
BOOK REVIEWS

Annual Review of Physiology, 1987, Vol. 49, pp. 839, (ed.) Robert M. Berne, (Published by Annual Reviews Inc., 4139, El Camino Way, Palo Alto, California 94306, USA), Price: USA \$ 32, Elsewhere \$ 35.

This year's volume is filled with a feast of 47 reviews covering nine physiological systems, including two special topics (molecular mechanism of muscle contraction, phototransduction in vertebrates). In addition, there is the impressive prefatory chapter contributed by J. R. Pappenheimer of Harvard Medical School. The prefatory chapter sheds several "pearls of wisdom" although Pappenheimer has been too modest to state that he does not have them in his shell. When one reads such accounts, one does not know where to draw the line separating the biography of a scientific development from the autobiography of a personality like Pappenheimer. In those days when such great stars were beginning their careers, conditions were entirely different from now. Most of the great American physiologists were then inspired by the training of British physiologists. The story of Pappenheimer is of a harmonious dedication to physiology, besides interests in music and mountaineering, of times and traditions that have by now almost vanished.

The gastrointestinal physiology section this year has given special attention to "membrane mechanisms for the transport of H^+ , OH^- , and/or HCO_3^- ". This is because "throughout the gastrointestinal tract there is a remarkable thematic repetition involving the operation of two electroneutral ion exchangers, $Na^+ - H^+$ exchanger and a $Cl^- - HCO_3^-$ exchanger". Five reviews are included to deal with different aspects of the "proton and bicarbonate transport systems in gastrointestinal epithelia".

Comparative physiology section includes four review articles discussing relationships in scaling and structure-function, dealing particularly with issues of power function of mass and surface law in the consideration of body metabolism. It may be recalled that the mean metabolic intensity in mammals has been usually considered to be proportional to a power of body weight, and the surface law incorporated $2/3$ or $3/4$ power of mass into the equation. The current concern about these baseline equations has been discussed together with the supply-demand aspects of oxygen consumption.

In the cell and molecular physiology section, the physical factors in membrane function (e.g. lateral diffusion of proteins, red cell deformability, lipid transport in cell, membrane elasticity, viscosity, and deformability) have been reviewed in six articles, to discuss the integrative aspects of membrane in the overall functioning of cells and organisms.

In the renal and electrolyte physiology section, three review papers are included to discuss advances on juxtaglomerular apparatus and tubuloglomerular feedback, in the understanding of the renal haemodynamics and the renal tubular function. The role of calcium in the tubuloglomerular feedback and the alterations of its reactivity have also been discussed.

The endocrinology section has covered in seven reviews, the recent progress on actions of hormones on the central nervous system. It has been previously recognized that the brain produces a variety of endocrine "releasing" hormones. In recent years, it has also been recognised that the brain itself is a target of a number of endocrine hormones such as those of thyroid, gonads, and of even gut, besides renal and other peptides. A glimpse of these intense researches (action of thyroid hormones on brain development, brain insulin, six difference of brain, steroid actions, gut and renal peptides) is provided in these reviews.

In cardiovascular physiology, seven reviews have been contributed to summarise recent progress in understanding long-range adaptations, instead of short term changes of homeostasis. An increase in the "load on the blood vessel wall" stimulates synthesis of connective tissue and contractile proteins and cell growth. The same is true of the "heart". Various aspects of regulation of protein synthesis and angiogenesis have been discussed as they have a bearing on the understanding of disease and adaptation.

The section on respiratory physiology included five papers to discuss the innervation of airway smooth muscle. This is an aspect of great practical importance, and the section should be followed well by specialists of allied fields also. The reviews reveal how much complicated is the peripheral and central neural control of airway smooth muscle, not so thought of hitherto.

Four reviews are included under the special topic of molecular mechanism of muscle contraction, to update our knowledge on "relationships between

mechanical, chemical, energetic, and structural aspects of muscle contraction" including kinetics of actomyosin ATPase in cyclic cross-bridge actions. Under the other special topic on phototransduction in vertebrates, four reviews are included on some of the interesting researches of the past 15 years that culminated in the "cGMP cascade theory of phototransduction".

In a short review like this, the many exciting trends and details of a wide range of physiological researches presented in the volume cannot even be outlined. Moreover, the Annual Review of Physiology is meant to be read critically and carefully by specialists. As usual the volume is a collection of the outstanding highlights of contemporary trends of physiological advances, that must be studied and enjoyed by specialists in biomedical sciences.

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What Went Wrong? Case Histories of Process Plant Disasters by Trevor A. Kletz, (Published by Gulf Publishing Company, Book Division, P. B. 2608, Houston, Texas 77001) 1985, pp. 204, Price: \$ 47.

Documentation of chemical process disasters has become extremely relevant in the wake of the Bhopal disaster. The decade 1975-1985 witnessed a series of major chemical accidents. Information on these is widely scattered in chemical engineering literature. Trevor A. Kletz has done a signal service by bringing out a collection of important case histories of such accidents based on reports collected from different companies. The author's prefatory remarks deserve to be quoted:

"The purpose here is to show what has gone wrong in the past and to suggest how similar incidents might be prevented in the future. Unfortunately, the history of the process industries shows that many incidents are repeated after a lapse of a few years. . . People move and the lessons are forgotten. The book will help to keep the memories alive".

The case histories are divided into groups depending upon their occurrence in plant operations such as

maintenance, modification, human error, false labelling, over-inventorization, transport within and without plants. Accidents have occurred when equipments are not adequately prepared for maintenance by isolation from hazardous materials or not identified correctly leading to the opening of the wrong equipment or hazardous materials were not removed prior to opening. Accidents have also happened when changes are made in the plants leading to unforeseen side effects.

Even well-trained and well-motivated operating personnel make mistakes from time to time. Examples are: they forget to close a valve or close the wrong valve. "They know what they should do, want to do it, and are physically and mentally capable of doing it. But they forget to do it. Exhortation, punishment or further training will have no effect". The author's inference that errors occur, "not in spite of the fact that the man is well-trained, but *because* he is well-trained" is substantiated by the fact of life that a highly trained person tends to relegate routine operations to a lower level of brain function. The conscious mind does not continuously monitor routine operations. Errors also occur when persons do not carry out instructions which they consider unnecessary.

Accidents involving storage tanks are caused by overfilling, overpressurizing, sucking-in and explosions. Accidents involving stacks arise mainly out of choking. Leaks of hazardous materials have great potential for disaster. Most hazardous materials will not burn or explode unless mixed with air and hence the safest method is to keep fuel away from air. One of the commonest errors made at the stage of drawing process flow-diagram is the failure to foresee that "flow may take place in the reverse direction to that intended".

In the Epilogue to the Book Kletz gives brief accounts of the Bhopal disaster, the gas disaster of Mexico City and the gasoline fire of Sao Paulo, Brazil. According to him, the most important lesson to be learnt from Bhopal is the need to develop plant designs which use less hazardous raw materials. "Most chemical engineers have continued to try to *control* hazards by adding to their plants large quantities of protective hardware. Perhaps, now we shall see more interest in way of *avoiding* hazards by inherently safer designs. Applying this philosophy to Bhopal leads us to ask what research, if any, had been done to find routes to the final product that did not involve the production of hazardous intermediates and if it was really necessary to carry such large intermediate stocks".

The book should prove very useful to safety managers, design and maintenance engineers and for students of plant safety in chemical industries.

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Science of Engineering Materials by C. M. Srivastava and C. Srinivasan, (Published by Wiley Eastern Ltd., 4835/24, Ansari Nagar, Dariaganj, New Delhi 110 002), 1987, pp. XII + 462, Price: Rs. 40.

The rapid and fantastic developments made in the last few years in materials science and technology and in superconducting materials during the last few months calls for a better understanding of the structure and property correlations of materials. In this context this book is timely and most welcome.

The book is intended as a two semester course on materials science, solid state chemistry and solid state physics in Indian Universities at graduate level. The introductory chapter as well as the introductions to individual chapters set the tone for the subject. The materials considered are: metals, alloys, amorphous and crystalline solids, polymers and materials for nuclear and space applications. The properties of interest include: electronic, electric, magnetic, thermal, mechanical, acoustic, optical etc. Chapters on bonding, crystal structure, chemical equilibria, reaction kinetics, phase transformations and defects in solids help in the better understanding of the properties of matter both at microscopic and macroscopic level. Lastly, there is a chapter on modern techniques for materials characterization.

The book has few misprints and mistakes. For example: p. 62. The rate equation for third order should be $k [\text{NO}]^2 [\text{O}_2]$. On the same page, the symbol used for activation energy is \mathcal{H} . The reviewer would rather have preferred the commonly used symbol E_a . p. 134. Reference (5) – year of publication is missing. p. 152. Reference (1) – year of publication should be 1974. p. 155. Equation 9.10 Denominator should read product of activities of reactants.

In general, the authors have succeeded in conveying the importance of fundamental principles of science in the preparation of 'Engineering Materials' with desired properties. I have enjoyed reading the book. It is very well written, informative and useful

as an introductory text in materials science. The price of the book is low and within the reach of college/university students. I recommend the book as a text for materials science course in Indian Universities.

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Circulating Fluidized Bed Technology by Prabir Basu, (Published by Pergamon Press Inc., Maxwell House, Fairview Park, Elmsford, New York 10523, USA), pp. 452, Price: \$ 85.

The book contains the invited and refereed papers presented at the First International Conference on Circulating Fluidized Beds (CFB) held at Halifax, Canada, in November 1985. It is divided into sections on hydrodynamics (14 papers), combustion and heat transfer (7 papers), design and operating experience (8 papers), and related processes (8 papers), in addition to the overview section containing 7 invited papers contributed by International experts in their respective areas of research.

The book opens, appropriately, with a fascinating history of the development of the first circulating bed, the fluidized catalytic cracking (FCC) unit, starting from the catalytic research in 1928 to the successful operation of the first commercial FCC unit in 1942. This sets the stage for the succeeding review articles on the fundamentals of hydrodynamics, heat transfer, and combustion, and on applications (combustion, calcination, absorption). The presentations are concise, the information offered is state-of-the-art, and hint at potential areas of research.

The relatively large number of papers on hydrodynamics is a reflection of its importance in the overall CFB process. The majority of the papers report experimental investigations, using beds ranging from 4 cm to 115 cm in diameter, on such fundamental aspects as minimum fluidizing velocity, optimum velocity at high temperature ($\approx 900^\circ\text{C}$), flow regimes, choking, slugging, RTD, and solid density profiles.

Several diagnostic techniques like X-ray, capacitance probes, fibre optic probes, and pressure fluctuation signal analysis are used in the studies.

The combustion studies range from the combustion of carbon electrodes in a 10 cm dia laboratory

unit, to burning of wood wastes in a 5 m dia commercial plant. The lone paper on heat transfer points to the utter lack of reliable information on this important aspect of CFB.

The section on design and practical experience is full of interesting information on the latest in the applied CFB technology. It can be observed that while CFB can be used as a scrubber, calciner, gasifier or a ore reducer, it is as a combustor that the technology is at an exciting take-off stage. In particular, the information on the proposed 150 MWe CFB plant in Canada provides proof of its tremendous potential for utility application.

The final selection contains useful information on some novel CFB concepts like concentric CFB, adjacent CFB, thermomixer, combined and dual systems, and CFB with a draft tube. There is a lone paper on CFB gasifier.

In general, the papers offer the much needed information, though not comprehensive, on several

aspects of CFB. It is surprising, and disappointing, that there is only one reported investigation exclusively on sulphur retention which is one of the most important requirements of any new coal combustion technology. The slick publication, does contain several typographical errors. The labour that the editors have put in to include a 'Discussion' at the end of each paper is not very rewarding. A useful subject index and a list of conference attendees are listed at the end. The Reviewing Committee includes many well-known researchers in the field of fluidized beds.

On the whole this Pergamon publication is a useful addition to the libraries of academicians and practising engineers.

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