were the best preserved. As a general rule, muscle and epithelial tissue were the least well preserved.

From Czechoslovakia came a paper by Eugen Strouhal and Luboš Vyhnánek (Náprstek Museum and Charles University, Prague, Czechoslovakia). Their indirect methods for dating ancient Egyptian mummies are based on dating coffins by shape, decoration, paleography, and evaluation of the name of the deceased person. There are many examples, however, in which the results are not consistent because the mummy could have been displaced after the removal of the coffin from the tomb.

Only direct methods can yield better results. The most widely used one consists in dating according to the changes in mummification techniques.

More accurate modern dating methods are based on the carbon-14 treatment, in which either the fleshy remains or bone collagen is used. The former procedure, however, does not yield good results because of impurities from mummification stuffs which are not easily removable, and the latter requires sacrificing a larger part of skeleton; this today, from the museological point of view, does not seem to be justified.

Robin A. Barraco (Wayne State University School of Medicine) discussed the results of his search for intact protein in mummy tissue. Desiccated tissue samples were taken from two Egyptian mummies. The samples consisted of heart tissue, a strip of of abdominus rectus, and a section of neck tissue. The presence of proteinogenous material in the extracted samples was indicated by the use of the Folin-Lowry method, scanning spectrophotometric analysis, amino acid analysis, and polyacrylamide gel electrophoresis. Qualitative analysis of the proteinogenous material was difficult as a result of the high salt content of the product, which is probably due to the alkalis used by the ancient Egyptians in the mummification process.

James E. Harris (University of Michigan School of Dentistry) reported on the radiographic survey of the mummies of the New Kingdom Pharaohs in the Cairo Museum. The objective of the last expedition to the Cairo Museum (in January 1972) was to expand, through radiographic examination of the Royal Mummies, the knowledge of anthropometric variation, growth and development, disease, traumatic injuries, and the art of mummification. The mummies of the New Kingdom Pharaohs provide a biological collection which is unique because of the availability of extensive historical documentation.

The ultrastructure of mummified cells was discussed by Peter K. Lewin (University of Toronto). As part of a generalized study of the histology of mummified tissues, skin, muscles, tendons, and bones from an Egyptian mummified hand dating from about 400 B.C. were examined by electron microscopy to determine their state of preservation at the ultrastructural level. The electron photomicrographs are the first ever recorded from an Egyptian mummy, and although greatly shrunk, they show good preservation. Intact cells with cellular and nuclear membranes were demonstrated, as were some cellular cytoplasmic components of skin such as granules, mitochrondria, and tonofilaments. Red cells were also recognizable in the specimens.

The seminar closed with a general agreement that a Society of Paleopathology with its own journal was needed to provide coordination of effort among scientists in many different disciplines. As an interim measure, it was decided to provide a newsletter for communication among those active in the field until a journal can be established. The full mummy autopsy was recorded on color videotape. An edited 1-hour version of this tape will be made available to universities for teaching purposes.

T. AIDAN COCKBURN
18655 Parkside,
Detroit, Michigan 48221

Bacterial Plasmids

The important biological role and widespread distribution of bacterial plasmids have become increasingly apparent. These extrachromosomal genetic elements have been identified in a wide variety of bacterial genera and species, and, despite their nonessentiality for the viability of their host organism, plasmids determine bacterial traits that are often crucial to the organism for adaptation to its environment.

Twenty scientists from the United States and nine scientists from Japan met for a 3-day conference on bacterial plasmids at the East-West Center in Honolulu, Hawaii, on 13 to 15 November 1972. The conference was sponsored by the U.S.–Japan Cooperative Science Program of the National Science Foundation and the Japan Society for the Promotion of Science. One of the pioneers and a guiding figure in the development of the field of plasmids, Professor Tsutomu Watanabe, died on 4 November 1972. In recognition of the fundamental contributions of Professor Watanabe, and as an indication of the esteem and respect with which he was held by the scientific community, the participants of this meeting dedicated the conference to his memory.

Particular emphasis at the conference was placed on the sex factor (F) of *Escherichia coli*, on colicinogenic (*Col*) factors, known to determine the production of antibiotically active proteins designated colicins, and on R factors, plasmid elements that closely resemble sex factors and carry genetic determinants for resistance to commonly employed antibiotics.

The fact that plasmid elements have been identified as covalently closed, circular duplex DNA molecules has permitted the application of density gradient centrifugation in the presence of dye for the isolation of these molecules from bacterial cells. Isolation of very large plasmid elements was considered by D. Freifelder (Brandeis University). Considerable attention was paid to the buoyant density and size of the various plasmid elements isolated by these techniques. There was agreement that *Col* factors and R factors with sex factor activity generally are found as molecules of relatively high molecular weight and are present to the extent of a limited number of copies per cell. Those plasmid elements lacking sex factor activity usually have a relatively low molecular weight and are present as multiple copies in the cell, although exceptions have been observed. The phenomenon of R plasmid dissociation into two circular DNA components, a self-transmissible circular transfer unit (RTF) component and a smaller circular (r) component carrying the antibiotic-resistant genes, has been described in *Proteus mirabilis*. Aspects of the dissociability of R factors into the RTF and r components and the preferential replication of the r component under conditions of growth of the bacterium in the presence of one of the antibiotics were discussed by R. Rownd (University of Wisconsin), H. Hashimoto and S. Mitsuhashi (Gunma University), and J. Punch (Medical College of Virginia).

The use of heteroduplexing techniques for the analysis of structural relationships of certain identifiable genetic regions in sex factors that have incorporated segments of the bacterial

chromosome was described by N. Davidson (California Institute of Technology), and the application of these techniques to the study of structural relationships between *Col* factors was discussed by J. Inselburg (Dartmouth Medical School). The application of heteroduplexing techniques in conjunction with the development of conditions for transformation of *E. coli* with plasmid DNA as reported by S. N. Cohen (Stanford University) and the use of specific restriction endonucleases as described by H. Boyer (University of California, San Francisco) promise to elucidate the structural relationships between sex factor, *Col* factor, and *R* factor plasmids. In addition to these types of plasmid elements, the detection of circular DNA elements with unknown function in bacteria was reported by several of the participants. Studies on a particularly striking example of cryptic plasmid elements, the circular DNA elements in *Bacillus megaterium* strains, were described by B. Carlton (University of Georgia).

A substantial portion of the conference was devoted to a consideration of the genetic and biochemical factors responsible for plasmid DNA replication. Recent work on a very promising model system for the study of plasmid DNA replication, the defective bacteriophage λdv of *E. coli*, was presented by K. Matsubara (Kyushu University). The effect of the growth medium and various metabolic inhibitors on the replication of *Col* and *R* factors was described by R. Clowes (University of Texas, Dallas), D. Clewell (University of Michigan), and J. Punch. The effect of chromosomal DNA replication mutations on plasmid DNA synthesis was explored by R. Clowes and D. Korn (Stanford University). Mutations specifically affecting the replication of penicillinase plasmid DNA in *Staphylococcus aureus* were described by R. Novick (Public Health Research Institute, New York). Observations on an unexpected class of mutations that result both in altered ribosomal proteins and sex-factor replication were presented by H. Uchida (University of Tokyo). The properties of relaxation complexes of plasmid DNA and protein and the possible role of these complexes in plasmid DNA replication were reviewed by D. Helinski (University of California, San Diego), who also discussed the implications of ribonuclease-sensitive supercoiled plasmid DNA with respect to the role of RNA as a primer in plasmid DNA replication. The general property of incompatibility between various groups of plasmids was considered by W. Maas (New York University). This was followed by a discussion of the relation between cellular replication sites and incompatibility involving several of the participants. The role of replication of *Col* factor DNA in the expression of colicin production was considered in part by K. Mizobuchi (National Institute of Radiological Diseases, Japan) and P. Kahn (University of Minnesota).

Attention also was focused on the biochemical mechanisms responsible for the conjugal transfer of plasmid elements between cells. The mutational approach to this problem was reviewed by T. Miki (Kyushu University), while the effects of various inhibitors of this process utilizing normal and minicell recipients were explored by R. Curtiss (University of Alabama, Birmingham) and S. Hiraga (Kyoto University). D. Rupp (Yale University) presented data on the replication events accompanying plasmid DNA transfer and the effect of chromosomal DNA replication mutations on the transfer process. Recent advances in our understanding of the structure of the F pilus, a cellular appendage determined by the F-type sex factors, were reviewed by M. Tomoeda (Kanazawa University) and C. Brinton (University of Pittsburgh), and a detailed model for the role of the sex pilus in the conjugal transfer of DNA was presented by Brinton.

Finally, the incidence of plasmid elements that determine antibiotic resistance and enterotoxin production in a variety of bacterial genera and species was reviewed by S. Falkow (University of Washington), and the distribution of R plasmid elements in *S. aureus* in particular was discussed by S. Mitsuhashi (Gunma University). The restructuring of plasmid elements through the process of recombination between different plasmids was explored by T. Arai (Keio University), an associate of T. Watanabe, and the role of recombination in the evolutionary process of plasmid formation was discussed by S. Mitsuhashi and other participants of the conference.

DONALD R. HELINSKI
University of California, San Diego, La Jolla, 92037

STANLEY N. COHEN
Stanford University, Stanford, California 94305

MUNEMITSU TOMOEDA
Kanazawa University, Ishikawa, Japan

(Continued from page 428)

RECENT DEATHS

Donald H. Andrews, 74; professor emeritus of chemistry, Johns Hopkins University; 3 June.

Frank L. Ashmore, 47; former vice president, Duke University; 28 May.

Ulrich Clever, 43; professor of biology, Purdue University; 16 June.

Blanche H. Dow, 80; president emerita, Cottey College, and former president, American Association of University Women; 24 May.

Gerardian J. Downing, 78; former professor of physics, La Salle College; 11 May.

Harry W. Faust, 66; retired assistant director, organic division, Monsanto Industrial Chemical Company; 17 March.

Abel A. Hanson, 69; professor emeritus of higher education, Teachers College, Columbia University; 4 June.

Gordon D. Hoople, 78; professor emeritus of otolaryngology, Syracuse University; 4 June.

Harry P. Kauffman, 73; professor emeritus of poultry science extension, Pennsylvania State University; 28 May.

W. V. Lambert, 75; former dean, College of Agriculture, University of Nebraska; 31 May.

Fletcher Low, 80; professor emeritus of chemistry, Dartmouth College; 6 June.

Franze E. Lund, 63; former president, Kenyon College; 29 May.

David W. Minar, 48; professor of political science and urban affairs, University of Washington; 21 May.

H. Vernon Price, 63; professor of education and mathematics, University of Iowa; 4 June.

James J. Ryan, 69; former professor of mechanical engineering, University of Minnesota; 31 May.

George E. Schlesser, 68; chairman, education department, Colgate University; 14 May.

Donald B. Shutt, 80; bacteriologist and retired lecturer in dairy microbiology, Ontario Agricultural College, Canada; 5 June.

Martin E. Straumanis, 74; professor emeritus of metallurgical engineering, University of Missouri–Rolla; 16 March.

Erratum. In the article "APA: Psychiatrists reluctant to analyze themselves" (*Science*, 20 July, p. 246) the medical director of the APA, Walter Barton, was erroneously named as William Barton.