

Book Reviews

Genes and signal transduction in multistage carcinogenesis edited by Nancy H. Colburn. Marcel Dekker, Inc., 270, Madison Avenue, New York, NY 10016, USA, 1989, pp 480, \$ 150.

Genes and signal transduction in multistage carcinogenesis according to its editor is "relatively unique on making connections between events triggered at membrane receptors and nuclear gene regulation that may cause cancer". The connection between the events at the membrane level and the expression, suppression and regulation of relevant gene is the molecular biology of carcinogenesis itself.

The book is divided into four parts. The first deals with genetic variants for responses to carcinogens, tumor promoters and growth factors. Part II is on genes that confer susceptibility to neoplastic transformation. Part III is on signal transduction, specifically the role of protein kinases and phospholipases, and Part IV deals with 'stress associated signals and gene regulation'.

Part I has six chapters that provide genetic basis for multistage carcinogenesis. The first three chapters describe studies on genetic control of hepatocarcinogenesis, modulation of mammary carcinogenesis by enhancer and suppressor genes, and genetic determinants of susceptibility for skin tumor. Rodent model has been used in the above studies. These three chapters are lucidly written and provide compelling evidence for genetic control of carcinogenesis at the level of promotion. A gene designated as HCS (hepatocarcinogen sensitivity) has been identified which influences the post-initiation event during hepatocarcinogenesis (Chapter 1, Drinkwater).

Gould and his colleagues propose the interaction of enhancer and suppressor genes for development of mammary neoplasia in rats. They argue that enhancer gene is neither necessary nor sufficient for the development of mammary cancer whereas the loss of suppressor function is necessary but not sufficient for the occurrence of mammary neoplasia. DiGiovanni has addressed the question of the genetic basis of mouse skin tumor promotion in inbred mice using phorbol ester, and the data suggest that most inbred strains studied show similar tumor initiation, and the major genetic determinant for multistage carcinogenesis is at the level of tumor promotion. The work reported in these chapters indicates that promotion-susceptible genes are perhaps different from oncogenes like Ha- or Ki-ras that are implicated in tumor initiation. The other three chapters in Part I deal with genes identified in cell lines resistant or sensitive to growth factors and tumor promoters. All the six chapters in Part I are well written, and provide a wealth of information which is potentially useful to other workers interested in the problem.

Part II deals with isolation, characterisation and cloning of genes involved in tumor promotion. Garrity and his colleagues have focussed attention on mouse promotion sensitivity genes Pro-1 and Pro-2. Dienhardt and colleagues have studied the regulation of gene expression by tumor promoter 12-O-tetradecanoyl-Phorbol-13-Acetate (TPA), and studied its effect on the expression of a variety of genes like ornithine decarboxylase, C-fos and C-myc. They also provide information on the genes and proteins that are induced or repressed by TPA.

Other papers of Part II are 'Gene activation during multistage carcinogenesis in mouse skin' by Bowden *et al.*, 'Tumor promotion by 2, 3, 7, 8-tetrachlorodibenzo-P-dioxin' by Whitlock, 'Genes that

confer susceptibility to neoplastic transformation in rat fibroblast' by Mougneau *et al*, and 'Regulation of human papillomavirus gene expression' by Phelps and Howley.

Bowden and his colleagues have focussed attention on activation of ras oncogenes and have discussed the contradictory results obtained by other workers. They also have presented compelling evidence for differential gene expression, specially of mal sequence during mouse-skin carcinogenesis. Whitlock provided very valuable and authoritative information on 2,3,7,8-tetrachlorodibenzo-P-dioxin, a halogenated aromatic hydrocarbon, and its role in carcinogenesis. This is a complete article on TCDD and reading it was a sheer pleasure. Similarly, 'Regulation of human papilloma virus gene expression' is a well-written and informative article.

Parts III and IV deal with transformation-relevant signal transduction and focus on protein kinases and phospholipases and on stress-related signal transduction. Part IV specially stresses the role of free radicals in signal transduction.

We have come a long way from practically knowing nothing about carcinogenesis two decades back to the discovery of oncogenes, tumor-suppressor genes, growth factors, etc., which play a key role in carcinogenesis. We still have a long way to go to prevent and cure cancer. This is a well-written book and is an earnest effort in that direction. It would enrich any one who could find time for a critical reading. The articles are thought provoking and on the pursuit of understanding the process of carcinogenesis so as to achieve that ultimate objective—prevent and cure cancer.

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Introduction to medical immunology (Immunology Series 150), Second edition, edited by Gabriel Virella, Jean-Michel Goust and H. Hugh Fudenberg. Marcel Dekker, Inc., 270, Madison Avenue, New York, NY 10016, USA, 1990, pp 632, \$49.75.

Although several excellent textbooks describing the rapidly developing discipline of immunology exist, they are not adequate to meet the needs of medical students. The editors have made an effort to compile a textbook, primarily aimed at this group, that covered both the essential basic concepts of immunology and aspects relevant to medical practice that are usually not well developed in introductory textbooks. This revised edition, while retaining the original features (simplified diagrams, question-and-answer sections), incorporates vast new information that emerged since the publication of the first edition.

In the first part, the editors succeeded in clear but concise presentation of basic immunology which aids the reader for better understanding of the immunopathogenesis of various diseases. The second part includes description of techniques dealing with immunoserology, diagnostic immunochemistry and evaluation of humoral and cell-mediated immunity. The third part is devoted entirely to clinical immunology providing a lucid presentation of the basic concepts and latest developments on hypersensitivity, autoimmune diseases, transplantation immunology, tumor immunology, immune-deficiency and immunomodulation. Each chapter contains selected bibliography which will allow interested readers to obtain further information and get access to classical literature. The individual chapters were written by active investigators and experienced teachers. This book, which incorporates the best features of multiauthored and tightly edited volume, will be a major asset for medical students, residents and interns.

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Aquatic toxicology and environmental fate, Volume II, edited by G. W. Suter II and M. A. Lewis. ASTM, 1916, Race Street, Philadelphia, PA 19103, USA, 1989, pp 605, \$74.

Sponsored by the American Society for Testing and Materials (ASTM), through its Committee on Biological Effects and Environmental Fate, the research papers presented at the Symposium on Aquatic Toxicology and Hazard Assessment held in May 1987, are included as the eleventh volume of this series on Aquatic Toxicology and Environmental Fate. This volume is meant to herald the completion of a decade of implementing the paradigm of hazard assessment by testing and comparisons. Aquatic toxicology matured itself as a scientific field only by the end of 1970 and the first phase of investigations largely covered aspects of hazard evaluation through elaborate testing procedures. In the second phase, estimation of the probability of specific undesirable effects of the toxicants and risk assessment was called for. During this phase, newer methods of testing and analyses were evolved and through these efforts, the multifaceted problem of toxicology related to biological effects, manipulation, multiple pollution, cumulative effects of pollution through biological and physicochemical modification of the environment, etc., was sought to be tackled. Meaningful answers to some of the problems that pose a significant challenge to the environmentalists were derived.

This book includes thirty-eight contributed papers, grouped under seven headings - Fate of chemicals in water and sediment, Effluent toxicity, Chronic endpoints: statistical *versus* biological significance, Statistical procedure, Microcosms, QSARs and other data extrapolations and New methods for aquatic toxicology. The quality of papers reflects not only the concerted efforts of the authors but also the depth of involvement of the peer reviewers. The dedicated efforts of the technical editors is laudable. This series is rated as one of the quality compilations, catering to the imminent needs of research workers in the field of aquatic toxicology and environmental biologists would look forward to more such excellent and academically useful publications from the ASTM.

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Computational chemical graph theory edited by D. H. Rouvray. Nova Science Publishers, 283, Commack Road, Suite 300, New York, NY 11725, USA, 1990, pp 331, price not stated.

Theoretical and computational chemistry journals publish increasingly large number of graph theoretical applications. The basic concepts also seem simple enough to learn from first principles. As an added attraction, powerful computational resources do not seem to be required, as reflected by the preponderance of East European and Third World workers in this field. I was therefore curious to read the book under review, despite the multiple adjectives qualifying the title.

The book is an expanded version of a symposium conducted by the American Chemical Society in 1988, containing eight chapters divided into five sections. Certain degree of overlap of topics as well as heterogeneity in presentation and quality is unavoidably present. However, a wide variety of applications is covered, ranging from highly relevant to quite abstract ones.

In the first chapter, J. V. Knop *et al* have reviewed a number of codes for representing molecules in computers, an important problem in developing useful databases of chemical structures and reactions. Several procedures are compared and evaluated with respect to some ideal requirements. Evidently, considerable difficulties remain, most of the codes being restricted to special classes of molecules. It is interesting to note that the authors criticize the lack of precision of IUPAC rules and the conservative approach of *Chemical Abstracts Service* in their choice of molecular codes.

Chapters detailing exotic applications of graph theory follow. D. Bonchev has reviewed quantitative definitions of complexity. Thus, indices have been worked out for complexities of molecular structures and electronic structures, among other things (complexity of man is apparently 10^{25} to 10^{28} bits!). Not surprisingly, the problem lies not in the computing part, but in defining the concept of complexity itself.

A prolific worker in this area, K. Balasubramanian, has contributed some of his recent applications. While the chapter abounds in many details (e.g. a ten page table of the character of S_{11}), it is difficult to discern chemically interesting applications. The importance of enumerating equivalent classes of nuclei in multiple quantum NMR is stated, but it is not made clear how the graph theoretical approach has simplified the problem for the everyday spectroscopist. A subsequent chapter by H. Hosoya describes the technical details involved in counting polynomials, a procedure required for many applications.

Graph theory has been widely used in electronic structure calculations. A representative application for computing Kekule structures and related conjugated circuits in hydrocarbons is presented by D. J. Klein *et al.* Results for buckminsterfullerene (C_{60}) and the larger C_{240} cage molecule are discussed.

The most interesting applications in the book deal with quantitative structure-activity relationship (QSAR) studies related to drug design. Different approaches to the quantitation of molecular shapes and structures have been discussed. The definition and use of kappa values (L. B. Kier), chi values (L. H. Hall), and a variety of other graph theoretical indices (S. C. Basak *et al.*) have been reviewed. Applications (e.g. SARs for phenol toxicity to Fathead Minnows) are discussed rather briefly. However, a full chapter by P. C. Jurs and P. A. Edwards is devoted to the use of such indices for correlating structures and activities of olfactory stimulants.

Computer-based drug design is considered synonymous with high-tech graphics methods. P. G. Mezey forcefully argues the case for alternative nonvisual, algorithmic approaches for defining structures and shapes of molecules. With increasing reliability of molecular structure and similarity indices, these studies are likely to find widespread acceptance, although they are unlikely to replace visual evaluation of structural compatibility.

In the final chapter, M. S. Lajiness discusses computer-based screening procedures for selecting compounds for specific activity. Three methods employing different measures of molecular similarity are compared with a specific example.

The book is not meant as an introduction to chemical graph theory. However, those with a basic knowledge of the concepts involved would find a quick reference to a representative range of chemical applications that are currently being attempted and to the quality of results obtained using graph theory.

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Weak superconductivity edited by S. Benacka and M. Kedro. Nova Science Publishers, Inc., 283, Commack Road, Suite 300, Commack, New York, NY, 11725, 1990, pp 289, \$ 87.

The book is an outcome of the Fifth Czechoslovak Symposium on Weak Superconductivity held at the Smolenice Castle from May 29 to June 2, 1989. There were over seventy participants and the book under review contains 51 articles on the subject. By weak superconductivity the conference intends to highlight research work on weak links between two superconductors *via* tunnel and bridge

junctions. Various techniques are used for measuring some physical properties. These are SQUIDS (superconducting quantum interference devices), multichannel magnetometry and computer simulation of interferometers. Such studies have impact on various fields, for example, magnetometry, medicine, metrology, radiometry, etc.

The interesting feature of the conference was the covering of recently discovered high- T_c superconductors. As expected, the papers are concerned with the preparation of thin films of such materials by vacuum-deposition techniques, and their studies by means of both dc and rf methods, tunnel and micro-contact spectroscopy, rf QUIDS, etc.

As the conference is addressed to the new superconductors the volume is a valuable document for researchers in this field. Most of the papers are devoted to experimental techniques, measurements and results. A few contributions are concerned with theoretical analysis of the experimental data, for example the model of the low-field non-resonant absorption of microwaves in high- T_c superconductors, analysis of the dynamic reduction of critical current in undamped Josephson junction, numerical simulations for fast-Josephson devices, etc., to name a few.

The majority of the contributions is from the workers in Czechoslovakia and adjoining countries. This helps the readers in picturing the activities going on in these countries in the new fast-emerging field. The papers are technically sound and the presentation is professionally done. The volume does not seem to suffer from the usual mistakes of conference proceedings published in the past. Nova Science has done a good job.

The book is recommended for libraries and workers in this fast-growing field of high- T_c superconductors.

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Understanding relativity by Stanley Goldberg. Birkhauser Verlag AG, Ringstrasse 39, CH-4106, Therwil, Switzerland, 1984, pp 474, S.Fr. 60.

A large number of books on the special theory of relativity, technical, semi-technical and popular, have appeared since the creation of the subject in 1905 by Albert Einstein. Although scientists such as Lorentz, Poincaré and others had provided the mathematical steps a few years earlier, it was Einstein's 1905 paper which made the physics of relativity clear and projected the radical departure from the Newtonian concept of absolute space and absolute time. The scientific world was, as if, shaken from a stupor.

This book by Stanley Goldberg, a science historian, is scholarly written and the presentation is full of fascinating anecdotes. The author's aim has been to trace the origin of special relativity and gauge the impact of this truly scientific revolution on scientists and laymen.

The book is divided into three parts distributed over 11 chapters ending with 6 appendices, bibliography, etc.

First, we have the treatment of science, logic and objectivity and social institution of science. Then we are exposed to the fallacies of the classical (Galilean) principles of relativity and Newtonian mechanics. With this background, the presentation of the Einstein's special theory of relativity and its application, for example, clock paradox, length contraction, time dilatation, mass energy relationship along with four-dimensional analysis appear logical and proper. There is a short stint on the general theory of relativity.

In part II, we are exposed to the early response to the special theory of relativity from 1905–1911. This covers the French, the British and the American response and how scientists such as Planck, von Laue, Poincaré, Lodge, Lewis and Tolman reacted. It concludes with the popular response to this scientific revolution.

In part III, we are taken from response to the assimilation of relativity by the scientific community. The period covered is 1911–1919 and 1920–1980 and how the developments became an established pillar of the modern scientific edifice. How this field starting from logically sound physics developed into far-reaching philosophical and psychological domain is treated in a splendid manner.

The appendices give the mathematical derivations of some important results and they constitute a valuable addendum for technical understanding.

The author has done an excellent work in writing a book in a manner which will help readers to have a clear understanding of relativity. The book is printed well and has a large collection of photographs and figures which keep the interest of the readers alive.

The book is a must for libraries and scientists interested in the field.

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Formation and control of optical wavefronts edited by P. P. Pashinin, translated from the Russian by K. S. Hendzel. Nova Science Publishers, Inc., 283, Commack Road, Suite 300, Commack, New York, NY 11725, USA, 1989, pp 209 + viii, \$ 75.

Adaptive optics (AO) is an emerging technology, which at its core is concerned with the development of materials and techniques for the fabrication of what are known as AO elements. Human 'eyes' (as also the eyes of other living beings to a greater or lesser extent) can be cited as examples for AO elements. Therefore, in a way, the R & D activities in the AO field can be described as efforts to replicate the functions of optical elements such as the human eyes. In other words, the field of AO is concerned with the development of materials and techniques for shaping optical wavefronts in real time. The real challenge for the scientists/engineers working in the AO field lies in the development of large aperture, light weight, and flexible optical elements. Rigid and inflexible optical elements made out of glass, for example, would be very heavy if they are to be of large aperture. In the manufacture of AO elements, like in the case of their conventional counterparts, material selection, design, fabrication, and testing are the important steps. The present volume deals with some of the above-mentioned aspects of the AO elements.

The book under review is a volume in the series portraying the Proceedings of the Institute of General Physics, Academy of Sciences of the USSR, the series editor being none other than the well-known laser physicist and Nobel laureate Prokhorov.

The volume contains three chapters. The first one deals with the subject of the development of AO mirrors based on metallized polymer films. The mirrors are intended for use at the wavelengths corresponding to near infrared (1.06 μm) and middle infrared (10.6 μm) regions of the electromagnetic spectrum. Such mirrors find a place, for example, in the fabrication of space telescopes. The authors of this chapter, Voljak *et al.*, present the results of their experimental and theoretical investigations on the radiation resistance of metallized polymer films and the fabrication of mirrors with adjustable radius of curvature.

In the second chapter, the author Koryakovskiy *et al* discuss the use of the well-known Talbot phenomenon for the testing of the wavefronts emanating from large aperture systems such as, for example, systems using mirrors of the type mentioned under chapter one. Also, the Talbot method is used for testing the wavefronts encountered in some of the high-power modern lasers. The authors have presented a detailed account of the diffraction theory of the Talbot effect and discussed its application potential in the field of AO.

The third chapter by Lukishova *et al* deals with the problem of shaping the intensity profile of light beams using apodized diaphragms. Apodization is a well-studied technique in optics, and the authors have tried to indicate its usefulness in the brightness enhancement of neodymium-glass-based laser systems. After the necessary survey of the existing literature the authors discuss the possibilities for using rare-earth-doped fluorite in the manufacture of apodized diaphragms and the applications potential of apodized diaphragms in high-power laser systems.

Each chapter contains a fair amount of references which should help the reader wishing to get more information. The material presented in this volume, however, is targeted towards the specialist. The non-specialist (and I feel even the specialist) would be immensely pleased to go through the book (and may even be pleased to buy it) if only it contained a Preface (in the form of an overview of the AO field) by the editor indicating its scope and target audience. I find that this has been the serious deficiency of all the volumes that have come out in this series. Therefore, the natural habitat for such a volume seems to be a public library rather than the bookshelf of an individual. I doubt whether at the stated price of \$75 many individuals would like to buy the book.

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Metal optics and superconductivity edited by A. I. Golovashkin. Nova Science Publishers, Inc., 283, Commack Road, Suite 300, Commack, New York, NY 11725, 1989, pp 285, \$106.

Metal optics and superconductivity is a 285-page long collection of seven articles, edited by A. I. Golovashkin. The first three articles are devoted to theoretical and experimental study of the normal-state metal optics of 3d and 4d transition elements, and intermetallics of A15 and B1 structure. The remaining four articles deal with certain superconductive characteristics of these materials, specially the tunneling gap singularities, experimentally and theoretically. Emphasis is on quantitative first principle calculations and detailed comparison with experimental data.

The first article in the collection presents a microscopic calculation of the complex dielectric function and the electron energy-loss function for fast electrons for several simple, transition and noble metals based on the LTMO band structure determination with the muffin-tin potential, calculated self-consistently by the local density-functional method. A detailed comparison is made with the experimental data on the dielectric function over the infrared and visible frequency range. There is a revealing discussion of the inter- and intra-band effects, local-field and exchange-correlation effects on the macroscopic dielectric constant of a crystal. The article is very readable and self-contained, prefaced with a discussion of the partial f-sum rules clarifying the notion of effective number density of electrons when the conduction and the core-electron excitations overlap.

The second article presents a detailed experimental discussion of the dispersion of complex dielectric

function for the two important A15 materials Nb-Al and Nb-Ge in the infrared-visible-ultraviolet spectral region and at two temperatures. This study brings out an important point, namely, the possible thermal transfer of oscillator strength from the long-wave inter-band transition to the intra-conduction band transition. The same effect is seen in NbN with the B1 structure as discussed in detail in the third section.

The remaining articles discuss the Josephson and the quasiparticle tunneling and Andreyev reflection with a detailed review of the subharmonic and harmonic gap singularities in the I-V characteristics for different kinds of weak links with 'direct conductivity' (and tunnel junctions with 'short') made from NbN and several A15 intermetallics.

This collection of articles is clearly addressed to specialists and can serve as a resource book. Given that optical conductivity is perhaps the best probe of the dynamics of conduction and valence electrons, relevant to metal optics of reflecting mirrors in the infrared and ultraviolet spectral region, and the normal state transport properties of the novel high- T_c superconductors, the book should be useful to physicists and material scientists alike. Strongly recommended for libraries.

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Phase conjugation of laser emission edited by N. G. Basov (50th Anniversary Edition, Proceedings of the Lebedev Physics Institute, Academy of Sciences of the USSR, Series Editor N. G. Basov, Vol. 172). 1988, pp vii + 240, \$76 (US & Canada), \$91 (elsewhere), Nova Science Publishers, 283 Commack Road, Suite 300, Commack, New York, NY 11725.

The first volume in the series 'Proceedings of the Physics Institute' was published in 1936 and over the years the readers of the Proceedings of the Lebedev Physics Institute have become familiar with many of the discoveries and achievements of the Institute's scientists. The first six volumes of the series were published over a 20-year period, 26 in the subsequent 10 years, and now, nine to ten a year!

The present volume contains the results of research on the phase conjugation of light fields with complex spatial temporal, spectral and polarization configurations by hypersound-stimulated scattering and on the phase conjugation of emission from pulsed CO₂ lasers by four-wave mixing.

Although the practical possibility of achieving a reversed wave was first discovered in holography, it was during a study of the laser emission conversion by means of stimulated Brillouin scattering that the discovery of the phenomenon of self-conjugation by stimulated scattering was reported by B. Ya. Zeldovich *et al* in 1972. These pioneering studies by the Lebedev Physics Institute prompted interest in the problem of phase conjugation and its possible practical applications specially in regard to self-adjusting laser-target system for laser thermonuclear fusion and dynamic distortion correction. During the past two decades, a search for phase conjugation techniques based on other types of nonlinear optical mixing, particularly parametric three- and four-wave mixing, has been going on in many laboratories all over the world. Attempts are currently being made to investigate phase conjugation not only in the visible region of the spectrum but also in the ultraviolet and infrared regions and with supernarrow and long pulses, depolarized emission, composite laser beams, intermittently pulsed operating conditions.

The present volume consists of two parts. The first one has three chapters and deals with the formation of the space-time structure of light waves by stimulated scattering in hypersound. The

Quantum Radiophysics Laboratory of the Lebedev Physics Institute has been concentrating on the self-conjugation of light by stimulated Brillouin scattering from 1978 as it is more promising for the development of high-power laser systems than the degenerate four-wave mixing.

Chapter 1 contains an exhaustive theoretical treatment of the pump-correlated Stokes fields along with the influence of gain saturation and the features of scattering of spatially noncoherent emission. A number of original techniques for achieving phase conjugation of laser beams in zero-threshold scattering and of depolarized emission narrow light pulses, etc., have been indicated. The authors have also discussed the methods of determining the essential parameters involved in Brillouin scattering using interferometers containing phase conjugate mirrors. In addition, they have dealt with practical schemes for increasing the efficiency of phase-conjugation mirrors. Unfortunately, the translator does not seem to have appreciated the fact that for any one without some knowledge of Russian and the subject of optical phase conjugation, the notation may cause some difficulty. For example, with the current interest all over the world in nonlinear optics, a notation like P_{NL} or P^{NL} would have been more appropriate than P(HJ).

In a similar way, on page 7 in bibliography, it could have been Born, M. and Wolf, E. *Principles of optics* rather than Boln, M and Vol.' f. E. In many equations, the impression is not clear; for example, (ϵ) in several places and also the symbol for the amplitude of the field could have been different from that for the dielectric constant, that too on the same page. A little attention to the letters used in equations would have made the *Proceedings* self-contained and useful even for a researcher commencing work in this field.

Chapters 2 and 3 are concerned with the experimental investigation of all aspects of phase conjugation discussed theoretically in Chapter 1. Since Academician Basov and his coworkers are pioneers in this field, Chapter 2 will be found extremely useful by all research workers in the field.

However, in this chapter also, one wonders if it would have been better to bring the notation in the formulae in tune with the translation. For example, instead of $\Gamma_{KOP}/\Gamma_{HKOP} = 2$, it could have been $\Gamma_{cor}/\Gamma_{uncor} = 2$ so that it is immediately clear that it is the ratio of the gain increment of the pump-correlated Stokes field to the gain increment of the pump-uncorrelated emission.

In the second half of the volume the subject of phase conjugation by four-wave mixing in nonlinear media has been dealt with in detail. The development of phase-conjugation techniques in the infrared is of strategic importance as the most powerful and efficient HF, DF, CO and CO₂ lasers operate in this spectral region. Four-wave mixing has been the chief method of achieving phase conjugation in the infrared. However, the efficiency is considerably lower than what has been achieved in the visible region. Hence, the most important task involves the search and investigation of nonlinear media which will give high-reflection efficiencies (up to 100% and above) and this requires a better understanding of the physical processes underlying the phase-conjugate mirrors, like their dynamic reflection range, polarization and spectral properties and the quality of phase conjugation. A brief account has been given in Chapter 1, of the second half of the *Proceedings*, of the physical principles of phase conjugation by four-wave mixing. This is followed by a description of the experimental assembly for investigating four-wave mixing and phase conjugation with a pulsed CO₂ laser. Chapter 3 deals with reflection by FWM (four-wave-mixing) in semiconductors (InAs and InSb) and BC₁₃- and SF₆- resonant molecular gases.

In Chapter 4, the characteristics of optical phase conjugation which play an important role in applications such as dynamic reflection range, reflection of multifrequency emission, polarization properties and above all phase-conjugation quality have been dealt with briefly but in a critical way. In conclusion, they have not only formulated the important results but pointed out the essential

directions in which one may usefully undertake research such as four-wave mixing theory in molecular gases in nonstationary mixing, development of new methods of phase conjugation and exploring phase conjugation by stimulated Brillouin scattering in the medium infrared.

The volume is not only an excellent account of the contributions of the Lebedev Physics Institute to phase conjugation of laser emission, but also a critical review of this subject up to 1986 and is a valuable reference source for researchers in this field.

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Geology of mineral deposits by V. I. Smirnov (first Indian reprint), Nem Chand and Bros., Civil Lines, Roorkee, U.P. 247667, India, 1989, pp 520, Rs. 60.

Smirnov's *Geology of mineral deposits* published in 1962 was made available to the English-speaking world in 1976 by Mir Publishers and the first Indian reprint in 1989 by Nem Chand. The book is perhaps the most important general work on ore deposits in the Russian literature. Since its appearance, plate tectonic hypothesis has achieved its present level of popularity. It would be a most mistaken view if some readers think that this renders obsolete the geosynclinal conception which underlies so much of this book. Dunham feels that Smirnov's philosophy is in no way invalidated by the recent exciting progress in global tectonics and his book still remain an influential text.

There are 14 chapters in this book, starting with an excellent historical survey on mineral deposits. The succeeding chapters on: Areas of distribution, geological environment of the ore formation; magmatic deposits; pegmatitic deposits; carbonate deposits; skarn deposits; albitite-greisen deposits; hydrothermal deposits; pyritic deposits; deposits of weathering; placer deposits; sedimentary deposits and metamorphogenic deposits are described with excellent illustrations. There is a lot to be learnt from this book; it is a compulsory reading for those who teach economic geology. The cost of this 520-page book is just Rs. 60.

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Fuel science and technology handbook edited by James G. Speight. Marcel Dekker, Inc. 270, Madison Avenue, New York, NY 100016, 1990, pp 1408, \$ 234.

Environmentalists may continue to heap opprobriums on it, dooms-day Cassandras may continue to identify it as the prime culprit for the green-house effect, but fossil fuel shall continue to fuel the inexorable progress of the chariot of human civilization. For generations to come, engineers, scientists and technologists will have to be taught the art of efficacious utilization of this ultimately limited resource of energy. To that extent, this volume presents under one cover, an up-to-date state of the art on the subject. Like any good handbook, it is basically informative, bringing an extensive, but by no means exhaustive, bibliography well up to 1988. It is not that a user will learn the intricacies of the technology by gleaning through these pages, but he/she will have sufficient overview to make his/her choice from among the alternatives and will refer the appropriate literature for technical details.

The book contains five sections, one each on petroleum, coal, natural gas, tar sand and oil shale. Technologies for the utilization of the first three are, of course, the most advanced and proven, while

those for the last two are tentative and awaiting commercial success. Each section deals with the origin, occurrence and recovery, classification, composition and properties, and all aspects of beneficiation and utilization. The exploitation of tar sand deposits is still tentative, with only a token contribution to our insatiable energy need coming from two commercial ventures. The interest in oil shale, by far the largest of all fossil fuel resources of the world, is intimately linked to the crude oil price; its future looks good when the petroleum price increases, and bleak when it nosedives. Eventually, however, the exploitation of tar sand and oil shale has to come to rescue us from the energy crisis.

In sum, this handbook will surely find its place in the book shelves of all fuel technologists, besides it being stocked in all libraries.

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