
BOOK REVIEWS

Annual Review of Public Health, Vol 9, 1988, pp. 598, (eds) Lester Breslon, J. E. Fielding and L. B. Lave, (Published by Annual Reviews Inc., 4139, El Camino Way, Palo Alto California 94306, USA), Price: USA \$ 39, elsewhere \$ 43.

In keeping with the usually high standards of Annual Reviews, the volume under review has assembled a wealth of information on the frontiers of public health. Titles of chapters which have appeared in the nine volumes since the inception of *Annual Review of Public Health* in 1980 have also been arranged category-wise: Age-and disease-specific problems, Behavioural aspects of health, Environmental health, Epidemiology, Biostatistics, Health services. Public health related articles appearing in *Annual Reviews of Genetics, Nutrition, Psychology and Sociology* for 1988 have also been listed.

The six-year overview of the AIDS epidemic by J. E. Osborn gives an update on human immuno deficiency viruses, modes of their transmission and control. Variation in genome pattern of the viruses has been extensively studied. The isolation of other primate retroviruses after the recognition of HIV has added confusion to the emerging picture of the pandemic. The oncogenic potential of the retroviruses does not permit immunological control by live virus or an inactivated-whole virus vaccine. Since the epidemic has only been recognized for six years, the median incubation interval following infection has not yet been established. The mechanism of pathogenesis has not been uncovered completely, except for the attrition of T4 cells. Voluntary control of risky sexual and drug abuse holds the greatest hope of stemming the spread of HIV" besides involuntarily subjecting all donors of blood to screening for HIV.

The chapters on viral vaccines by Parkman and Hopps and vaccines for parasitic diseases by Higashi summarise the state of vaccination strategies for the diseases communicated by viruses and vector-borne and free parasites. Vaccines against poliomyelitis, measles, mumps, rubella, influenza (types A and B), rabies, hepatitis B, yellow fever and adenovirus are commercially available. The basic techniques of recombinant DNA and peptide synthesis, and monoclonal antibody production by the hybridoma technique have made available synthetic peptides, subunit vaccines, vector vaccines, reassortant vaccines and anti-idiotypic antibody vaccines. These are

being applied increasingly in herpes simplex, dengue and Japanese encephalitis, and to improve the traditional viral vaccines. In contrast, the progress achieved in vaccines against parasitic diseases such as malaria is unimpressive because of the persistent difficulties in the *in vitro* and *in vivo* cultivation of protozoa and helminths. Once a sporozoite-derived vaccine is available, it will help in preventing the establishment of *P. falciparum* malarial infection by eliminating the initial exoerythrocytic phase of infection.

Prevention and control of cancer has been covered in four chapters: The early detection of cancer, by Battista and Grover; Models for cancer epidemiology, by Thomas; Health hazards of passive smoking, by Eriksen, LeMaista and Newell; and Preventing cigarette smoking among school children, by Best, Thomson, Santi, Smith and Brown. Although the evidence for the effectiveness of pap tests for cervical cancer is overwhelming the test is not being universally applied. Again, in spite of the very useful etiological information available on breast cancer, no generally accepted and tested primary preventive strategy has been evolved. Early detection methods of use in the prevention of lung cancer have not been evolved. The same is true for other cancers. Development of early detection techniques and their validation for screening are costly ventures but a choice can be made between tests which are effective, such as mammography, and the routine performance of X-rays in asymptomatic individuals for lung cancer, which does not help in detection at all.

Environmental tobacco smoke (ETS) is the combustion products inhaled by non-smokers in the proximity of burning tobacco. ETS is made up of the side-stream smoke emitted from the burning tip of the cigarette and the mainstream smoke inhaled, filtered and exhaled by the smoker. Sidestream smoke contains higher concentrations of ammonia, benzene, nicotine, carbon monoxide, many carcinogens and particulate matter, 10 to 20 per cent of which could be deposited in respiratory airways. Over 3800 compounds have been detected in ETS. In order to control the hazards of passive smoking, there should be a more vigorous campaign against smoking in workplaces, schools and places of indoor public assembly.

Occupation-related health hazards to which health care workers are exposed have been reviewed by Cleves and Omenn. Educational programmes for

employees who are under medical care can improve the effectiveness of treatment; thus stress and need for pain medications can be avoided by prior counselling. The concern about the loss of productivity and decrease of standards of employee welfare caused by alcohol, drug and emotional problems has been discussed by Mullen.

Other chapters also orchestrate the central theme of prevention, the lessons to be learnt from well-designed epidemiological studies and creation of awareness and education on public health problems.

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Matrix Ensembles in the Many-Body-Problem by N. Ullah (Published by Oxford University Press, Walton Street, Oxford DX2 6DP), 1987, pp. 140, Price: not given.

The high complexity in solving the dynamical equations involving a large number of interacting particles is well known. The methods of statistical mechanics have been developed to deal with the dynamics of the many-body physics for a long time. The matrix ensemble theory is a variant of the statistical mechanical principle as applied to nuclear many-body problems. Originally it was applied to study the distribution of widths and spacing of compound nuclear levels in nuclear reaction. With the passage of time, a host of other applications namely the determination of (a) collective rotational and vibrational data on nuclei; (b) symmetry mixing parameters, (c) average values of scattering matrix and the fluctuations of cross-sections and many others have appeared in the literature. The development of the subject was originally due to Wigner who suggested replacement of the problem of finding eigenvalues by diagonalizing Hamiltonian matrix by the problem of finding the joint distributions of eigenvalues starting from a given distribution. Wigner assumed the Hamiltonian matrix as real and symmetric and has a Gaussian distribution. Dyson analysed and classified the Gaussian ensembles into different categories depending on how the system behaves under rotations and time-reversal operations. The gaussian nature of the ensemble was also confirmed later by Balian from information theory. Dyson also introduced the concept of "circular ensemble" in the literature which is based on the unitary nature of the Hamiltonian of a physical system. Mehta showed

the equivalence of the two ensembles and discussed the mathematical aspects of circular ensemble in fuller details. The other major developments of the subject are due to French, Brody, Wong, Porter, Nesbet, and a few others including the present author.

In this book the present author has given a consistent description of the historical development explaining the mathematical and associated physical concepts clearly in his first introductory chapter. Application of the random matrix ensembles to different areas in nuclear physics has been taken up in the later chapters. Collective rotational and vibrational parameters of nuclei have been discussed in chapters two and three, while the calculations of the mixing parameters based on symmetry principles are taken up in chapter five. The most interesting determinations of the correlations between the parameters of the S-matrix and its relation to R-matrix will be found in chapter eight. This chapter also contains the evaluations of fluctuations of cross-sections.

Chapter ten considers an interesting application of Grassmannian elements in matrix ensemble theory. The use of Grassmann variables in physics has of late become very common. The author has introduced the elements of this algebra and also considered the integration procedure to discuss its application in matrix-ensemble mechanics involving fermions.

The whole book leaves an impression in the mind of a reader. The book will be found very useful both to teachers and scholars who are engaged in the study of random matrix-ensembles and their applications to nuclear many-body physics.

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Annual Review of Cell Biology, 1987, Vol. 3, pp. 498, (eds) G. E. Palade, B. M. Alberts and J. A. Spudich, (Published by Annual Reviews Inc., 4139, El Camino Way, Palo Alto, California, USA), Price: USA \$ 31, Elsewhere \$ 34.

This is the third volume in the series with 15 reviews on this rapidly expanding biological research. The editors state that they propose to

"concentrate on central topics in cellular and molecular biology", especially "broad fields of primordial importance, such as plant cell biology, or in active fields currently undergoing impressive and exciting developments, such as immunology and developmental biology".

One of the new excitements in biology is the recognition that alternative splicing of RNA in eukaryotes leads to the generation of protein diversity. An article describes this phenomenon whereby a single gene can produce a variety of related but distinct protein isoforms increasing the coding capacity of the genome. Another article discusses the genetic and molecular analysis of the structure and the function of the viral src oncogene product and post-translational modifications of the src-encoded proteins and their contribution to cell transformation. Recently acquired knowledge on the replication of bovine papilloma virus type 1 and Epstein-Barr virus DNAs as plasmids has been reviewed.

Six articles are devoted for the area of cell surface and membranes and their biological roles. One of the less known areas covered is about laminin ($M_r = 850000$), an abundant glycoprotein in basement membrane with both structural and biologically active roles. One of the well-studied and repeatedly reviewed area of mammalian fertilization has been given a place with an emphasis on the events following encounter of sperm and egg to form a zygote involving the species-specific egg receptors glycoproteins and the inactivation of sperm receptors following fusion. Two vibrant areas of biological research on cell-surface receptors and on cell adhesion process are reviewed with focus on the receptors, now considered to "make up one family of a super family of glycoproteins". Another article is devoted to the less popular subject of oligosaccharide signalling in plants, developed out of findings that fragments of plant cell wall can profoundly change plant growth and development.

The activation of B-lymphocytes to proliferate and to differentiate into "plasma" cells that secrete large amounts of antibody, and the regulatory control on these processes by antigen, helper T-lymphocytes, macrophages, complement-components and antibodies have been reviewed in a comprehensive article. The related subject of growth and differentiation in the hemopoietic system, "organized hierarchically with multipotential self-renewing stem cells, committed progenitor-cells, and mature cells", have been included as a short chapter.

A recently purified microtubule based, force generating protein, kinesin, has been the focus of one article and discusses the issues concerning cytoplasmic microtubule-based motors, their association with organelles, their contrast to other force-generating proteins of muscle myosin and ciliary dynein. Most eukaryotic cells exhibit three types of motility migration across a substratum, changes in shape and movements and streaming of cytoplasm within the cell. Myosin, the best characterized eukaryotic motor and much-reviewed protein, has again found a place in this volume with respect to molecular biological approaches to its structure and function.

Constitutive and regulated secretion of proteins has been discussed in a very informative review. It appears that all the transport steps from cytoplasm to the rough endoplasmic reticulum and through Golgi complex are common for secretory proteins, lysosomal enzymes and plasma membrane proteins, and segregation occurs at a late Golgi step. Regulated secretory cells differ from constitutive secretory process in the following characteristics: need external stimulus, secretory products concentrated and condensed into specialized membrane-bound granules, existence of large intracellular pool of mature secretory products in these granules ready to be released on stimulation. Processing of proteins by proteolysis is getting an increasing attention recently. Ubiquitin, an evolutionarily conserved, ubiquitous protein, plays a key role in marking other proteins for destruction by covalently attaching to them and also in heat shock response. Ubiquitin is about 9 KD in size with 76 amino acids, lacking in cysteine and tryptophan but having two C-terminal glycines, the terminal one forming an isopeptide bond with lysine ϵ -amino group by an ATP-dependent process. One review focusses on the role of ubiquitin in intracellular post-translational modifications and as a reversible cross-linking agent in cells. The last article is devoted to polypeptide growth factors which stimulate proliferation of cells and play roles in differentiation development, chemotaxis, tissue repair and inflammation. These act through specific receptors through which the response of gene activation, transcription, and cell division are obtained. Discovery of new growth factors is anticipated. The reviewer rightly sets forth some unanswered questions: mechanism of increase in DNA synthesis, physiological substrates of the receptor tyrosine kinase, relationship of over-expression of growth factors and pathogenicity.

These reviews reveal the wide canvas of the cell biology research. A number of new openings are now made in the study of more complex processes. The investigators are asking more incisive questions, made possible by the molecular approaches with the new, sensitive tools. This volume will be a

valuable possession for all those engaged in biological research.

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NEWS

NMR THROWS LIGHT ON CANCER

NMR spectroscopy, unlike its imaging counterpart, is not normally thought of as a tool in medical diagnostics. But this could soon change.

In recent years NMR imaging has proved itself as a particularly useful technique for obtaining an anatomical picture of tumours in the human body. Two of the biggest problems facing the doctor who has to deal with cancer are early detection and assessing the potential of the tumour to spread (metastasise)—patients die from tumours that metastasise, but rarely from those that do not. At the recent North American chemical congress in Toronto, however, Dr Ian Smith of the National Research Council in Ottawa, Canada, indicated that NMR spectroscopy, when used alongside the imaging technique, has enormous potential for dealing with just these sort of problems.

Some years ago Mountford and coworkers at the University of Sydney, Australia, found that tumours in rats gave excellent NMR spectra. They observed strong CH_2 and CH_3 peaks coming mostly from the fat content of the tumour, and established that the decay rate of these peaks depended on whether the tumour is metastatic or not—a comparatively slow rate (*ca* 770 ms) was characteristic of a metastatic tumour whereas a fast time (*ca* 150 ms) indicated a non-metastatic tumour.

Now Smith and his colleagues have applied NMR spectroscopy to solid tumours in humans. By studying the spectra from excised breast and colon tumours from 200 patients they obtained results similar to those of rats. Moreover, they found that

the width of the CH_2 component proved to be an indication of the progression of the tumour in its invasion of the wall of the colon—the narrower the peak, the further the tumour had progressed. They concluded, therefore, that NMR spectroscopy is a potential tool not only for determining the tendency to metastasise but also for diagnosing the degree of malignancy.

Smith and his colleagues then went on to determine the potential of NMR spectroscopy as a general screen for cancer. Earlier in 1986 Fossel at the Beth Israel Hospital in Boston had used NMR to look at blood and had defined a parameter *P* in terms of the width of the peaks produced from the fatty acid components— CH_2 and CH_3 —in the blood. Their results showed $P < 33$ for patients with cancer and $P > 33$ for healthy people. Smith's group measured this parameter for 1400 people with and without cancer. They found that indeed cancer patients do give a low *P* value but unfortunately so do people with diabetes, hyperlipidaemia and pregnant women—all associated with high fat levels in the blood, leading to false positive results.

However, because the number of false negatives is rare, Smith concluded that while the test probably would not be useful as a general screen, it could be useful in determining the development of cancer in 'high risk' patients or for following the efficacy of treatment. (*Chemistry in Britain*, Vol. 24, No. 8, August 1988, p. 754; Published by the Royal Society of Chemistry, Burlington House, London W1 V 0BN).