ability of constructive interaction between knowledge systems and value systems so the "is" and the "ought" can come together in a mutual dialogue and critical examination. In one of the papers on augmenting psychiatric services, J. A. Starkweather reported on using a computer typewriter terminal for screening interviews in which the computer program simulated a psychiatric social worker in the intake interview.

On the third level of interdisciplinary communication, J. G. Miller presented information input-output curves for cells, organs, organisms, groups, and organizations which showed an analogous form for each level of organization. The papers from Ohio State established a logical base for use of concepts from set theory, information theory, graph theory, and general systems theory in educational research. Members of the mathematics panel cautioned against confusing increasing numbers of applications of general systems theory with advances in fundamental theory.

An interesting example of the fourth level or multidisciplinary stage was S. C. Dood's hypothesis on a probabilistic-interacting mathematical generating function, which when given certain assumptions, predicts the size of the minimum elements in the following families of systems: entropic, gravitational, energetic, material, living, human, social, and systematizing systems. It may take a number of years to develop acceptable tests of such a hypothesis.

In several discussions it was pointed out that the concept of negative feedback or the detector-selector-effector loop inherent in general systems has now made the study of goal-directed behavior acceptable to "hard" scientists. In a summarizing session, L. von Bertalanffy pointed out that general systems theory is potentially a new natural philosophy in that it looks at the universe as an organization, instead of a world of chaos.

FREDERICK B. WOOD
General Chairman

Engineering (M)
Systems Engineering in Agriculture

This symposium, held on 29 December 1965, was part of the Section M program.

Agriculture has become a complex undertaking where man, machines, biological systems, and environment must interact to produce food and to make a profit. New approaches to systems optimization have proven effective in the military and industrial sectors. These approaches are being adopted by agricultural engineers seeking to create more effective systems of food and fiber production.

The purpose of the symposium was to consider how the successful systems methodologies used in industry and the military can be employed in design of complex agricultural systems.

Thomas H. Rockwell (Ohio State University) described how computer simulation is used to optimize an inventory problem requiring rapid and flexible management decisions. A community blood bank was studied as an example, and possible uses of such simulation in agriculture were described. Seth Bonder (University of Michigan) showed how operations research methods are used to prepare design models of new armored weapons systems. The design models were then used in simulated dynamic combat situations. Several analogies between the performance of track-laying military vehicles and the prime movers of agriculture were brought out.

H. N. Stapleton and K. K. Barnes (University of Arizona) discussed mathematical modeling of systems of cotton production. They conceived a new "figure of merit" methodology to aid management judgment. However, they recognize a painful lack of coefficient data which are needed for use in systems models. David A. Link (North Carolina State University, Raleigh) showed how activity network techniques can be applied to stochastic networks, such as farm machinery scheduling and management. Techniques such as CPM and PERT cannot be transferred directly to these agricultural systems but can be modified into useful aids for decision-making. Kenneth Von Bargen (University of Nebraska) described how systems engineering is used to optimize production of alfalfa hay from 4000 acres. Various combinations of men, machines, and materials were allowed to interact with weather to gain knowledge and data for generalized systems analysis and engineering.

The lack of reliable data (physical, chemical, biological, economic) is now hampering a large part of the systems engineering effort. Formulation of reasonably adequate models has proceeded very well but the variation in output of the models is still too great because of missing or inadequate data.

The arranger of this symposium is grateful to Charles F. Savage and Newman A. Hall (chairman and secretary, respectively, of Section M) for encouraging the idea of the symposium.

ROBERT E. STEWART,
Program Arranger

Medical Sciences (N)

Alpha Epsilon Delta (N1)

A symposium on the "Preparation for the practice of medicine in the next decade," was sponsored by Alpha Epsilon Delta, the International Premedical Honor Society (29 December 1965).

The image of the "family" doctor may return in the next decade but he will be somewhat different. He will probably be a specialist in health care, according to C. C. Cutting (Permanent Medical Group). He envisions large "health centers" as distinct from hospitals. The result will be a new type of doctor, the general physician, "an expert trained and motivated in predictive medicine, preventive medicine, health maintenance and a co-ordinator among the specialists—a sort of anchor man."

"The application of the increasing body of knowledge in the basic sciences to the treatment of human disease obviously is lagging behind the acquisition of this information, but much of it will undoubtedly be applied to medicine over the next 10 to 15 years. The students who are in training at the present time will most certainly have to use much of the new information in their practice in the future," J. H. Githens (University of Colorado School of Medicine) pointed out.

The College of Arts and Sciences, as always, must continue its responsibility of giving the students the broad and liberal education that is so necessary in the practice of any profession. The competition for admission to medical school will probably not change too much and much responsibility for this will rest with the premedical advisors. Everyone is concerned about the qualified students who are not able to be admitted because of lack of vacancies in the medical schools. Concern
was voiced that we keep the ratio of physicians to population as near as possible to what it is today and that the quality of our medical care does not suffer because of the changes.

There are advantages and disadvantages to "Medicare," as reported by D. L. Wilbur (American Medical Association). Although he opposed Medicare, he will support the law, whose long-term "disadvantages will probably outweigh its advantages. It will make medical care available to persons who have not sought it and have not got it because of financial or other considerations. One of its long-term advantages" he suggested, "will be a tremendous educational upsurge in the allied health professions."

Other participants included H. S. Jacoby (University of Pacific), R. Cohn (Stanford University School of Medicine), and J. B. de C. M. Saunders (University of California School of Medicine). Norman F. Witt (national president, Alpha Epsilon Delta) presided.

Alpha Epsilon Delta has sponsored a program on some phase of medical and dental education at the meetings of AAAS almost yearly for the past 20 years.

Maurice L. Moore, Secretary

American Physiological Society (N3)

During the symposium on "Oogenesis and early embryonic development" (28 December 1965) the formation, function, and fate of the annulate lamellae in oocytes and embryos of invertebrates was considered by R. G. Kessel (University of Iowa) and F. H. Moyer and C. A. Verhey (Washington University, St. Louis). The annulate lamellae, derived from the nuclear membrane at specific times during oogenesis, remain in a stacked array in the cytoplasm until they dissociate upon the commencement of protein synthesis. Ribosomes were present, in some cases, upon the stacks of annulate lamellae. It was suggested that the origin of the annulate lamellae was a method for the conveyance of material formed in the nucleus into the cytoplasm and its storage there until required by the cytoplasm for its functioning.

K. D. Smith and H. Ursprung (Johns Hopkins University) demonstrated that the cytoplasm of mature eggs of tunicates may be spatially differentiated with respect to mitochondria, endoplasmic reticum, and lipid droplets. Thus the unfertilized egg has become specialized for future functional capacities prior to entry of the sperm. Smith and Ursprung also demonstrated that the fertilized egg is capable of considerable growth and cell division without the concurrent expression of the DNA. This evidence suggests that the unfertilized egg contains, in its cytoplasm, information in the form of messenger RNA for controlling protein synthesis in the developing embryo after fertilization.

The possible location of mRNA within vesicles derived from the annulate lamellae was suggested by F. H. Moyer and C. A. Verhey. They have found that these vesicles disappear after fertilization while the synthesis of proteins is increasing. Thus, the mRNA which controls protein synthesis after fertilization is presumably synthesized in the unfertilized egg and enclosed in the vesicles to prevent its destruction prior to fertilization.

The relation between growth, differentiation, and protein synthesis was also examined in more fully developed embryos of the brine shrimp, Artemia salina, by J. S. Clegg (University of Miami, Coral Gables, Florida). Unlike most embryos, these forms undergo an extensive period of development during which embryonic differentiation occurs in the complete absence of cell division. It was shown that extensive protein synthesis does occur during this time but that the extent of RNA synthesis was either slight or absent. This suggests that later embryonic stages, at certain times, might also be capable of further development without the concomitant DNA-directed synthesis of mRNA.

This symposium was arranged on behalf of the American Physiological Society and Section F of the AAAS by R. M. Iverson (University of Miami) and R. E. Smith (University of California, Los Angeles).

R. M. Iverson, Program Arranger

Dentistry (Nd)

A symposium (27 December 1965) on the subject of the "Behavioral sciences in dentistry" was held at the AAAS annual meeting in Berkeley, California. The program brought together participants who reported on their studies of stress and fear, interdisciplinary approaches to a variety of relevant problems, and the development of the behavioral sciences in the general context of relevancy to dentistry.

The basic work on psychological stress indicates that the anticipation of stress is very important. Using physiological measures as indices of arousal, it was clearly shown that the subjects' maximum response occurs prior to stress. With the occurrence of stress, there is a rapid drop in the indices of arousal. This basic finding seems to be in keeping with the study which showed that children have a marked response to being told that they were to have a tooth removed. Here again marked response occurred during the anticipatory period and tended to disappear following the stress removal of a tooth.

However, the latter study also showed that children reacted less favorably to oral surgery when the anticipatory period was very short. The role of psychological stress as a factor in oral disorders was also discussed. Early studies indicate that such stress may be a factor in the production of cleft palate.

Psychological stress also appears to be a factor in some disorders of the gingival tissues. New sophisticated techniques now being developed for the recording of physiological changes in oral tissues were described.

The research on experimental fear reduction shows that subjects can be desensitized to a specific fear; that this desensitization lasts; and that, subsequently, there is a tendency for subjects to be less fearful in general. The importance of this basic work to dentistry is obvious, as is the need for more knowledge of fear in the dental situation. The theme was developed that the dental situation presented an ideal natural situation for studies of some basic psychological phenomena such as stress, fear, and pain. This point was well illustrated in the paper on reduction of pain through audio analgesia, where the dental situation was used for a behavioral study. Here the volume of the white noise was found to be the important variable in control of pain.

This symposium—the first of its kind—emphasizes the importance of the behavioral sciences to the field of dentistry, and the need to bridge the void that exists between activities in basic research and their application at
Medical Sciences (N)
Maurice L. Moore

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