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.

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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.

Robert Austrian (University of Pennsylvania) discussed the status of the infectious diseases in 2000, and Nathan Shock (NIH) pointed out that the problems of degenerative diseases are not identical to those of aging. Shock, Tumen, and Vincent Whitney (University of Pennsylvania) all pointed out that the number of persons over 65 will have jumped from the present 16.5 million to over 20 million by the turn of the century. Shock, however, did not suggest that there should be a new medical specialty of geriatrics but rather concluded that all physicians should be trained to care for the needs of the elderly and that the elderly patient should be considered both a diagnostic and therapeutic challenge. Like Kety, Shock believed that the great breakthrough will be in the advance in our knowledge of arteriosclerosis, which will allow, if not prevention, at least a slowing of the process. Shock, William Mellman (University of Pennsylvania), Irving London, and Robert Davies (University of Pennsylvania), spoke of ethical problems, which will become more acute as the use of artificial organs, transplants, and genetic knowledge becomes more widespread.

George Koelle (University of Pennsylvania) pointed out that the present environmental chemical hazards could be classified into air pollution from radioactive fallout, from nonradioactive fallout, and from metals and other contaminants; water and soil contamination by insecticides and herbicides; and drugs, cosmetics, and food additives. The major portion of his talk was concerned with the effects of insecticides and herbicides. Koelle suggested that by the year 2000, we may know the effects of chronic small doses of the insecticides and herbicides upon man and their relation to cirrhosis, sterility, teratogenesis, and neoplastic diseases. He believed that the writings of Rachel Carson, despite the criticisms which have been heaped upon them, should not go unheeded and that there should be adequate legislative controls against indiscriminate mass spraying, together with the development of truly selective, safe poisons and biological controls. After reviewing human genetic disorders, Mellman pointed out that we will surely know more about the genes responsible for human variation in the year 2000 and that this knowledge should permit us to further manipulate the process of natural selection, making it essential that the physician consider the ethical problems, not only of who shall live and who shall die, but also of who shall be born. The problems confronting man in his journeys into space and under the water were reviewed by George Ruff (University of Pennsylvania) and Hermann Rahn (State University of New York, Buffalo), respectively.

The discussion following talks about the training of the physician and the nature of clinical investigation in the year 2000 by Dewitt Stetten, Jr. (Rutgers), and Irving London was lively. Stetten predicted that there would be a greater number of women in medicine. London believed that the family physician would come from the ranks of the general internist and pediatrician and that the number of internships may decrease as only those internships dedicated to training will be retained. Both Stetten and London predicted that in the year 2000 there will be closer association between medical schools and universities. Robert Mitchell (University of Pennsylvania) concurred with Whitney's population profile for the year 2000, which indicated that our ways of living would change with respect to hours of work and leisure and distribution of income among the population. As a result he predicted that one or more completely new transportation systems will overlay those systems which seem so modern today, and in discussing the logistics of getting patients and physicians together, he pointed out that a transportation system must have individual flexibility, appropriate speed, and adequate safeguards against accidents. Some of the systems which are technically possible even now are freeways with vehicles electronically controlled with regard to destination and spacing; trains which operate a fraction of an inch above steel rails on air pads, capable of making the 90-mile (144-km) run between New York and Philadelphia in 38 minutes; vertical and short take-off and landing aircraft; hydrofoil and air cushion transit over water; the separation of kinds of traffic, vehicular from pedestrian and passenger vehicles from goods vehicles; moving sidewalks and Carveyors, where small automated cars move on a grade-separated system at an average of 15 miles per hour and passengers can enter or leave the transit cars by stepping from a parallel slow-speed belt at stations.

In discussing hospital building in the year 2000, Louis Kahn (University of

Pennsylvania) expressed the opinion that a hospital should be recognizably different from all other types of structures and illustrated some of his ideas by pointing out characteristics of buildings being constructed at the Salk Institute at San Diego, California, and in Karachi, Pakistan.

In pointing out that one must "distinguish the inevitable from the circumstantial," Kahn could well have been speaking of what must be done in the field of medical care, as Osler Peterson (Harvard) pointed out the alternative courses which this country may follow with regard to who will be treating the patients and who will be paying the bills for medical care and medical education in the year 2000.

In summarizing what he believes will be the relation of biology, medicine, and society in the year 2000, Robert Davies described several genetic and eugenic experiments which are now being carried out in subhuman species. Two examples of such experiments are those dealing with the viability of bull sperm, which has been kept in the frozen state for years, and the rapid establishment of good stock in remote regions. The latter experiments involved air transportation of rabbits, into which fertilized ova of a highly desirable strain of sheep had been transplanted. On arrival, the fertilized sheep ova were then transplanted into sheep of a less desirable strain, thereby establishing, in a short time, a flock of sheep with highly desirable characteristics.

The consensus was that the conference served the purpose for which it was organized, that is, to focus attention upon and discuss the problems in medicine which might be present at the beginning of the 21st century because of the thoughts and actions in 1964 of physicians and those responsible for the training of physicians.

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Forthcoming Events

March

9–10. **Arms Control**, first West Coast conf., Los Angeles, Calif. (R. D. DeLauer, TRW Space Technology Laboratories, Redondo Beach, Calif.)

9–11. **Wildlife Management** Inst., Las Vegas, Nev. (C. R. Gutermuth, 709 Wire Bldg., Washington, D.C.)