biology has suffered from a lack of application of proper techniques and research approaches. In the hope of relating the techniques and known information of rumen and sludge digestion microbiology to soil microbiology, a round table discussion was held at the 64th annual meeting of the American Society for Microbiology in Washington, D.C., 3–7 May 1964.

L. E. Casida, Jr. (Pennsylvania State University) pointed out that only limited knowledge is available concerning anaerobic soil microorganisms and that it is not even known whether most soils maintain conditions anaerobic enough for the existence of anaerobic bacteria other than the spore-forming clostridia. Conventional techniques for the demonstration, enumeration, and isolation of anaerobic soil bacteria were discussed by Casida, and it was pointed out that these techniques do not show the existence of highly oxygen-sensitive anaerobes even if they are present in the soil.

An alternate approach was suggested to include these organisms. Dilutions of soil would be quantitatively applied to thin nutrient agar films of low O/R potential and then sealed between cover slips and slides. After incubation at suitable temperatures the dilutions would be observed microscopically for formation of microcolonies. Thus, anaerobes, which show no macroscopic evidence of growth in the laboratory when present techniques are used, might produce microscopically visible growth of a few generations in such a sealed chamber.

It was pointed out by D. Caldwell (U.S. Department of Agriculture, Beltsville) and P. H. Smith (University of Florida) that the anaerobic bacteria of the rumen and sludge digestion systems are extremely sensitive to oxygen. Therefore, their enumeration and isolation require complete exclusion of oxygen and maintenance of low O/R potential during all handling, including collection of sample and inoculum transfer. It was suggested that the same techniques be applied to soil anaerobes. In particular, it was suggested that soil in the field be impregnated with inert gas before it is tested, and that such soil then be transported to the laboratory and processed under a blanket of inert gas.

It is hoped that at least a few of the investigators who listened to or participated in this discussion will find their imagination and interest so sparked by the presentations that they will initiate investigations on the more oxygen-sensitive anaerobes of the soil.

This meeting was planned by the Soil Microbiology Section of the American Society for Microbiology.

L. E. Casida, Jr.
Pennsylvania State University, University Park 16802

Neurospora

Researchers working with *Neurospora* in various disciplines and in various parts of the world gathered at the 2nd *Neurospora* Information Conference, Houston, Texas, 4–7 March 1964, for the informal exchange of ideas and information and for the comparison of methodological approaches to some of the more rapidly developing areas of research. No formal presentation of research papers was scheduled; there were, instead, five informal sessions, each of which was devoted to the discussion of one field of research.

Each session was opened by a chairman who presented a summary of the current status of knowledge in that field, an evaluation of the methods currently in use, and a formulation of the questions he felt could most profitably be explored through studies on *Neurospora*. An informal discussion of research programs and techniques followed each session. Relevant experimental data, when available, were presented.

The session on mutagenesis was chaired by Charlotte Auerbach (Edinburgh University, Scotland). She emphasized in her introductory remarks (i) the difficulties of quantitative evaluation of mutation data, particularly in regard to mutagen specificity, and (ii) the technical difficulties encountered in the study of mosaicism and delayed mutation. In the following discussion that was devoted largely to methodology, D. Stadler (University of Washington) described a new heterocaryon system for the detection and study of recessive lethal mutations. He reported some of the results obtained after using a heterocaryon containing the *cot*, igloo, and flat mutations.

Other discussions on mutations were presented. F. de Serres (Oak Ridge National Laboratory) reported results of an intensive study of mutations at the *ad-3* locus. Stadler described a method for the scoring of both forward and reverse mutations in the same genetic system with the use of 4-methyl tryptophan, and S. Gross (Duke University) described a system for scoring both forward and reverse mutations for sulfate requirement. J. Reissig (Universidad de Buenos Aires) discussed his method for detecting both forward and reverse mutations at the *pyr-3* locus. In the discussion on the measurement of reverse biochemical mutations, resistance mutations, and the problem of mutagen specificity, the technical difficulties and the need for new methods were again emphasized.

In the session on recombination (chairman, Stadler) it was noted how interallelic recombination in *Neurospora* and other ascomycetes yield characteristic patterns of results which could be explained if a chromosome were made up of a series of fixed recombination regions. It was suggested that when one of these regions is paired for recombination (as it is in perhaps 1 percent of the meiotic cells) reciprocal (2:2) segregation always occurs at the ends of the region. However, between the ends there may be multiple, nonreciprocal events. Recent hypotheses were discussed which attempt to describe recombination at the level of DNA molecules. Critical tests of these molecular models for recombination can be made with *Neurospora* and other organisms suited to tetrad analysis and the selection of rare recombinants.

The session on regulation and development (chairman, A. Sussman, University of Michigan) opened with reports on cytology and ultrastructure by R. J. Lowry and somatic mitosis in *Neurospora* by A. N. Namboodiri (both of University of Michigan). Then, the question of the spatial and temporal localization of enzymes during development was introduced; the localization of invertase (R. Metzenberg, University of Wisconsin) and the regulation of aryl β-glucosidase, cellulase, and cellobiase (B. Eberhart, University of North Carolina) were both noted. R. Wagner (University of Texas) described a class of isoleucine-valine mutants which may represent "organizational" mutants. Such mutants possess all of the enzymes necessary for the synthesis of these amino acids but are defective in the organization of these enzymes into a functional complex. A. Fox (University of Wisconsin) and N. Horowitz (California Institute of Technology) compared their disparate results on the tyrosinases of *Neurospora* and discussed possible reasons for the discrepancies. The remainder of this session evolved into a discussion of some of the hitherto neglected morpho-

logical mutants of *Neurospora* and their potential value as tools in the biochemical study of morphogenesis and development. A. Srb (Cornell University) pointed out the interesting possibilities of the peak (biscuit) mutants which have drastic effects on ascosporogenesis in the homozygous condition and Sussman described extensive studies on the clock mutants which reveal a circadian rhythm.

The late David Bonner (University of California) chaired the session on gene action in which the discussion centered on the nature of enzyme subunits, their genetic specification, interaction, and enzymatic activities. Evidence for glutamic acid dehydrogenase (J. Fincham, John Innes Institute, England), invertase (Metzenberg), and tryptophan synthetase (Bonner) points toward alteration of tertiary structure by point mutations. Studies of tryptophan synthetase at La Jolla suggest that one polypeptide subunit may be involved in more than one enzymatic function, as does that on malic acid dehydrogenase–aspartate amino transferase (K. Munkres, Yale University) and that on carbamylphosphosynthetase and aspartic transcarbamylase (V. Woodward, Rice University). The concept of gene-enzyme relationships was further complicated by J. DeMoss' (University of California, San Diego) description of interaction between the gene products of the *tryp-1* and *tryp-2* loci, which are unlinked but both of which contribute subunits to anthranilate synthetase. The subunit from *tryp-1* also acts as indole glycerol phosphate synthetase.

In discussions on the genetic basis of regulation R. Barratt (Dartmouth College) and B. Sanwal (University of Manitoba) reported on the glutamic acid dehydrogenases. R. Davis (University of Michigan) discussed the interrelationships of arginine and pyrimidine biosynthesis and the evidence for two isolated pathways of carbamyl phosphate synthesis. Reissig noted his work on regulation in these pathways; he utilizes his technique for detecting different *pyr-3* mutants with widely varying levels of enzyme activity. In discussing regulation in the leucine pathways, Gross said unlinked genes appear to be under coordinate control. Bonner presented the hypothesis that the central portion of the *tryp-3* (*td*) locus appears to serve a regulatory function over both the right and left portions of this genetic region.

The final session dealt with allelic complementation. J. Fincham, chairman, surveyed the existing data on complementation mechanisms and presented the results of extensive work on the mechanism of complementation between *am* mutants (glutamic acid dehydrogenase). In vitro complementation studies in the adenylosuccinase system were discussed by D. Woodward (Stanford University). Y. Suyama (University of California, San Diego) noted differences between in vivo and in vitro complementation in the tryptophan synthetase system. The above systems appear to involve the activation of polypeptide subunits through the formation of hybrid polymeric proteins. However, Wainwright presented evidence from his cell-free tryptophan synthetase-forming system that complementation may occur at the stage of polypeptide synthesis in this case.

B. Webber (Oak Ridge National Laboratory) and A. Ahmed and N. Giles (both of Yale University) discussed biochemical, genetic, and complementation studies dealing with the structure and function of the complex *hist-3* region which they conclude consists of three cistrons functionally coordinated in an operon. The session closed with a general discussion of the relationships between genetic and complementation maps and their interpretation.

No extensive publication of the proceedings of the meeting will be undertaken. A more extensive summary of the meetings will appear in the *Neurospora Newsletter* which is circulated to all persons interested in the field.

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BARBARA J. BACHMANN
Department of Microbiology, Yale University, New Haven, Connecticut

American Association for the History of Medicine

The history of public health and psychiatry and a broad range of other medical historical subjects were reviewed at the 37th annual meeting of the American Association for the History of Medicine, Washington, D.C., 30 April–2 May 1964. Approximately 200 medical historians attended sessions held at the National Library of Medicine, the National Institutes of Health, and the Smithsonian Institution's new Museum of History and Technology.

James Shannon (director, National Institutes of Health) served as discussant for a major symposium on the "Federal Government and Health Research, 1900–1960," held at NIH under the chairmanship of Philip Sapir (National Institute of Mental Health). George Rosen (Columbia University School of Public Health) discussed "Patterns of health research in the United States" and noted that at the start of the 20th century not one well-equipped, well-endowed institution for research in medicine existed in the United States. He then reviewed how the spectacular growth in the scope and quality of American medical research since 1900 culminated in the broad programs of the National Institutes of Health. Rosen pointed to the concept of a "critical level" in history—to periods of relative quiescence in which dynamic forces exist in an unstable equilibrium. Such periods existed in U.S. health research in 1900, in the 1930's, and again after World War II. During the years from the turn of the century, the federal government has gradually replaced other agencies in the stimulation and support of health research. James Cassedy (Division of Research Grants, NIH) then discussed "The registration area as a health research resource," and explored the federal-state relationship and the development of national vital statistics from 1885 to 1915. So poor were the standards of U.S. death registration towards the end of the 19th century, that it was not unusual to find listed such interesting causes of death as "suicide" by an infant less than a year old, and an elderly man's death occasioned by "puerperal hemorrhage!" Jeanne Brand (National Institute of Mental Health) traced the historical factors which enabled passage of the National Mental Health Act of 1946 and noted the impact of this legislation upon the wide-ranging Public Health Service program in support of mental health research. The final paper in the symposium, by Hunter Dupree (University of California), dealt with "The structure of the government-university partnership after World War II." Dupree posed the question of how an historian could best tackle the period 1945–50—the years in which the government-university partnership took clear shape. He noted the difficulties with relation to vast and multiple source