently declared that the "preparation of the United States government for its role in the conference is nil, just plain nil."

And, on 25 November, the possibility that Habitat will be called off, or at least moved from Canada, was raised when the Vancouver City Council, at a late evening meeting, voted ten to one against hosting the conference because members of the Palestine Liberation Organization are planning to attend (see box, p. 1182).

Habitat is one of a series of U.N. conferences that have been held during the past few years to discuss global problems related to the future of human life. There have been conferences on population, women, food, and the environment. Habitat is a child of the 1972 conference on the environment that was held in Stockholm, which emphasized the natural environment and sought international cooperation for its protection. Habitat is meant to extend the Stockholm agenda and focus on the human environment. The U.N. describes Habitat, or the notion of human settlements, as an "exciting new concept. . . . It means the totality of the human community—whether the city, town, or village—