Meetings

Research and Training in Biomaterials

Research and training in the important and rapidly developing field of biomaterials was the subject of a conference help in Chicago on 5 and 6 April 1968. The complexity and sophistication of the supramolecular and histological structure of biological tissues poses not only a problem to scientists studying biomaterials, but also poses a challenge to biomaterials engineers working to synthesize new materials for use in medicine. These artificial materials should be considered in the context of a closer analysis of the biological tissues.

The important roles of membranes in biological systems was discussed by E. Leonard (Columbia University). These membranes act as anticonvectants, antishear structures, and diffusion controls. The requirement for biologically compatible material for synthesis of artificial membrane systems is difficult to satisfy because of the high surface to volume structures into which the membranes are formed. J. Bougas (Boston University) reviewed the history of metal implants for heart valves; he discussed developments in the use of titanium and other commercial alloys for surgical materials and mentioned new composite structures fabricated of metals and polymers together. F. Leonard (Walter Reed Army Medical Center) described studies on homologous alpha-cyanoacrylate monomers which polymerize on site to form wound coverings. E. Greener (Northwestern University) discussed the large-scale requirements for biomaterials in the dental health industry. For example, there are now about 100,000 dentists using about 300 to 400 million dollars worth of dental materials and disposables annually. Dental decay occurs in about 97 percent of the American population, and there are about 700 million untreated caries lesions (cavities)—that is, an average of about four per person.

G. Bugliarello (Carnegie-Mellon University) discussed the complexity of blood as a fluid biomaterial having many phases. Mechanical factors lead to advanced rheological definitions which are further complicated by boundary layer phenomena. E. Salkovitz (University of Pittsburgh) discussed the properties of bone as a biological material and indicated that its complexity is seen when the many hierarchical levels of histological structure are studied. For example, the basic properties of osteons (microscopic elements in bone) reveal the importance of nonhomogenous and nonisotropic factors that must be considered in any analysis of mechanical properties of bone. K. Keller (University of Minnesota) discussed mass transport phenomena in the circulatory system. He stressed the importance of scaling considerations, such as the "Peclet Number" which relates convective to diffusional velocities. A. Rubin (Cornell University) discussed the structure of collagen in relation to its uses in tubular membranes for artificial kidneys and transparent membranes for artificial corneas.

J. Dickson (NIGMS) defined the interests of the NIH bioengineering and biomaterials divisions. This included basic research in physical biology, engineering development of applications for medical care, and social engineering involved in the delivery of health services for the population of this country.

Centers for biomaterials research should be established in crucial areas, for example, near industry. Standards need to be established; a scientific group must be able to provide scientific grounds for the authorization and control of new materials for medical uses. These centers might also be subsidized for small-scale production of important new biomaterials, not yet commercially feasible on an industrial scale. Training programs for developing adequate manpower resources, especially crucial at the doctoral level, are needed. The fact that ten times more biomaterial scientists (250) are needed than can be produced (30) within the next 5 years indicates the priority that should be assigned to these programs. Cooperation between government, industry, and universities is essential for the success of biomaterials research and training.

The conference was supported by the National Institute of General Medical Sciences, the University of Illinois, the Presbyterian–St. Luke's Hospital, and the Whittaker Corporation. A summary of the conference proceedings is scheduled for publication by Plenum Press, with the title "Biomaterials."

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Calendar of Events

National Meetings

February

2–7. American Soc. for **Testing and Materials**, Denver, Colo. (T. A. Marshall, Jr., The Society, 1916 Race St., Philadelphia, Pa. 19103)

3–5. American College of **Surgeons**, Omaha, Neb. (Communications Div., 55 E. Erie St., Chicago, Ill. 60611)

3–6. American **Physical** Soc., New York, N.Y. (D. W. Havens, Columbia Univ., New York 10027)

3–6. American Assoc. of **Physics Teachers**, New York, N.Y. (M. W. Zemansky, The Association, 335 E. 45 St., New York 10017)

5–6. **Sanitary Engineering** Conf., 11th, Urbana, Ill. (J. H. Austin, 3230 Civil Engineering Bldg., Univ. of Illinois, Urbana 61801)

5–7. American Acad. of **Occupational Medicine**, Boston, Mass. (B. D. Dinman, Inst. of Industrial Medicine, Univ. of Michigan Medical Center, W 5634, Ann Arbor 48104)

5–8. American **Educational Research** Assoc., Los Angeles, Calif. (R. A. Dershimer, The Association, 1126 16th St., NW, Washington, D.C. 20036)

10–11. **Industrial Electronics and Control Instrumentation**, Washington, D.C. (H. P. Kalmus, Harry Diamond Labs., Dept. of Army, Washington, D.C. 20438, or E. Mittelmann, 549 W. Washington Blvd., Chicago, Ill. 60606)

10–11. **Transducer** Symp., Washington, D.C. (E. Mittelmann, 549 W. Washington Blvd., Chicago, Ill. 60606)

10–13. **Weed Science** Soc. of America, Las Vegas, Nev. (F. A. Holmes, E. I. du Pont de Nemours & Co., 701 Welch Rd., Palo Alto, Calif. 94304)

11–13. **Aerospace and Electronics Systems**, Los Angeles, Calif. (R. W. Gregory, Northrop Nortronics, Palos Verdes Peninsula, Calif.)

12–14. **Chemical Marketing Research**