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The National Bureau of Standards has published an annotated bibliography on soft x-ray spectroscopy, which contains a list of approximately 550 references on pertinent literature for 1950-60. Emphasis is on application of soft x-ray spectroscopy to the study of valence band electronic states in metals and alloys; references on apparatus and experimental problems are also included, as are references which help corroborate soft x-ray data with other results. (Superintendent of Documents, Government Printing Office, Washington 25, D.C. $1. Order NBS Monograph 52)

A comprehensive guide to the uses of water resources in the U.S. has been prepared by Water Information Center, Inc. Water Atlas of the United States presents state-by-state information on precipitation, streamflow, evaporation, and other facts important to the understanding of water resources. The atlas contains 40 color maps, all of equal size and mileage scale. (Water Information Center, Inc., 60 East 42 St., New York 17. $6.95 plus mailing charges)

The proceedings of the symposium on plant embryology (Delhi, India; 11-14 November 1960) are now available. The 274-page publication includes 29 papers covering descriptive, developmental, phylogenetic, comparative, and experimental aspects of embryology, and special modes of reproduction. (Under Secretary, Publications Directorate, Council of Scientific and Industrial Research, New Delhi, India)

Scientists in the News

Donald M. Swingle, meteorological division, U.S. Army Electronics Research and Development Laboratory, Ft. Monmouth, N.J., has been named chairman of the National Task Group for Meteorology, part of the federal government's interdepartmental committee for atmospheric science.

A. Robert Goldfarb, formerly associate biochemistry professor, Chicago Medical School, has been appointed chief, section of biochemistry, research division, Sinai Hospital, and associate professor of biochemistry, Wayne State University Medical School, Detroit, Mich.

Charlotte Campbell, former chief of the medical mycology section, bacteriology department, Walter Reed Army Institute of Research, has been appointed associate professor of medical mycology, Harvard University faculty of medicine.

Floyd A. Odell has become director of biomedical sciences for the Field Emission Corporation, McMinnville, Ore. He formerly was technical director of research, U.S. Army Medical Research Laboratory, Fort Knox.

François Chapeville, biochemist working at Saclay Nuclear Research Center, near Paris, has been awarded the Charles Leopold Mayer prize for his research on the role of "adaptors" in the transcription of genetic information by ribonucleic acid.

Max Schlamowitz, of Roswell Park Memorial Institute, has been named associate professor of microbiology at Baylor University College of Medicine.

British scientists who plan to visit the U.S. during the coming year: P. M. A. Rabbitt, of the Medical Research Council, Applied Psychology Research Unit, Cambridge, will spend 1963 at the National Institutes of Health, Bethesda, Md.

H. A. Johnston, member of the Population Genetics Research Unit of the Medical Research Council, Oxford, plans to attend the meeting of the Pan American Sanitary Bureau, in Washington, D.C., 5-7 January before traveling to Panama, Mexico, and Colombia, in connection with a survey on congenital malformations.

D. N. Rhodes, principal scientific officer, Low Temperature Research Station, Cambridge, will be in the U.S. 7-19 January. He will attend the International Conference on Radiation Research, Natick, Mass., and visit Seattle, Wash.; Corvallis, Ore.; Davis, Calif.; San Francisco, Calif.; and Washington, D.C.

James C. Elms, formerly director of space and electronics programs at Ford Motor Company's aeronautical division, has been appointed deputy director for development and programs at NASA's Manned Spacecraft Center, Houston, Texas, effective January 1963. He has been succeeded at Ford by Charles H. Sword, previously manager of the contract administration office.

John H. Carter, former president of Itel Laboratories, has been elected president and chief executive officer of Allied Research Associates, Inc., Concord, Mass.

Wilfred A. Gibson, chief, statistical research and consultation unit, Army personnel research office, has been appointed psychology professor at Queens College, New York.

J. Martin Cross, of the Verona Pharma Chemical Corporation, Newark, N.J., has been named group leader of organic synthesis research at the Mobay Chemical Company laboratories, New Martinsville, W.Va.

Derrick T. Vail, professor of ophthalmology and chairman of the department, Northwestern University medical school, has been elected next president of the International Ophthalmological Congress.

John P. Hagen, associate director for long-range planning of the National Aeronautics and Space Administration, has resigned to become professor of radio astronomy at Pennsylvania State University. He plans to continue as a consultant to NASA.

Willis W. Wagener, senior forest pathologist with the U. S. Forest Service experiment station, Berkeley, Calif., has retired after 42 years with the United States Department of Agriculture. He will serve as a consultant to the station.

Recent Deaths

Lucy W. I. Bassett, 54; assistant biology professor, Loyola University, Los Angeles; 29 Nov.

J. Wallace Graham, 56; president, Toronto Academy of Medicine.

Paul D. Lamson, 78; professor emeritus and retired chairman, department of pharmacology, Vanderbilt University school of medicine; 3 Oct.

Curtis C. McDonnell, 87; retired chief chemist, Department of Agriculture insecticide division; 15 Dec.

Erratum: In the report "Increased sensitivity of taste and smell in cystic fibrosis" by R. I. Henkin and G. F. Powell [Science 138, 1107 (7 Dec. 1962)], the range given in column 7 for detection thresholds for taste of HCl among normal volunteers should have been 0.5-6, not 0-6 n mole/filter.

Erratum: In the letter "Time Dilatation" by L. O. Pilgram [Science 138, 1180 (7 Dec. 1962)] the term light process in the last line of column 1 should have been life process.
dislocations are involved in this discussion, they are not specifically considered from a geometrical standpoint.

In two related chapters Urusovskaya first discusses the theory of asterism (smearing of Laue reflections as a result of plastic deformation), as a prelude to discussing deformation without asterism, and then kink bands and related plastic features. The common aspects of these phenomena are discussed.

Indenbom specifically treats the dislocation theory of plastic deformation. His treatment is quantitative and concerned especially with the interaction between dislocations.

Miuskov examines the nature of intracrystalline boundaries, including both small-angle and large-angle boundaries. The discussion includes the various theories of such boundaries, the detection of these boundaries by etching, the motion of boundaries under stress, their surface energies, and diffusion along them.

This book assumes a general knowledge of crystal plasticity. Its subject matter centers on the dislocation explanation of the plasticity of crystals. Most, if not all, of the material has already been published elsewhere; the value of the book is in integrating the material. I found the chapters by Urusovskaya, on deformation with and without asterism and on deformation related to kinking, most interesting and very readable.

M. J. Buerger
Department of Geology and Geophysics, Massachusetts Institute of Technology

Applied Mathematics


This textbook of advanced calculus for students of applied mathematics is a revised and enlarged version of the author's earlier book, Advanced Calculus for Engineers [Prentice-Hall (1948)]. In its present form the book is roughly comparable to Sokolnikoff and Redheffer's Mathematics of Physics and Modern Engineering [McGraw-Hill (1958)], although, on the whole, it is both less comprehensive and more "integrated" than the latter. It is also some 260 pages shorter and somewhat more heavily weighted in the direction of ordinary and partial differential equations.

Consideration of several examples may clarify this comparison. In Sokolnikoff and Redheffer, numerical analysis is the subject of a final separate chapter of some 60 pages, which touches on iteration methods, interpolation, approximation, and numerical integration of differential equations. In Hildebrand, numerical methods appear mainly as a part (some 25 pages) of an opening four-chapter sequence on ordinary differential equations. The Newton-Raphson iteration technique is also given brief notice in a much later chapter in which Jacobians have been introduced, while the method of Stodola and Vianello is noted in connection with boundary value problems in still another chapter.

Again, in place of separate systematic study, which Sokolnikoff and Redheffer award the subject of infinite series in a chapter of more than 100 pages, Hildebrand integrates parts of this subject into treatments of ordinary differential equations (nearly 70 pages), boundary value problems, partial differentiation (Taylor's series), and functions of a complex variable.

Hildebrand introduces the Laplace transform early as a method for ordinary differential equations and uses it again in connection with a particular partial differential equation and in inversion via contour integration. Here Hildebrand's 40-page introductory treatment, which concludes with a table of some 40 particular Laplace transforms, is considerably more full and comprehensive than the 15-page appendix on the Laplace transform in Sokolnikoff and Redheffer.

Occasionally, Hildebrand's definitions are less than precise. For instance, the first sentence in chapter 8, on partial differential equations, reads as follows: "A partial differential equation is said to be linear if, when the equation has been rationalized and cleared of fractions, no powers or products of the unknown function or its partial derivatives are present." Is the partial differential equation

\[
\frac{\partial u}{\partial x} + \sin \frac{\partial u}{\partial y} = \tan u
\]

linear? And what of partial differential equations which cannot be rationalized and cleared of fractions?

Truman Botts
Department of Mathematics,
University of Puerto Rico, Rio Piedras

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Meetings
Quantum Chemistry and Solid State Physics

Something of a mile-marker has been reached in the area of testing and applying quantum theory. This was the feeling of many who attended the Symposium on Quantum Chemistry and Solid State Physics, 27 August to 1 September 1962, as they listened to W. Kolos (Polish Academy of Science) describe a successful and precise calculation of the four-body problem that is the H₂ molecule (two electrons and two protons), a calculation which accounted for nuclear motion and incorporated 80 terms.

The symposium was sponsored by the Quantum Chemistry Institute at Uppsala University under the stimulating guidance of Per-Olov Lowdin. It was held at Rättvik, a tiny Swedish resort town. The topics of discussion were numerous, from the four-body problem already mentioned, to considerations of density matrices in many-body theory, solid state theory, and ligand field theory, to recent work in quantum biology, including suggestive considerations of the tunneling of protons that could affect gene, DNA, RNA, and protein synthesis. It was apparent in the discussions that the means of application, and even to some extent the quantum theory itself, in certain of its details and in its time dependency, is still being tested. Much work that was reported dealt with the means available now to circumvent the considerable mathematical and computational difficulties which beset the quantum chemist.

Progress in solving problems with the Schrödinger equation has been made on several fronts. J. Coleman, P. O. Löwdin and F. Sasaki described advances in the density matrix approach in many-body theory, while N. Bazley and D. W. Fox told of new methods for determining lower limits of the energy levels of atomic and molecular systems. The problem of electron–electron interaction (correlation) was discussed in terms of the alternant molecular orbital scheme (different orbitals for different spins) by R. Pauncz for hydrocarbons, by G. Dermit for diamond, and by J. W. Moskowitz for the interesting hypothetical molecule, annular H₆.

A statistical theoretical study along the lines of the Fermi-Thomas approach was described for atoms by R. Gaspar. The evaluation of zeta-function expan-
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sions for molecular integrals was described by Moskowitz. Remarks on linked-cluster expansions were presented by Löwdin. An interesting extension of density matrix theory in a Hückel-type approximation was made and applied to conjugated hydrocarbons and benzene compounds containing heteroatoms by H. Looyenga of Nederlandse Centrale Organisatie, T.N.O., Delft.

In masterful presentations, B. and A. Pullman described the considerable progress in understanding the relative reactivity and natural selection of many molecules of biological importance. Quantum chemistry has been helpful in interpreting the role of enzyme constituents important in oxidation reduction reactions, in the calculation of stability to ultraviolet radiation, in evaluation of the role of functional molecular portions (as opposed to whole molecules) in carcinogen action, and in the evaluation of hydrogen bonding through the amino acid residues as potential pathways for electron transfer. Löwdin presented an interesting and potentially fruitful notion of protonic tunneling between the doubly hydrogen-bonded base pairs of the double-stranded DNA molecule. If such a process did occur, it was pointed out, then inversion of pairing and other faulty storage of information could occur. This then has direct implications in the problems of mutations, evolution, aging, and tumor inception.

Recognition was given the perennial problem of phase determination in electron and x-ray diffraction determinations by K. Hedberg.

There are new areas where quantum chemistry is being used to solve major problems. The determination of the cage-like structure of the many new polyhedric organic and inorganic molecules was discussed by R. H. Hoffman, and the many-electron approach of Nazaire-Pines to the treatment of the dielectric constant of a solid and the consequent estimation of London intermolecular force terms was developed by Jan Linderberg. H. A. Pohl discussed the nature of carrier transport vis-à-vis molecular overlap in molecular solids with special reference to conductivity and piezoresistivity; the existing gap in the theory of carrier mobility in solids in the transition range between that well described by wave-packet "drifting," and that describable by "hopping" processes (between about 500 and 0.01 cm²/volt sec); the much needed extension of theory using random coordinate spacings to the problems of electronic transport processes in amorphous solids and liquids; and the problem of the near identity of the activation energy of conduction to the lowest triplet energy in molecular solids of organic nature. Finally, Coleman made a laudatory reference to the equation of Wentzel for many particles which is relativistically invariant; and Löwdin presented a challenging discussion of the reaction rate problem in terms of the wave mechanical evolution operator for the time dependent Schrödinger equation. Löwdin urged a fresh consideration of the evolution operator in treating kinetic problems and expressed confidence that it would become a powerful tool.

The attending scientists, who came from many nations, united in expressing their deep appreciation for the hospitality extended them by their Swedish hosts, and for the stimulating approaches in quantum chemistry presented at the Symposium.

HERBERT A. POHL
Department of Chemistry,
Polytechnic Institute of Brooklyn,
Brooklyn, New York

Forthcoming Events

January
21-23. Institute of the Aerospace Sciences, annual, New York, N.Y. (IAS, 2 E. 64 St., New York 21)
22-24. Reliability and Quality Control, natl. symp., San Francisco, Calif. (L. W. Ball, Boeing Co., P.O. Box 3707, Seattle 24, Wash.)
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