have shown little or no awareness of these facts.

Frost (Henry Ford Hospital, Detroit) described his quantitative ("morphometric") studies of the internal and external growth and regression of bone under various conditions, emphasizing measurement of the products of cellular activity rather than the osteoblastic and osteoclastic cells themselves; conditions studied included thyrotoxicosis, hyperparathyroidism, Cushing's syndrome, hypophosphatasia, and many others. Frost also tried to elucidate the biochemical relations between physical loads and the internal remodeling of cortical bone.

The papers of Moseley and Frost were discussed by Blumberg (Armed Forces Institute of Pathology) and Simon (Mt. Sinai Hospital), who showed slides illustrating the preservation of bone structure in prehistoric humans and animals under normal and pathological conditions. Simon showed roentgen films of a prehistoric human skeleton from the collection of the Museum of Northern Arizona, in which there were sclerotic lesions in the pelvis that were roentgenographically indistinguishable from lesions in a person now under treatment for Hodgkin's disease.

In closing, the chairman announced that the establishment of a central Registry of Human Paleopathology is now being planned at a major eastern university. The symposium attendance was 91; the proceedings will be published in the *Journal of the History of Medicine*.

SAUL JARCHO
Mount Sinai Hospital, New York

Sensory Research Discussion: "Sonar" and Electronic Reading for the Blind

Problems encountered by the blind since the beginning of time have included difficulty in navigation and inability to read. To a degree these have been overcome by dog guides, the "long cane," braille, and Talking Book. That sophisticated electronic aids may be on the way is indicated by the proceedings of Sensory Research Discussion No. 53 (Massachusetts Institute of Technology, Cambridge, 10 November 1964), where progress in British research on sensory aids for the blind was reported. American and other efforts were reviewed in prior discussions.

John Hancock Davis continues his work at Bradford Institute of Technology to develop a recognition reading machine for the blind which will react audibly to the optical scanning of ordinary ink-print on paper; he hopes to accommodate several type fonts with his machine.

Patrick W. Nye (National Physical Laboratory) is working on a reading process for the blind wherein lines of ordinary print are scanned optically and certain features of the writing are extracted. The processor detects the presence of ascenders, descenders, "x"-height verticals, horizontal line segments, and diagonally inclined segments. These feature-analysis data are used to control a "resonance vocoder" or "parametric artificial talker" (PAT) which emits an audible output that can be learned.

Don Liddle (University of London) is trying to determine human capability in ferreting out an audible, comprehensible signal buried in noise and the speed with which this can be done. The temporal factor in discriminating a signal in noise is relevant to the mobility of blind travelers because more prompt corrective action after sensing faint sounds, echoes, or sound shadows of dangerous objects increases safety.

In regard to the ultrasonic aid for the blind developed by Leslie Kay (Lanchester College of Technology) and being produced by Ultra Electronics, Ltd., J. K. Dupress (M.I.T.) indicated that six metal prototypes are complete. These hand-held, torch-like devices are about 20 cm long and weigh 340 g. Probing the environment with swept-frequency ultrasonic pulses, these "torches" receive energy returned by reflecting objects and produce a signal which communicates information regarding such objects to the blind user. Kay hopes to develop a miniaturized binaural version of his unit.

J. Alfred Leonard (Applied Psychology Research Unit, Cambridge) is compiling data on the abilities of blind persons to steer straight courses. He is also studying ability to balance on a narrow rail, comparing performance by sighted and blind individuals. Leonard hopes to develop an understanding of the contribution of various degrees of partial vision to performance of such tasks and to capability in mobility. He is also working with auditory means for indicating the course for blind students running on an athletic track. A social survey of the mobility of blind persons in England is also a current project which Leonard hopes will lead to a good base for a long-range research program on mobility of the blind.

HOWARD FREIBERGER
Veterans Administration,
252 Seventh Avenue,
New York, New York

Education in Chemistry: United States and Japan

A United States–Japan conference on chemistry education took place in Oiso, Japan, 16–20 November 1964; the meeting was financed in part by the NSF and the Japan Society for the Promotion of Science. Six Americans and 11 Japanese attended.

The teaching of chemistry at the college undergraduate level was discussed. College chemistry curricula in the two countries were surveyed, with reference to the nature of high school chemistry courses. In Japan, high school chemistry is uniformly controlled by the Ministry of Education, but college curricula vary according to various circumstances; such conditions contrast markedly with those in the United States.

The meeting went on to discuss introductory college chemistry courses; common problems such as teaching techniques in handling large numbers of students and methods of instruction in the laboratory were dealt with. Discussion of the introduction of physical principles such as thermodynamics and quantum mechanics into introductory chemistry courses was especially stimulating; there was common agreement that better ways of uniting the two principles of energy and structure should be sought. Advanced courses in analytical, organic, and physical chemistry were described; suggestions for their rearrangement were made by both Americans and Japanese.

Lastly, the problem of teaching chemistry to nonscience students was dealt with. Reports on experiments were made by both teams; there was universal agreement that such courses should be limited in breadth and greater in depth and perception, rather than the reverse. Various specific recommendations were made to agencies of both governments.

The American delegation consisted

of Gordon M. Barrow (Case), Robert C. Brasted (Minnesota), David N. Hume (M.I.T.), L. Carrol King (Northwestern), Leonard K. Nash (Harvard), and Charles C. Price (Pennsylvania), and the Japanese were Shizuo Fujiwara, Taro Hayashi, Teruichiro Kubo, Tamon Matsuura, Hiroshi Minato, Takashi Mukaibo, Ryohei Oda, Hisateru Okuno, Kengo Shiomi, Matsuji Takebayashi, and Bun-ichi Tamamushi; they represented various fields of chemistry as well as various kinds of institutions.

B. TAMAMUSHI
Tokyo Woman's Christian College, Tokyo, Japan

Medicine in the Year 2000

By the end of this century academic and nonacademic medicine will be confronted with a variety of problems related not only to medical care, research, and education, but also to sociology, urban planning, data processing, and architecture. Under the sponsorship of the University of Pennsylvania and the Merck, Sharp and Dohme Post-Graduate Program, the sixth annual conference on graduate medical education (Philadelphia, 3–4 December 1964) was devoted to speculation on the nature and solution of some of these problems.

To demonstrate that the 36 years between now and the beginning of the next century is sufficient time for tremendous changes to occur, Henry Tumen (University of Pennsylvania) reviewed the remarkable changes in the patterns of diseases which have occurred since 1928. However, he emphasized that diagnosis, treatment, and prevention must still depend upon the skill of the individual physician dealing with the individual patient, and he predicted that the need for complete knowledge of the individual patient will never be eliminated. His suggestion that the knowledge, effort, and interests of physicians must be related to the health of the community and, indeed, to human society as a whole was reinforced by Irving London (Albert Einstein Medical College, Yeshiva University), who eloquently predicted that clinical investigators in the year 2000 would have to know not only about the natural sciences but also about the social sciences, for physicians must be made to realize that Hygieia's concept of the fostering of health should be considered at least as important as Aesculapius's concept of the therapy of illness.

Otto Schmitt (University of Minnesota) predicted that by the year 2000 the development and use of conventional digital processing techniques will have reached a plateau and that expansion in data processing will be in the realm of development and production of computers, which will substitute the more natural "gray thinking processes" for the present artificial "black-white processes." Schmitt predicted that infallibility may be sacrificed for the sake of more memory and more hybrid and parallel logic. He also predicted that different data-processing equipment for pattern recognition and pattern discovery will be developed.

The status of the various classes of diseases in the year 2000 was the subject of much speculation. Seymour Kety (NIH) predicted that the number of mentally disturbed individuals and the public costs of their care will not be reduced but that there will be a shift from institutional care to individual care near the patient's home. By 2000, Kety predicted, the prevention of senile dementias resulting from arteriosclerosis and diminished blood flow may be a reality; many of the basic problems in mental retardation will still be unanswered; and, of major mental disorders, the depressive illnesses will be most nearly understood. In the discussion following Kety's talk, it was brought out that by 2000 there may be many more lay psychotherapists, who will carry out therapeutic procedures under the direction of medically trained psychiatrists.

In surveying the field of neoplastic diseases from Alley Oop's famous time capsule, Joseph Burchenal (Sloan-Kettering Cancer Institute) found that

> In the year 2000 cancer is no longer the serious problem it was in 1964 as attested to by the fact that many of the larger research institutes, which were devoted to the solution of the cancer problem, have in the past decade, 1990–2000, turned their interests to problems in degenerative diseases and mental illness. The progress since 1964 has been made in several areas: prevention; detection with the development by 1975 of a serum test to discover the preclinical stages of cancer and reagents which differentially stain cancer cells; surgery and radiation therapy; the development of chemotherapeutic agents, that attack specific types of cancer, which even in 1964 was recognized to be biochemically heterogeneous; and the greater knowledge of host defense mechanisms.