tute of Technology, who made two initial melts of Du glass.) Denver fire clay or alumina crucibles were used. SiO_2 was added as Pennsylvania Glass Sand, Na_2O as the carbonate, and Al_2O_3 as the hydroxide (both as Mallinckrodt analytical reagents). Two compositions (NAS_{10-10}, NAS_{11-18}) were made to our specifications by E. B. Shand of the Corning Glass Works. Glasses were analyzed for major constituents and trace impurities by the U.S. Testing Company. The final composition differs from that of the initial mixture in a complex manner but always has a significantly lower Na_2O and Al_2O_3 content. The losses generally take place along paths pointing toward the SiO_2 corner of the ternary diagram and are roughly proportional to the initial Na_2O or Al_2O_3 content. Data in terms of initial composition also yield systematic plots, a useful finding for surveying glasses. Haber-type bulb electrodes (3 to 10 mm in diameter) were made from small pieces of tubing blown in a gas-oxygen flame. A few small membrane electrodes (less than 300 μ in diameter) on lead glass stems were prepared by modifying the method of MacInnes and Dole. It should also be possible to prepare microelectrodes in the form of fine capillaries of sodium-sensitive glass sealed by fusing at the tip. Electrodes were filled with 0.1*M* NaCl and stored in the same solution at least 24 hours prior to study, although 0.1*M* HCl was also used without difference in results. A chlorided silver wire formed the internal electrode. Immediately prior to study, the stem of the electrode was rinsed with distilled water, dried and insulated by dipping in paraffin. The insulation proved satisfactory for several hours and could be renewed when necessary. The bulk of the measurements were made in solutions less concentrated than 0.1*M* with a Beckman model G *p*H meter and a Beckman KCl calomel fiber reference cell. Solutions were prepared directly from Baker analyzed reagents and analyzed spectrographically for impurities, which were found to be unimportant. Experiments were designed so that liquid junction potentials contributed no important error. (In Figs. 1 and 2, the liquid junction was held constant by keeping the concentration of the macrocomponent of the mixture unchanged; in Fig. 3, only the glass electrode was varied.) Single-ion activity coefficients for Na^+ and K^+ equal to the mean activity coefficients were assumed. The resistance of representative bulb electrodes lay between 10^8 and 10^{10} ohms. Most glasses respond rapidly to Na^+ change, coming to a stable value while being washed. No attempt has been made to measure the high-frequency noise (above 100 cy/sec) or to measure the response time to a rapid step in Na^+ concentration.

4. M. Dole and B. Z. Wiener, *Trans. Electrochem. Soc.* 72, 107 (1937).
5. M. Dole, *The Glass Electrode* (Wiley, New York, 1941).
6. P. Gross and O. Halpern, *J. Chem. Phys.* 2, 136 (1934); D. O. Jordan, *Trans. Faraday Soc.* 34, 1305 (1938); H. J. C. Tendeloo and A. J. Zwart Voorspuij, *Rec. trav. chim.* 62, 793 (1943).
7. The value of k_{BC} for a particular ionic mixture B^+, C^+ can be evaluated from the k_{AB} and k_{AC} values for the ion mixtures A^+, B^+ and A^+, C^+ by the relationship $k_{BC} = k_{AC}/k_{AB}$, which has been found to be valid experimentally.
8. B. P. Nicolsky, *Acta Physicochim. U.R.S.S.* 7, 597 (1937).
9. M. Dole, personal communication.
10. G. Kornfeld and V. Rothmund, *Z. anorg. u. allgem. Chem.* 103, 129 (1918).
11. The extreme abruptness of development of alkali cation sensitivity relative to H^+ with small additions of Al_2O_3 is likely to be of practical significance in minimizing the cation error of *p*H glass electrodes since this finding suggests that even minute traces of alumina are to be avoided in preparing such glass melts.
12. For Ca^{++} and Mg^{++}, these numbers are to be taken as indicative of order of magnitude only since equations for electrode potential in mixtures of ions of unequal valence have not yet been verified.
13. J. H. Northrop and M. Kunitz, *J. Gen. Physiol.* 7, 25 (1924).
14. G. Scatchard, I. H. Scheinberg, S. H. Armstrong, Jr., *J. Am. Chem. Soc.* 72, 535 (1950).
15. D. O. Rudin, J. U. Casby, G. Eisenman, unpublished data.

News of Science

Archeological Discoveries in Iraq

The Smithsonian Institution sponsored an archeological expedition to Shanidar Valley in the Zagros Mountains of northern Iraq during the season 1956–57 that has resulted in several important discoveries, chief of which are the finding of two adult human skeletons of premodern type in Shanidar Cave and the discovery of an early Neolithic village site nearby. Ralph S. Solecki of the Smithsonian led the expedition, his third to the area.

The discovery of the two skeletons, as well as an earlier find, that of a child's skeleton in 1953, places Shanidar Cave among the more important Early Man sites in the Old World. In western Asia it is second only to the Mount Carmel site in Palestine in upper Pleistocene skeletal remains.

Both of the adult skeletons were recovered from the top of the Mousterian layer, the bottommost of four stratigraphic layers at Shanidar Cave. One of the skeletons was found at a depth of 14.5 feet below the surface, and the other at about 23 feet. In both, the bones were in an unfossilized or natural state.

The Mousterian layer is recognized as belonging to the Middle Paleolithic period associated with Neanderthal man. The skeletal remains appear to be of Neanderthal type on preliminary observation, and their position in the upper part of the Mousterian layer, above which was found a layer containing Upper Paleolithic artifacts very similar in type to its Aurignacian counterpart in western Europe, indicates a very late type of Neanderthal man. The bottom of the Upper Paleolithic layer has been dated by the carbon-14 test to be about 34,000 years old.

The shallower of the two skeletons, by virtue of its stratigraphic depth, is possibly about 45,000 years old. Although the bones in this skeleton were broken, the skeleton is fairly complete. It measures about 5 feet 3 inches long. The skull appears to represent a "conservative" Neanderthaloid, unlike the "progressives" of Mount Carmel, which show mixed features resembling both *Homo sapiens* as well as Neanderthals. In fact, the skull of Shanidar man more closely resembles that of the Neanderthal man of the La Chapelle-aux-Saints (France) find, which is a classic or conservative type. There is one very apparent exception to the resemblance. The brow ridge in the Shanidar specimen, instead of being carried across above the eyes in a continuous bulge, or "torus," is broken between the eyes. The teeth, which show rather heavy wear, are in very good condition.

The second skeleton is not so well preserved as the first. The skull has a heavy brow ridge above the eyes, and the teeth are worn quite flat. A conservative estimate for the age of the skeleton might be 60,000 years.

Artifacts of chipped stone were found in the same strata as the skeletons, associated with remains of fire hearths, showing that the cave had been a habitation site. These artifacts are Mousterian in type.

The nearest locus of ancient skeletal or paleoanthropological finds in significant numbers is Mount Carmel, where Neanderthal skeletons of both conservative and more humanly advanced or progressive types have been recovered. One of the more interesting problems associated with the discovery of the Shanidar skeletons is that it appears that the Neanderthal progressives of Mount Carmel were earlier in time than the Shanidar remains. It would seem that Neanderthal man of a very backward or conservative type existed in the mountains of Kurdistan, while only 600 miles away in Palestine a type of man with some *Homo sapiens* characteristics lived and died some thousands of years before.

The recent excavations bring the total of skeletal finds at Shanidar Cave to six, including three skeletons of Mousterian man or Neanderthaloids, two Neolithic burials, and one Islamic age skeleton.

There is promise of additional finds, since only a portion of the cave deposits has been examined.

The early Neolithic village site investigated by the expedition fits in the stratigraphic record of the long sequence in Shanidar Cave. The stone foundation remains that were uncovered indicate some kind of rude architecture. The site is one of the oldest thus far known in Mesopotamia, predating the village site of Jarmo, excavated in southern Kurdistan by the University of Chicago expeditions several years ago. It appears to equate with Karim Shahir, one of the early village sites identified in Iraq.

The Iraq expedition was supported by grants from the Smithsonian Institution, the American Philosophical Society, the National Science Foundation, the Wenner-Gren Foundation for Anthropological Research, and the William Bayard Cutting Traveling Fellowship of Columbia University. Two oil companies in the Near East, the Iraq Petroleum Company and the Arabian American Oil Company, cooperated in the expedition's work. As in the past two seasons, the Iraq Directorate of Antiquities gave its cooperation.

Deep-Sea Organisms

Live specimens of a sand flea and a sea worm were recently brought up from ocean depths of 13,200 and 16,200 feet, respectively, by a research group aboard the *Vema*, a vessel operated by Columbia University's Lamont Geological Observatory. Robert Menzies, director of biology and research associate in geology at Lamont, was chief scientist of the expedition.

Usually organisms brought to the surface from great depths are dead. The sand flea, really a shellfish that resembles a ⅛-inch lobster, survived a temperature change of from 34°F to 61°F without any apparent ill-effects. It was taken in the Congo Submarine Canyon off the coast of West Africa at latitude 5°S., longitude 8°E. The worm was taken in the Cape Basin off South Africa at latitude 28°S., longitude 8°E., and underwent the same temperature changes as the sand flea.

AEC Program to Aid Nuclear Technology in the Life Sciences

The Atomic Energy Commission has established another program to stimulate education and training in the application of nuclear technology to the life sciences. The commission has announced that it will make grants for the acquisition of specialized radiation equipment and teaching aids by accredited schools of agriculture, veterinary medicine, medicine and pharmacy, and public health, and by departments of biophysics and biology in colleges and universities.

Assistance will be provided for the purchase of radioisotopes and specialized equipment—including radiation detection, monitoring, and counting instruments—equipment for laboratory instruction in the analytical chemistry of radioactive materials of direct application in the life sciences, and equipment for laboratory instruction in health physics. Grants may not exceed $250,000 for any single institution. Further information about the new program may be obtained from the Director, Division of Biology and Medicine, U.S. Atomic Energy Commission, Washington 25, D.C.

Report on Research

The implications of basic research for the Nation's economy and defense are still not properly appreciated in this country, according to a report on *Basic Research–A National Resource* by Alan T. Waterman, director of the National Science Foundation. Waterman compares the financial support given applied research and development with that afforded basic research; he finds economic incentives sufficient to insure the future of the former, but not of the latter. He also emphasizes that basic research needs increased support from private industry, state government, foundations, and the general public; however, when other sources are not available, the Federal Government must assume responsibility for support. The report, which is written in nontechnical language, is on sale for 45 cents a copy at the Government Printing Office, Washington 25, D.C.

Rheumatic Fever Institute Merges with Worcester Foundation

The Rheumatic Fever Research Institute, Chicago, Ill., merged with the Worcester Foundation for Experimental Biology, Shrewsbury, Mass., on 1 October. The institute has turned over its personnel, research projects, assets, grants, and name to the Worcester Foundation and will move to Massachusetts in the fall of 1958, when a new laboratory is expected to be completed. Scientists making the changeover will include Eugene L. Hess, known for his studies of proteins of the lymphatic system, and Yutaka Kobayashi, an entomologist.

The Chicago Institute was incorporated in 1947 under the directorship of A. F. Coburn as an independent, nonprofit medical research institute affiliated with the Northwestern University Medical School. It employed about 25 people, including those working on basic research and physicians studying clinical aspects of rheumatic fever. Under the merger the clinical work has been discontinued, and basic biochemical studies have been emphasized.

Until the new laboratory is completed, adding approximately 25,000 square feet to the Worcester Foundation, a branch of the foundation will be maintained on the top floor of the Municipal Contagious Disease Hospital in Chicago.

NSF Fellowships

The National Science Foundation has announced that applications are now being accepted in four of its fellowship programs for advanced study and research in the natural sciences: a predoctoral fellowship program for which college seniors and graduate science students may apply; a postdoctoral fellowship program; a senior postdoctoral fellowship program for candidates who have held the science doctorate for a minimum of 5 years; and a science faculty fellowship program for college teachers of science who wish to improve their competence as teachers.

Approximately 1000 awards will be made to American citizens in March 1958. Under the broadened program, fellowships will be awarded in the mathematical, physical, medical, biological, engineering, and other sciences, including anthropology, psychology (other than clinical), geography, certain interdisciplinary fields, and areas of convergence between the natural and social sciences.

Stipends vary with the academic status of the fellow. First-year fellows, students entering graduate school for the first time or those who have had less than 1 year of graduate study, will receive annual stipends of $1600. Fellows who need one final academic year of training for the doctor's degree will receive annual stipends of $2000. Fellows between these groups will receive stipends at the rate of $1800 annually. The stipends for regular postdoctoral fellows will be $3800 per year. Dependency allowances will be made to all married fellows. Tuition and laboratory fees and limited travel allowances will also be provided.

Senior postdoctoral fellows and science faculty fellows are awarded stipends adjusted to match as closely as feasible the regular salaries of the award recipients up to a maximum of $10,000 per year. A travel allowance is also usually made available.

National Science Foundation fellows may attend any accredited nonprofit institution of higher education in the United States or a similar institution abroad. Applications for the 1958–59 National Science Foundation graduate and regular postdoctoral fellowship pro-