

a review. The mounting interest in bacterial and viral pathogenicity, that would complement the article by Di Rita and Mekalanos 'Rhizobium genetics' by S. R. Long highlights recent progress in the field and points out opportunities for genetic studies both on symbiosis with plants and on fundamental questions of bacterial function and inheritance. Proteolysis has now been recognized as an important phenomenon in regulation of genetic expression in microorganisms. Genetics of proteolysis in *Escherichia coli* by S. Gottesman reviews our present knowledge on the subject. An equally fascinating area, Multipartite genetic control elements: communication by DNA loop has been competently reviewed by S. Adhya. Recent discoveries in some regulatory systems show that, even in the *lac* operon, the DNA control elements are multipartite in nature and are located at sites distant from the promoter. 'Mechanisms that contribute to the stable segregation of plasmids' have been reviewed by K. Nordstrom and S. J. Austin.

In the area of human genetics an important article, 'The isochore organization of the human genome' by G. Bernardi, discusses the identification of a small number of families of DNA fragments characterized by similar base compositions, by fractionating DNA fragments by equilibrium centrifugation in preparative caesium-sulphate density gradients in the presence of sequence-specific DNA ligands. The results discussed in the review suggest a novel experimental approach in human genome research—compositional mapping. A review of great topical interest is 'Molecular structure of human chromosome 21' by G. D. Stewart, M. L. Van Keuren, J. Galt, S. Kurachi, M. J. Buraczynska and D. M. Kurnit. The small size of chromosome 21, coupled with its clinical relevance, ensure that it will continue to be the subject of intensive study.

'Structure and function of telomeres' by V. A. Zakian deals with telomeres defined in molecular terms: simple repeats at DNA termini of eukaryotes and the proteins which bind specifically to these sequences *in vivo*. Determination of the mechanism of telomere replication will continue to be a crucial area of research. Other areas of future research on telomeres are also discussed

in this review. Transposable elements, originally discovered in maize, continue to be a topic of intense interest. 'Maize transposable elements' by A. Gierl, H. Saedler and P. A. Peterson and 'The population genetics of *Drosophila* transposable elements' give the latest advances in this area in representatives of plants and animals. 'Alternative splicing in the control of gene expression' discusses a phenomenon which has emerged in recent years as a widespread device for regulating gene expression. Whereas in lower organisms the classical, constitutive, splicing is more prevalent, in higher metazoans alternative splicing appears to be more prevalent. The review focuses upon the mechanistic, functional and evolutionary aspects of alternative splicing.

'Homologous recombination in mammalian cells' by R. J. Bollag, A. S. Waldman and R. M. Liskay focuses on three approaches currently used to study recombination in cultured mammalian cells. These approaches are useful in targeting foreign DNA into host cells. Current targeting schemes in mouse embryonic stem cells appear to allow the generation of mutant mouse lines for many cloned genes.

'Mechanism and developmental program of immunoglobulin gene rearrangement in mammals' by T. K. Blackwell and F. W. Alt clarifies many aspects of the recombination mechanism of the immunoglobulin heavy-chain regions and discusses how our understanding of the switching of the immunoglobulin-variable-region gene assembly and heavy-chain class switching are controlled during B-lymphocyte differentiation.

In the area of plant genetics the review 'Habituation: heritable variation in the requirement of cultured plant cells for hormones' by F. Meins, Jr., discusses plant cells that have lost their requirement for auxin and cytokinin (habituation). There are hints that habituation may have a causal role in morphogenesis. The review discusses the evidence that habituation results from reversible modifications of heredity, known as epigenetic changes, and discusses possible mechanisms for these changes.

Other subjects dealt with in this volume relate to alcoholism, rDNA redundancy in *Drosophila*, self-incompatibility in *Brassica*, adenovirus E1A transactivator, protein stability and func-

tion, prokaryotic signal transduction, evolutionary quantitative genetics, 21-hydroxylase deficiency, and nematode muscle.

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## Earth science reviews

**Annual Review of Earth and Planetary Sciences 1990.** Vol 18. G. W. Wetherill, A. L. Albee, Francis G. Stehli, eds. Annual Reviews, Palo Alto, USA, 1990. 472 pp. Price: USA \$ 53, elsewhere \$ 57.

Space scientist James Van Allen, in the first, autobiographical, article in the volume, writes about the liberal and pioneering atmosphere that prevailed in America in the early part of this century. This spirit permitted the gradual flowering of a genius who had a knack of providing mechanical gadgets. Allen's later work was under conditions where imagery was the motto, multiple approaches to a problem were the rule, and money was no object. We get to know the development of high-altitude research and early satellite work in military or quasimilitary laboratories. The dramatic changes that followed the landing of man on the Moon and his return safe and sound and the mission to outer planets are then traced. These make fascinating reading. We get an intimate picture of a life full of purpose and achievement.

The volcanic activity of the Valles Toledo Caldera Complex, which has been continuously active since the last 13 million years, forms the subject of a review which summarizes the results of research since 1980. Dahlen, in another article, provides a model for the development of fold and thrust belts and submarine accretionary wedges at compressive plate boundaries. The soft-bodied fauna (the Ediacaran fauna) and the pre-Ediacaran medusoids at the Precambrian-Cambrian boundary are the subject of a review by Conway Morris. The biotic discontinuity across the Precambrian-Cambrian boundary and the possibility of mass extinction of

much of the Ediacaran fauna are discussed.

Another subject of current interest is the biological consequence of planetary impact, especially at the Cretaceous-Tertiary (K-T) boundary. Digby McLaren and Wayne Goodfellow marshal various kinds of evidence—stratigraphical, mineralogical, geochemical and biological—that have a bearing on the problem. An exhaustive list of references to works on this subject is furnished. The geochemical characterization of hydrothermal solutions on the sea floor is discussed by Von Damm. While presenting a wealth of chemical data he has attempted to provide answers to several key questions related to sea floor hydrothermal activity. Presence of high-salinity fluids in the oceanic crust is indicated. Wetherill's article on formation of the Earth is absorbing. The different stages in the formation of the planet, starting from the Sun and Solar Nebula, and transformation of planetesimals to planets, is traced. Quantitative theories seem to indicate an initially extremely hot and

molten planet. Other papers include subjects like seismic discrimination of nuclear explosions, the nature of the Earth's core, and synchrotron radiation: applications in the earth sciences.

A review paper of unusual interest is the one about migration of saline groundwater across North America. The migrating brines appear to have travelled many hundreds of kilometres, leaving behind diagenetic signature on the sediments through which they have passed. The process is not without economic interest as it has helped precipitate metallic minerals and allowed petroleum to migrate with the brines. Evidence is presented for considering brine migration as a giant hydrothermal system operating on a regional scale. A link between tectonic deformation and deep groundwater flow is suggested. The authors claim that the concept of brine migration over long distances provides a framework for understanding a number of significant but seemingly unrelated phenomena like the origin of metallic ores, high temperature recorded in

shallow sediments, diagenesis of interior sediments including enrichment in potash feldspar and clays, palaeomagnetic signatures and radiometric ages unrelated to the host rock, and oil reservoirs found far from source beds. This is a thought-provoking paper which has within it seeds of a number of research problems.

All in all, the bunch of review papers included in the volume are creative and challenging writing and excellent reading material. These Annual Reviews have now become indispensable reading to all active earth scientists. They stimulate thinking over a wide spectrum of fascinating problems and present some of the latest developments and excitements in earth science.

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## SHANTI SWARUP BHATNAGAR PRIZES IN SCIENCE AND TECHNOLOGY FOR 1991

Nominations are invited by the Council of Scientific & Industrial Research for the Shanti Swarup Bhatnagar Prizes in science, including engineering and technology, for 1991. The prizes are to be given for research contributions made primarily in India during the past five years. The upper age limit for nominees for the prize is 45 years.

The prizes, each of the value of Rs 50,000, may be awarded annually for notable and outstanding research, applied or fundamental, in the following disciplines: (1) biological sciences, (2) chemical sciences, (3) earth, atmosphere, ocean and planetary sciences, (4) engineering sciences, (5) mathematical sciences, (6) medical sciences, and (7) physical sciences.

Nominations should be sent as per the prescribed proforma by 1 April 1991. Regulations governing the prize and the proforma for nomination may be obtained from the Head, Human Resource Development Group, Extramural Research, CSIR Complex, Pusa, New Delhi 110 012.