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In line 2 on page 1581 the words "Equation 2a" should have been followed by a colon, *not* placed in parentheses. The same is true of "Equation 2b" which occurs five lines below eq 3 and "Equation 3" which occurs two lines below that. The point is that the sentences following these words discuss each of the equations referred to, not the sentences which precede them.

**Additions to Bicyclic Olefins. VIII. Electrophilic Addition of Trifluoroacetic Acid and Deuteriotrifluoroacetic Acid to Norbornene and Related Bicyclic Olefins. Evidence for the Capture of the Unsymmetrical (Classical) 2-Norbornyl Cation** [*J. Am. Chem. Soc.*, **97**, 2469 (1975)]. By HERBERT C. BROWN\* and KWANG-TING LIU, Richard B. Wetherill Laboratory, Purdue University, West Lafayette, Indiana 47907

On page 2474, first column, 14 lines down, the sentence, "The 2-norbornyl cation has not been captured in unsymmetrical form in some 11 different reactions," should read: "The 2-norbornyl cation has now been captured in unsymmetrical form in some 11 different reactions."

**Study of Olefin Proportions from E2 Reactions of Secondary Alkyl Bromides. Mechanistic Implications** [*J. Am. Chem. Soc.*, **97**, 2477 (1975)]. By IRVING N. FEIT,\* ILENE KAIN BREGER, ANTONIA M. CAPOBIANCO, THOMAS W. COOKE, and LARRY F. GITLIN, Department of Chemistry, C. W. Post College of Long Island University, Greenvale, New York 11548.

On page 2479, one sentence is repeated and another left out. Lines 14-11 from the bottom of the right-hand column should read:

"... weak base. Ring strain is advanced as the explanation for the unexpectedly slow reactions of the alicyclic tosylates. Rather than invoke . . ."

**A Fluxional, Catalytically Active Metal Cluster, Ni<sub>4</sub>[CNC(CH<sub>3</sub>)<sub>3</sub>]<sub>7</sub>** [*J. Am. Chem. Soc.*, **97**, 2571 (1975)].

By V. W. DAY\* and R. O. DAY, Department of Chemistry, University of Nebraska, Lincoln, Nebraska 68508, and J. S. KRISTOFF, F. J. HIRSEKORN, and E. L. MUETTERTIES,\* Cornell Material Science Center and Spencer T. Olin Chemistry Laboratories, Cornell University, Ithaca, New York 14853.

Line 14, left column of page 2572 should read, "... and shorter than the 2.508 Å value . . ."

**The Structure of Heptakis(*tert*-butyl isocyanide)molybdenum(II) Hexafluorophosphate, a Seven-Coordinate Complex with C<sub>2v</sub> Monocapped Trigonal Prismatic Geometry** [*J. Am. Chem. Soc.*, **97**, 2697 (1975)]. By DAVID L. LEWIS and STEPHEN J. LIPPARD,\* Department of Chemistry, Columbia University, New York, New York 10027.

In the Abstract, change  $Z = 4$  to  $Z = 8$ .

On page 2698, left column, line 27 should read: (00 $\bar{1}$ ), (110), ( $\bar{1}\bar{1}0$ ), ( $\bar{1}10$ ), and (1 $\bar{1}0$ ); etc.

**Carboxyl-Assisted Hydrolyses. Synthesis and Hydrolysis of Diphenyl *cis*-2-(3-Carboxy)norbornyl Phosphates** [*J. Am. Chem. Soc.*, **96**, 6492 (1974)]. By S. STONEY SIMONS, JR.,\* James Bryant Conant Laboratories, Harvard University, Cambridge, Massachusetts 02138.

A hydroxyl, not a carbamyl, group was found to induce a lithium aluminum hydride reduction from the more hindered side of a molecule.<sup>20</sup> This correction can only strengthen the structural assignment of **10**, though since now no example is known of an amide group altering the predicted stereochemistry of a metal hydride reduction.

**Direct Synthesis of Fluorocarbon Peroxides. III. The Addition of Chloroperoxytrifluoromethane to Olefins** [*J. Am. Chem. Soc.*, **97**, 13 (1975)]. By NYAL WALKER and DARRYL D. DESMARTEAU,\* Department of Chemistry, Kansas State University, Manhattan, Kansas 66506.

On page 15, first column, under *erythro*-CF<sub>3</sub>OOCFHCFHCl,  $J_{BD} = 13.3$ ,  $J_{BE} = 3.9$ , and  $J_{CD} = 4.1$  Hz.

## Book Reviews

**MTP International Review of Science. Series One on Physical Chemistry. Volumes 1-4, 6, 7, 10-13.** Consultant Editor: A. D. BUCKINGHAM (University of Cambridge). Butterworth and Co., London, and University Park Press, Baltimore, Md. 1972. 3357 pp. \$24.50 per volume.

The publisher of this encyclopedic compendium of reviews has set out to provide regular, authoritative appraisals of the recent advances achieved in entire fields of physical chemistry. This first 13-volume series deals principally with the period 1967-1971, and further series are scheduled to be issued every two years. Three of the volumes (5, 8, and 9) have been reviewed elsewhere in this Journal.

The authorship is international and distinguished. The discipline of physical chemistry has been carefully subdivided by consultant editor A. D. Buckingham into structural units. Separate volumes, in the charge of subeditors, have been devoted to each unit. Each subeditor has in turn organized a group of some six to ten authors who have contributed reviews.

From a purely organizational point of view the coordination of this large group of authors and editors has been accomplished successfully. In the series as a whole, there is an appropriate choice of material, authorship, and balance between the description of technical details and theory. This balance is satisfactory both for the general professional reader and the expert. Thus the publishers' stated formal aims seem to this reviewer to have been successfully carried out.

However, one might have hoped for more than an array of independent reviews. After all, the publisher has created something of a new medium for the presentation of modern scientific ideas, by commissioning reviews of such wide coverage at one time. It seems a pity therefore that no noticeable effort was made to exploit the potentially unique possibilities of the medium. The work fails to provide the reader with an overview of physical chemistry as a whole today. There is almost no general, historical, or philosophical perspective to the work. Physical chemistry is presented as an array of separate areas rather than as an integrated, living branch

of science, with cultural and scholarly overtones. Moreover, no attempt has been made to integrate the notation or cross-reference the reviews.

Notwithstanding this, Volume 1 does provide a model of a well-integrated group of reviews of theoretical chemistry. It offers a clear readable account of one structural unit with a coherent perspective of its position within physical chemistry, its development during the five-year period, and its sense of purpose. Volumes 2 and 4 likewise stand out as models of well-coordinated groups of papers, each commencing with purposeful introductory material. To varying extents the other volumes provide material of more specialist interest. Except for the convenience of having them bound together, they might equally well have been dispersed throughout the literature. Few general readers would therefore be tempted to read the whole series from end to end, although separate volumes do provide admirable critical, systematic surveys of the most active branches of physical chemistry. As such, they will be of continuing interest to all chemists.

It is unfortunate that the separate volumes are not individually indexed and that the index volume provided is inadequate. A spot check showed that in some articles less than 20% of the key words or key concepts appeared in the index. As usual this shows that indexing is a task that a professional author cannot delegate successfully to the publisher.

The standard of art work and printing is high throughout the series.

The rest of this review deals with the separate volumes.

**Volume 1: Theoretical Chemistry.** Edited by W. BYERS BROWN (University of Manchester).

The opening paper by Muscher underpins the discussion of the rest of the volume by emphasizing a historical and philosophical view of the modern theory of correlation in atoms. The review moves adroitly outside the arbitrary confines of the 1967-71 period defined by the publisher. Subsequent papers span developments in the traditional areas of molecular electronic structure, intermolecular forces, and magnetic properties. Papers by Fitts and by Levine cover respectively the more dramatic developments in the study of the liquid state by computer simulation and the theory of scattering.

The volume is strongly recommended both to the theoretician and to the generalist. It is clear and it covers the most important developments in a reasonably comprehensive manner, without being excessively complex, abstruse, or detailed.

**Volume 2: Molecular Structure and Properties.** Edited by G. ALLEN (University of Manchester).

The reviewer found this volume of outstanding interest. It provides a purposeful and fair account of a carefully selected subset of topics of modern concern. Four reviews give a balanced account of developments in the molecular interpretation of bulk properties. They cover infrared refractivity, acoustical studies of molecular conformation, magnetic susceptibility (from an integrated theoretical, semiempirical, and experimental point of view), and dielectric polarization. Three other reviews cover more direct methods: neutron diffraction, the use of gas-phase electron diffraction in conjunction with spectroscopy, and the application of infrared and Raman spectroscopy to the determination of crystalline polymers. All reviews have informative general introductions. Volumes 3, 4, and 11 contain additional material on other aspects of molecular structure and properties.

**Volume 3: Spectroscopy.** Edited by D. A. RAMSAY, F.R.S.C.

The title covers a wide area, many aspects of which are mentioned in accompanying volumes. Volume 3 emphasizes a number of specific areas of spectroscopy which have seen their principal advances during the review period (multiple resonance spectroscopy, band contour analysis, pressure-induced hydrogen absorption spectroscopy). There is a reasonable balance between topics of interest in electronic, vibrational, and rotational spectroscopy. On the whole, this volume conveys a very favorable impression of forward momentum in a mature, but active field.

**Volume 4: Magnetic Resonance.** Edited by C. A. MCDOWELL (University of British Columbia).

This well-edited and carefully balanced volume covers ten specific areas in a wide and active field. These include the discussion

of gas, liquid, and solid phases and range from the analysis of small molecules to systems of biological size and the study of radiation damage. There is a successful balance between the discussion of the general theoretical background, which is so closely bound up with progress in each area, and new experimental techniques and specific results. This volume brings together several timely and interesting reviews.

**Volume 6: Electrochemistry.** Edited by J. O'M BOCKRIS (University of Pennsylvania).

The editor has directed attention to topics of both industrial-technical and of pure scientific interest in electrochemistry. The emphasis is on the rates and mechanisms of electrochemical processes, reflecting a change in focal point in the field from macroscopic to microscopic, during the last few years. A clear, orienting review on quantum theory of electronic charge transfer at interfaces is followed by papers discussing topics ranging from the production of nonequilibrium solid phases, to ellipsometric optics applied to electrochemical systems, and to biological electrochemistry. Most of the authors have not confined themselves too narrowly to the 1967-71 period. They give considerable assistance to the reader by paying proper attention to the theoretical backgrounds of their fields. The reviews are therefore stimulating to the general physical chemist and interdisciplinary worker, as well as being of use to the expert.

**Volume 7: Surface Chemistry and Colloids.** Edited by MILTON KERKER (Clarkson College of Technology).

This volume covers a field linking physical chemistry, biochemistry, and chemical engineering. There are noteworthy reviews of interest from any one of these angles by Tien, on the chemistry of membranes and the relationship to structure and biological function; by Ellis on recent progress in the solution of persistent problems in the analysis of solid surface layers by elastic and inelastic electron scattering; and by Pound, on the development from a classical view, to the modern computer oriented treatments of nucleation. Other reviews convey more specialist information and provide very useful technical compendia of references.

**Volume 10: Thermochemistry and Thermodynamics.** Edited by H. A. SKINNER (University of Manchester).

This volume emphasizes both new developments in a mature field and the critical analysis of experimental precision and data assessment. There are, for example, papers on biochemical thermochemistry and high-temperature thermodynamics, alongside a review which examines critically the profusion of thermodynamic data compilations. The volume summarizes a great deal of chemically useful information.

**Volume 11: Chemical Crystallography.** Edited by J. MONTEATH ROBERTSON, F.R.S. (University of Glasgow).

The emphasis in this volume is not on the methods, analysis, or technique of crystallography, but on the specific information which has been contributed by crystallography to a wide variety of chemical problems. There is particular concern with systems involving large organic molecules (biologically important species, proteins, and natural products). In a field as mature as this, the techniques are perhaps rightly regarded as proven; the contribution of the information obtained by their use is of greater interest. Thus it is perhaps a pity that most of the papers concentrate on bringing together specific results for chemical compounds derived solely by X-ray analysis. By contrast, a review by J. C. Speakman on hydrogen bonding offers a wider viewpoint, encompassing a discussion of the relationship between X-ray studies and analysis by other methods, examination of the chemical bonding, and so on. The volume contains an interesting and wide-ranging account of crystal structure investigation in the USSR.

**Volumes 12 and 13: Analytical Chemistry. Parts I and II.** Edited by T. S. WEST (Imperial College, University of London).

These volumes deal mainly with applications of established methods of physical chemistry to chemical analysis. The contents can therefore, for the most part, be fully understood by any undergraduate chemist. The reviews document the precision with which direct elemental analysis can be achieved for virtually any element in the periodic table, recent progress toward the identification of anions in a solution by the use of ion-selective electrodes, and the analysis of biological and other compounds by evaluation of the

rates of catalyzed reactions. Advances in small-scale organic analysis and the use of modern, specific, organic analytical reagents are covered. There is a reasonable balance between attention to areas of industrial and of academic interest, and between chemical and instrumental methods. The work concentrates on the technical rather than on the general, and confines itself to the 1967-71 period more closely than any of the other volumes reviewed.

Philip Empedocles, *University of Michigan*

**Molecular Cytogenetics.** Edited by B. A. HAMKALO and J. PAPANICOLAOU (Biology Division, Oak Ridge National Laboratory). Plenum Press, New York, N.Y. 1973. xv + 359 pp. \$20.00.

The recent bridging of molecular genetics and cytogenetics is represented by this book, appropriately entitled "Molecular Cytogenetics." The merging of these two areas over the last decade has significantly improved our understanding of the DNA-gene-chromosome relationship. New and unexpected results are emerging, and one has to believe that molecular cytogenetics holds a key to the mystery of how the vast amount of DNA present in a eukaryotic nucleus can be organized into such a complex structure as the chromosome and yet in such an intricate and relatively unfailling manner replicate, transcribe, and be controlled with respect to time and frequency of gene expression.

"Molecular Cytogenetics" is the proceedings of the Twenty-Sixth Annual Biology Division Research Conference held April 9-12, 1973, in Gatlinburg, Tennessee. As the editors state in the forward, the objective of the meeting was "to bring together researchers interested in problems of chromosome organization, activity and regulation in prokaryotes and eukaryotes." Contributors to the volume represent an authoritative group of 42 U.S., 6 South American, and 18 European scientists and include many pioneers of the discipline. The conference brought together scientists with varied backgrounds in genetics, cytology, and biochemistry, some with major research emphasis on prokaryotes and others emphasizing eukaryotes.

Two events occurred in 1969 that perhaps together served as the most important stimulus toward development of the field of molecular cytogenetics. One of these was the ability to see a gene in action, as visualized with the electron microscope. O. L. Miller, Jr., and B. R. Beatty's paper in *Science* entitled "Visualization of Nucleolar Genes" gave scientists their first glimpse of a known gene transcribing its product, in this case ribosomal RNA (rRNA). This visual confirmation of the molecular mechanism of gene action previously determined by molecular-genetic means was impressive indeed and suggested that molecular genetics and cytogenetics could be powerfully complementary in future research. Extensions of these findings are included in this volume. The other development that had a significant impact on emphasizing the efficacy of combining molecular genetics and cytogenetics was J. G. Gall and M. L. Pardue's *in situ* nucleic acid/chromosome hybridization technique. This work followed Ritossa and Spiegelman's (1965) chromosomal localization of DNA complementary to rRNA in *Drosophila* by hybridizing labeled rRNA with DNA isolated from special cytogenetic stocks. The *in situ* hybridization technique allowed the visual localization to a specific chromosomal segment of (1) redundant gene systems, such as rRNA, 5S RNA, and histone genes, and (2) repetitive DNA, such as the pericentromeric satellite DNA of the mouse. Localization of these types of genes or DNA is difficult by conventional means; the *in situ* technique provides vivid results and does not require the synthesis of specialized cytogenetic stocks. Additional information gained from this technique also is included in this volume.

The papers are short and easy to read and most of them succinctly present considerable background information. The book could serve as one of the texts in a course on molecular cytogenetics. A fair subject index is included which would be useful to the student, especially since the sequence of the papers in the volume is somewhat haphazard. The volume contains a useful combination of information on prokaryotic and eukaryotic organisms, with the emphasis on eukaryotes. Except for a paper on the chloroplasts of *Euglena*, essentially no information was reported among the remaining 25 technical papers on the molecular cytogenetics of plants. Although more limited information is available for plants,

the conference perhaps could have served to stimulate greater activity in this area.

"Molecular Cytogenetics" is very enjoyable, if not exciting, reading and presents a wealth of information. The breadth of the subject should make the book useful for any person interested in biology. One of the highlights of the book certainly is the summary paper written by Hewson Swift of the University of Chicago. He summarized the content of the conference, supplemented with pertinent information from the literature, into the areas of (1) Poly-A and translational control, (2) Transcription (phage and bacterial systems, mitochondrial protein synthesis, silk glands, salivary glands, collagen, puff induction by RNA, and chromosome proteins), (3) DNA synthesis (phage DNA replication, phage evolution, eukaryote DNA replication, and DNA amplification), and (4) the structure of the genome (strandedness, repetitive DNA, sequence arrangement, and the reality of unique sequences). The insight of Dr. O. L. Miller, Jr., Chairman of the conference organizing committee, in attempting to integrate the structural and functional aspects of the genetic system is reflected in this book—a book recommended for all biologists and others interested in the molecular basis of life.

Ronald L. Phillips, *University of Minnesota*

**Higher Excited States of Polyatomic Molecules. Volume II.** By M. B. ROBIN (Bell Laboratories). Academic Press, New York, N.Y. 1975. x + 418 pp. \$39.50.

Volume I of the same book covered theory, experimental methods of vacuum uv spectroscopy, electron impact, photoelectron spectroscopy, etc., and excited states of saturated compounds. This volume, II, deals with simple unsaturated chromophores such as ketones, acetylenes, and nitriles (Chapter IV); nonaromatic compounds such as amides, acids, esters, acyl halides, N-oxides, polyenes, and cumulenes (Chapter V); aromatic compounds (Chapter VI); inorganic compounds (Chapter VII); and finally, biochemicals (Chapter VIII). There is a 47-pp addendum which serves to supplement and up-date each of the chapters mentioned above. Most of the material in the addendum is from 1973 references with a few from 1974.

The book is written in an easily readable way, almost like a lecture style, although some figures are too small and too crowded (e.g., Figure VI.A-8). The treatment of excited states of each compound is such that the book is useful to experimental spectroscopists because of the theoretical analysis of experimental data. For example, an *ab initio* theory is used in a profitable way in explaining the so-called "perfluoro effect" in fluoroethylenes. At the same time, theoretical assignments are critically analyzed in relation to the experimental results, often pointing out fallacies of theoretical assignments (e.g., discussion on  $\pi \rightarrow \pi^*$  transitions in ketones). This book should be of value to theoreticians as a source book of experimental data on many molecules of theoretical interest.

Although the title of the book implies discussion on "higher" excited states, low-lying  $n, \pi^*$ , and  $\pi, \pi^*$  (e.g.,  $N \rightarrow V$  in olefins) states including the lowest singlet (and triplet) excited states are described in most cases so that the utility of the book is not just limited to vacuum UV spectroscopists. Obviously, the emphasis of the book is on higher excited states of  $\pi, \pi^*$ ,  $n, \pi^*$ ,  $\sigma, \pi^*$ ,  $\pi, \sigma^*$ ,  $\sigma, \sigma^*$ , and particularly Rydberg states. As mentioned earlier, experimental and theoretical (both *ab initio* and semiempirical) results are discussed comparatively. CD and ORD results are also mentioned, where available, in addition to the usual vacuum spectroscopic results.

Chapter VIII, on biochemicals, is too brief (net three pages), although the peptide chromophore of proteins is treated in detail in Chapter V. It is worth noting in Chapter V that the original excitation interpretation of polypeptide  $\pi \rightarrow \pi^*$  bands ( $\parallel$  and  $\perp$ ) of Moffitt is reconfirmed alternative to the recent assignment of a Rydberg-type transition for the spectral region concerned. Listing all references at the end of the book is not convenient. The price of the book is prohibitively high.

In summary, the book is a valuable source of information to experimental and theoretical spectroscopists. To some extent, it is also useful to nucleic acid and protein biochemists.

Pfll-Soon Song, *Texas Tech University*