A broader clearance of Period VII at Godin Tepe itself will enable us better to define the period during which material from Period VII is found stratigraphically associated with later material. Through the horizontal clearance of one of the six small sites in the Kangovar-Bisitun area where similar materials in the pottery Neolithic period are found on or near the surface, by sounding perhaps one other such site, and by plotting all the sites in the region that date to this period, we should be able to reconstruct a reasonably complete picture of this valley at the time of Godin VII. One of these small sites in the neighborhood may yet yield evidence on the relationship between the aceramic and pottery phases of the Neolithic. Godin, of course, provides us an excellent opportunity to examine the relationship between the pottery of the Neolithic and subsequent cultural periods in western Iran, since there appears to be no major break in the developmental sequence between Godin VII and VI.

For the periods after the pottery Neolithic in western Iran we have had only the more or less stratified sequence of tombs excavated at Tepe Giyan on which to base our understanding of the developmental sequence from the 6th to the 1st millennium B.C. Even the evidence from our preliminary testing of Godin Tepe indicates how sketchy that understanding has been, since previously we had only suspected the presence of the Uruk culture in the area and had no evidence at all that the culture defined at Yanik Tepe near Tabriz, which has strong links with eastern Anatolia and the Caucasus, ever spread as far south as the central Zagros. Continued research at Godin will shed light on these new problems as well as on many of the long-standing issues that have puzzled archeologists concerned with the Bronze and Iron ages in western Iran.

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12. 10,400 ± 150 B.P. (GaK-807), determined by Prof. Kunihiko Kigoshi, Radiocarbon Laboratory, Gakushuin University, Tokyo. This is based on the Libby half-life of 5570 years; the age should be increased to about 8700 B.C. if the more precise half-life of 5730 years is used.
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14. The use of such terms as "era of incipient cultivation" and "Proto-Neolithic" points up problems in defining the term "Neolithic." At the present time, the only general agreement on this term is that food production should remain the *sine qua non* of the definition, but that features such as pottery, polished stone, and size and type of settlement and architecture are not, by themselves, good criteria for defining a Neolithic phase of development. This problem, brought into focus by the results of excavations at Jericho (Jordan) and Eynan (Israel), has been illustrated most recently by the discoveries of M. van Loon at Tell Mureybat in Syria, where it has been suggested that a large community of hunters and collectors lived in a village with solid architecture for approximately a thousand years [*Sci. Am.* **214**, No. 5, 53–54 (1966)]. We use the term "Neolithic" here as shorthand for small food-producing groups (agricultural or pastoral) in which metallurgy is absent or unimportant, while realizing that this definition also leaves much to be desired. We assume that, given its geographical location, further investigations will demonstrate that Ganj-i Dareh meets these requirements.
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22. Compare the stratigraphic situation at Dalma Tepe, where plain Neolithic ware also underlies later painted wares (*20*).
23. Trench B, strata 17 and 22. Both pins appear to be cast and are, therefore, early examples of their type.
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26. Field work described in this article was made possible by grants to Young (Godin Tepe) from the Royal Ontario Museum, University of Toronto, and the U.S. Government (Fulbright Commission); and to Smith (Ghar-i Khar and Ganj-i Dareh) from the University of Toronto, President's Fund for Special Academic Research.

NEWS AND COMMENT

Oceanography: PSAC Panel Calls for Setting Up New Agency

Unlike the space program, which is effectively in the hands of NASA and the Defense Department, the government's vast and growing oceanography program has evolved as an orchestrated anarchy of some 20 agencies that, for one reason or another, are concerned with the oceans. Their meeting ground is the Interagency Committee on Oceanography, an Executive Office body charged with planning and coordinating the overall program, which now costs $310 million a year—a 12-fold increase in less than a decade.

This blend of diversity and centralization is displeasing to Congress, which likes to know where to get information and whom to blame or influence when it comes to the conduct of federal programs. But within the Executive branch, the balkanized structure of oceanography has regularly been defended in terms of the substantive characteristics of the subject itself. Spokesmen for the Executive branch have argued that oceanography is a label for an agglomeration of variously motivated and diverse activities, ranging from the national security interests of the U.S. Navy, which supports two-thirds of the entire national program, to the State Department's $500,000-a-year contribution to eight international fisheries commissions. The fragmentation of authority, the spokesmen contend, simply reflects the fact that each participating agency has its own reasons for working in the ocean. Congress has generally accepted this reasoning and has never put much support behind proposals to consolidate oceanographic activities under one administrative authority. But, still interested in a more precisely defined authority, it passed a bill in 1962 directing the Office of Science and Technology to establish a position of Assistant Director for Oceanography. Since presidents don't like Congress

to tell them how to organize their staff functions, the bill drew a pocket veto, and from then until recently, the politics of oceanography was relatively quiet. Now there is a good deal of motion within both branches and it appears quite likely that a substantial administrative revamping of the federal oceanography effort will occur within a year or two.

The first step was accomplished last month when President Johnson signed into law a cautiously conceived new congressional approach to the issue—the creation of a temporary council and commission with directions to study the national oceanography program, propose revisions, and then go out of business (*Science*, 10 June). Thus, the door for change was opened, and last week there came through it what may well be the most influential single design for reorganizing the oceanography program: "Effective Use of the Sea,"* a 144-page report, 1 year in the works, by a panel of the President's Science Advisory Committee (PSAC). The 11-member group was under the chairmanship of Gordon J. F. MacDonald, chairman of the Institute of Geophysics and Planetary Sciences at U.C.L.A.†

In the growing literature of briefs for support of particular fields, the panel's product is noteworthy in many respects. It is intelligible; it is cautious and conservative in estimating the payoff from investment in oceanography; and finally, it is not an indiscriminate wish list of all the expensive ambitions of the oceanographic brotherhood. Inevitably, the report calls for a lot more money—to a total of $600 million by 1971, but it also raises questions about the quality of much current oceanographic work and the utility of "world-encircling expeditions." [There are those who contend that the study was, at least in part, inspired by embarrassment over an Academy report, "Economic Benefits of Oceanographic Research (*Science*, 25 December 1964) which literally promised that a bigger investment in oceanography would produce benefits ranging from cheaper pork to improved submarine detection. As one person associated with the preparation of the PSAC report put it, "The Academy report was perhaps a bit too enthusiastic."]

In the context of oceanography's political past, however, the most significant aspect of the report is its conclusion that oceanography has now matured to the point where administrative centralization should take precedence over diversity and that the emphasis of research should shift from surveys of the ocean to the solution of identified problems. Furthermore, the report insists that oceanography cannot thrive if it is confined by rigid intellectual boundaries, and therefore, that the environmental sciences—oceanographic, atmospheric, and solid earth—must be conceived of as a whole and brought into close contact with the basic scientific disciplines.

Specifically, the report calls for the establishment of a new mission-oriented agency to encompass a great portion of the non-Navy oceanographic programs that now sprawl through the Executive department. The function of the agency would be to participate in an overall national program which would have as its "ultimate objective *effective use of the sea* [original italics] by man for all the purposes to which we now put the terrestrial environment: commerce, industry, recreation, and settlement, as well as for knowledge and understanding."

The new agency, the report recommends, "would combine activities of the Environmental Science Services Administration, the Geological Survey (both its land and ocean activities), oceanographic activities of the Bureaus of Commercial Fisheries and Mines, and a portion of the Coast Guard's oceanographic activities." The objective of the agency would be to contribute to what the panel defines as the government's oceanographic objectives:

1) Acquiring the ability to predict and ultimately to control phenomena affecting the safety and economy of seagoing activities.

2) Undertaking measures required for fullest exploitation of resources represented by, in, and under the sea.

3) Employing the sea to enhance national security.

4) Pursuing scientific investigations for describing and understanding marine phenomena, processes, and resources.

Whether the new agency should be independent or part of an existing agency is something that the report leaves open. But the authors make perfectly clear that they desire to preserve some aspects of the administrative diversity that now characterizes the overall national program. First of all, the Navy, while supporting and contributing to the general advancement of oceanography, would not be included in the proposed new agency; nor would the National Science Foundation, with its general support of oceanographic research and education; the Atomic Energy Commission, which is primarily interested in waste disposal; or the Department of Health, Education, and Welfare, with its interest in water pollution. Whether the Interagency Committee on Oceanography is intended to survive the proposed reorganization is not clear. But in the panel's opinion, its functions of "information interchange and dissemination," as well as those of its counterpart in atmospheric sciences, should be assigned to a new interagency group under the Federal Council for Science and Technology.

One of the most striking characteristics of the panel's report is its effort to bring some structure and focus into the oceanography program without promoting institutional rigidity or interfering with scientific independence and spontaneity. For the promotion of marine biology, for example, the report proposes the establishment of three new laboratories—one each in the arctic, tropical, and temperate zones. But it also takes the position that the academic side of oceanography should be expanded, not by adding new laboratories, but by enlarging existing ones and making arrangements for them to accommodate visiting students and faculty from other institutions. Similarly, it argues that ships should be operated by consortiums of user groups, organized into three or four regional fleets, rather than by individual institutions; and that provisions should be made to accommodate researchers from universities without well-developed programs and facilities. While insisting that oceanography has advanced to the point where research should be shifted from "surveys to solutions," and that the utilization of the oceans is the rationale for federal investment, the report also makes a strong plea for broadening the fundamental base. "Oceanographic education has been narrowly conceived," it states, "and does not adequately recognize the importance of fundamental sciences in the program's long-range development. The intellec-

* For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Price, 60 cents.

† The other members were Douglas L. Brooks, Travelers Research Center; Robert Charpie, Union Carbide; Robert Fleagle, University of Washington; Finn J. Larson, Honeywell; William D. McElroy, Johns Hopkins; John Meyer, Harvard; Walter H. Munk, University of California, La Jolla; Jack P. Ruina, Institute for Defense Analyses; Henry Stommel, Woods Hole Oceanographic Institution; and Gerald B. Whitham, Caltech.

tual isolation of many oceanographic institutions needs to be corrected. Attempts should be made to associate oceanographic institutions with groups of universities to permit easy access by scientists throughout the country for work in ocean activities."

Other interesting qualities of the report are its conservatism, candor, and political sophistication. The general style of a disciplinary brief is to go for broke, to list all possibilities and predict national misfortune if they are not pursued. But the panel says that no more ocean survey ships are needed, that current technology does not warrant serious consideration of "deep-ocean airplanes" in the next decade, and that there is no need for accelerating research on deep-sea mining of minerals. It points out, "The mining and petroleum industries have shown a considerable willingness to invest in the development of ocean or any other resources wherever commercial prospects appear reasonably good. . . . Thus development of ocean raw materials is now subject to a market test that seems to be yielding reasonably sensible answers."

The panel stresses the military value of oceanography, and provides an interesting insight into a rarely discussed dimension of the arms race: concern over the possibility that the Soviets might develop techniques for continuous tracking of Polaris submarines. But on nonmilitary matters, it does not try to scare up support by warning what the Russians are doing, which is something of a landmark in scientific salesmanship. Whereas the Academy's Committee on Oceanography predicted great gains for U.S. fisheries from oceanographic research, the PSAC panel notes that "present performance suggests that foreign fleets would be quicker than U.S. industry to adopt new techniques." A rationale might be found, it adds, in the U.S. policy of seeking to improve the nutrition of the underdeveloped countries. But, in that case, it points out, the justification should be sought in foreign policy considerations and not in a direct economic return that is not likely to materialize.

Where the report does look for political support is in terms of the goals of the Great Society and the relative utility of oceanography versus space research. Noting "the ready and widespread Congressional acceptance of Great Society programs" aimed at eliminating environmental pollution, it says that oceanographic research and programs dovetail with this goal and can therefore be expected to attract support. The report states that "in any competition for funds with the space program, the case for oceanography would be very good." But it adds, "In making this statement we recognize many intangibles which are often used to justify programs."

MacDonald, chairman of the PSAC panel that produced the report, is a member of a new generation that is coming into the upper councils of science and government. At age 37, he is one of the few persons in these echelons who is not an alumnus of the World War II research effort. He has been a member of the Academy and of PSAC for several years, and in September will start a 2-year leave from U.C.L.A. to serve as vice president of the Institute of Defense Analysis, a Washington-based think-factory that serves the Defense Department. With his broad scientific background—he is widely considered to be one of the most versatile and creative geophysicists—and seasoning in the complex mix of military technology and strategy, politics, and science policy, MacDonald is extremely well regarded by the elders of science and government.—D. S. GREENBERG

Bell Labs: A Systems Approach to Innovation Is the Main Thing

In a country setting about 30 miles south of New York City and off the Garden State Parkway you encounter the rectilinear bulk of the Bell Telephone Laboratories new Holmdel building, its one-way glass reflecting the landscape and sky of the Jersey littoral. The big building, now in the final stages of completion, is one of the posthumous works of the late Eero Saarinen, the pacesetter and chief prizewinner in monumental modern architecture in recent years. In the Holmdel building Saarinen seems to have been striving to create an outsize symbol of the organization which pioneered the integration of research, development, and manufacturing into a continuous process and which may still manage it best.

The Holmdel building, built at a cost put officially at $34,000,000, is really four buildings enclosed in a big glass box. Perimeter corridors on each floor of the four units are designed to carry traffic away from labs and offices on cross hallways. Inside corridors open on a huge, cruciform lobby and reception area, which, rising to the roof, reminds one of nothing so much as of the nave and transepts of a cathedral.

By ingenious design of office and lab areas Saarinen provided both flexibility in respect to space and islands of quiet. For some occupants the question now is when does privacy become isolation. Since the front half of the building was put into use in 1962, but the back half is only now being completed, the verdict on the building will not be in for some time. It is evident, however, that Holmdel represents an interesting experiment in the effect of novel facilities on research atmosphere.

Ultimately, some 4500 people will work at Holmdel, primarily on development and systems engineering problems. This roughly equals the present number at Bell Labs Murray Hill site, an hour's drive northwest. Murray Hill is where fundamental research for Bell Labs is centered, where administrative headquarters are located, and where general services will be transferred now that the old West Street Building in New York City, where the labs began, is being "phased out." A third major Bell Labs facility in North Jersey is at Whippany where military work for the government, principally on the Nike antimissile project, is running at the rate of more than $170 million a year. Another major laboratory site at In-