presumably via a turnstile-type rotation. At this temperature exchange between **3a** and **3b** is still slow.

In summary, we have shown that the osmium center allows the isolation of a wide range of simple ethylene/carbonyl complexes. The scope of the ethylene displacement reaction from **3** and **4** is currently being evaluated as a means to synthesize other mononuclear osmium complexes.

(9) The structure determination was carried out by Dr. R. Ball of the Structure Determination Laboratory of the Department of Chemistry, University of Alberta. At the present stage of refinement the agreement factors are $R = 0.055$, $R_w = 0.064$.

(10) **3a**: IR (pentane) ν_{CO} 1945 (s) cm^{-1}; ^1H NMR (CD_2Cl_2, −115 to 0 °C) δ 2.69 (s); ^{13}C NMR (CD_2Cl_2, −100 °C) δ 23.8 (s, C_2H_4), 175.9 (CO). **3b**: IR (pentane) ν_{CO} 2026 (s), 1982 (s) cm^{-1}; ^1H NMR (CD_2Cl_2, −115 °C) δ 2.12 (br with shoulders, 8 H), 1.92 (br q, 2 H), −0.15 (br t, 2 H); (0 °C) δ 1.82 (br s); ^{13}C NMR (CD_2Cl_2, −100 °C) δ 66.2 (s, C_2H_4(ax)), 23.9 and 15.8 (s, s, C_2H_4(eq)) 189.3 and 183.8 (CO).

Acknowledgment. We thank NSERC and MPI for financial support, Dr. R. G. Ball for structure determination, and Johnson Matthey for generous loan of OsO_4.

Supplementary Material Available: Spectroscopic data on **1** and **2** and tables of cell parameters, positional and thermal parameters, and bond distances and angles of **5** (3 pages). Ordering information is given on any current masthead page.

Computer Software Reviews

ChemCad. C Graph Software, Inc. P.O. Box 5641, Austin, TX 78763. List Price $250.00 or $175.00 for academic users. If you purchase version 1.0, a second version 1.1 will be provided free when it is completed. Further updates will cost about $50.00.

ChemCad is an interactive graphics program which can be utilized to create input files for MM2 and the AMPAC suite of programs, MINDO/3, MNDO, and AM1, on a microcomputer. The ability to write Cartesian coordinate files for use with other programs is also possible. The ChemCad package includes ChemCad.exe, structure libraries, and help files, as well as MNDO and MM2 programs. The MM2 and MNDO programs are not products of C Graph. MM2 is Allinger's program adapted for IBM PC compatible microcomputers and does not contain any SCF treatment for π electrons. MNDO is a direct translation of QCPE 353 to the IBM PC.

ChemCad will run on the IBM PC or compatible equipped with a graphics card, DOS 2.0 or higher, and with 348K of memory. C Graph, however, recommends 512K of memory and the 8087 coprocessor chip. The 8087 chip is not required to run ChemCad but is required to run MM2 or MNDO. With less than 640K RAM MM2 or MNDO cannot be run with ChemCad in memory. This problem can be circumvented by using ChemCad to write an input file, then running MM2 or MNDO and reading the calculated geometry file back into ChemCad. ChemCad will also support the Microsoft mechanical mouse or the PCMOUSE optical mouse. A mouse is not required, the menu cursors can be moved with the numerical key pad, but a mouse greatly enhances operation of the software.

An outstanding feature of ChemCad is the ability to create molecules from library fragments. ChemCad has resident a 40 ring library containing both hydrocarbon and heterocyclic rings. Twenty acyclic substituents are also available as well as the ability to create your own structure library. These libraries along with the function ATTACH A SUBSTITUENT and ATTACH allow the rapid construction of complicated molecules. These attach functions automatically set the bond length of the newly created bond to the sum of the covalent radii of the attached atoms. The set parameter menu allows the user, however, to change bond lengths, bond angles, and dihedral angles in the library structures. Care must be utilized in these operations however because the reference atom must belong to a different group (defined below) than the atom or group to be moved.

Structures can also be built up piece-by-piece by choosing any one of 72 elements from a periodic table. Hydrogens can be added automatically to C, N, and O and lone pairs to N and O. The hydrogens are added to complete the normal valency of these atoms (sp^2, sp^3, or sp) at the expected bond lengths and angles. Occasionally the added hydrogens will not appear on the screen because they are hidden by the atom to which they are attached.

Increased flexibility in structure manipulation is also provided by the ability to define groups and perform group manipulations. A set of atoms defined to be in the same group can be manipulated together. The set parameter commands for example can move an entire group rather than just an atom. This allows the user to set the dihedral angle between portions of the molecule in one operation.

The viewing operations include rotation about an axis, rotation around a bond, zoom-in, zoom-out, and pan. The rotations can be done in 1, 5, 10, 45, or 90° increments either clockwise or counterclockwise. In addition a three-dimensional ball and stick drawing can be generated and plotted. An information menu can be used to determine distances in angstroms or angles in degrees in either the geometry minimized or rough structure. It appears that both bond lengths and intermolecule (through space) distances are available.

The documentation is adequate and the system is easy to learn how to use. This is a convenient and powerful addition to any molecular modeling package.

Edward L. Clennan, *University of Wyoming*

Reference Manager. Version 3.2. Research Information Systems, Inc., 1991 Village Park Way, Suite 206, Encinitas, CA 92024. List prices: RM-32000, $440.00; RM-800, $195.00; RM-75, $59.00; Capture module, $59.00; Lecture module, $39.00; Journal Formats module, $39.00 (quantity discounts available).

Reference Manager is a microcomputer based software package designed specifically for preparing scientific publications. It consists of a specialized database management program combined with a text-reformatting module that enables the scientist to store bibliographic references and later incorporate them into a manuscript for publication.

Reference Manager is available for any microcomputer using the MS/PC-DOS or CP/M operating systems and a Macintosh version will be available soon. The RM-75 and RM-800 versions are not available for CP/M based systems. The RM-75 introductory package is a demonstration system that allows the user to create multiple databases, but each database is limited to 75 references. The RM-800 package provides one 800 reference database and nine 75 reference databases and was designed for use with a floppy-based system. The RM-32000 package, which allows the user to build a main database of up to 32000 references and nine 75 reference databases, is obviously intended for use with a 10 Mb or larger hard disk system. The capture module enables downloading of references either individually or in "batch" from MED-LINE, Paper Chase, BRS Colleague MESH, MS78, MS74, MS70, and Biosis Previews. The lecture module creates a specialized file for the storage and rapid retrieval of slides for the preparation of a lecture. The journal format module contains about 100 "ready to use" formats for biomedical journals. The MS/PC-DOS versions require 256 Kb RAM and the CP/M version (2.3) requires 64 Kb RAM. Copy protection is invoked only after 200 references have been added to the database; at this time, a signed license agreement is exchanged for a "key" disk that will "unlock" the database.

The heart of Reference Manager is the database into which are entered authors, title, journal, volume:pages, year, keywords, "reference on file", and notes. Similar entries are required for book and book chapter references. Any of these fields can subsequently be corrected and references can be sorted by author, journal, and year. In addition, references can be retrieved by author, editor, journal, keyword, reference number, words or phrases in the title or notes, or any "string" in the reference.

Reference Manager operates in conjunction with many of the most

popular word processing programs (Wordstar, WordPerfect, XYWrite, Edix/Wordix, Microsoft Word, VisiWord, Volkswriter) and supports many printers (Okidata, IBM, HP Laserjet, Toshiba P1350, NEC 3500 series). When writing a manuscript, the reference numbers are enclosed in parentheses, separated by commas. The author must create a citation format for each journal to which manuscripts may be submitted. The Reference Manager program then creates a bibliography file and inserts the correct reference format into the manuscript, after which both the final manuscript and the reference file must be reformatted with the original word processing program. The manuscript and references can quickly be reformatted for a different journal provided that the original manuscript has been saved.

Reference Manager performs exactly as advertised. It was designed primarily for biomedical researchers and therefore it is not completely adapted for use by chemists. For example, one cannot create the ACS reference format because there is no option to print the "year" in boldface type. In addition, many chemists may think it a disadvantage that there is no program to download references from CAS Online. The program has no special method for handling notes that are included as references, but this could be overcome by using dummy references while preparing the manuscript. I had no problem running the program using one of the designated printers, but the printer installation program did not accept the lengthy "escape codes" required for microjustified subscript and superscript printer commands using an older dot-matrix printer. My most serious criticism of the program concerns its incompatibility with other database programs. If you already have a large database in another format, you must either abandon that database and re-enter the data, convert your database into MEDLINE format, or hope that RIS can convert your files at a cost of $195.00 + $0.03 per reference. In comparison with a database such as DBase II, the data entry was slow but the files are very compact and both retrieval and formatting were fast and required no knowledge of programming.

Reference Manager is highly recommended by scientists who used it to create their reference database and should therefore appeal to chemists who wish to start a reference database using a fully debugged program. It is extremely useful for preparing manuscripts in formats that require the inclusion of author and year in the text and alphabetical sorting of the references by first author, but for manuscripts in the ACS format, the functions it performs can easily be accomplished manually. Perhaps it is a little cynical to suggest that Reference Manager will be at its most useful in reformatting a rejected manuscript.

D. John Faulkner, *Scripps Institution of Oceanography (A-012F)*

ChemBase. Version 1.00. Molecular Design Limited, 2132 Farallon Drive, San Leandro, CA 94577. List Price $975.00 academic; $3500.00 industrial.

ChemBase is one of three components of Molecular Design Limited's (MDL) Chemist's Personal Software Series (CPSS). ChemBase is a molecule and reaction database manager with sophisticated search and visual display capabilities for the IBM PC which is designed to function like MDL's molecule database program MACCS and reaction database REACCS which run on mini and mainframe computers. The other two components of CPSS, ChemText, a word processor which can integrate structures, forms, and equations into text, and ChemTalk, a communication program that can link a PC to a host computer running MACCS and REACCS, have not been examined by this reviewer.

ChemBase is designed to run on an IBM personal computer (PC, PC XT, or PC AT). A minimum of 512K memory, a graphics card (Hercules), color graphics card, or enhanced color graphics card, and mouse (Mouse Systems or Microsoft mouse) are required. A modem is required for ChemTalk but not for ChemBase. A Hard disk is required for efficient usage since the files required to run ChemBase occupy more than 1 megabyte. Data can be printed on several laser or dot-matrix printers. On Epson printers a low resolution screen dump is obtained. ChemBase is copy protected and licensed for use on one computer by up to 3 people. It can be installed on one, and only one, hard disk. It can be uninstalled so that ChemBase can be installed on another computer or restored from a backup. A backup copy of the copy protected component of the system is provided.

ChemBase is a database manager designed specifically to maintain molecule and reaction databases primarily for the organic or organometallic chemist. Databases can be designed to include both structures and text in separate fields. Substructure searches can be efficiently carried out of both molecule and reaction data bases. Data searches of textual or numeric fields can also be easily carried out. Files generated with ChemBase can be transferred to MACCS and REACCS with ChemTalk.

ChemBase is menu rather than command driven, using a mouse for selection of commands. The keyboard is used only for text entries. Drawing structures can be accomplished very rapidly and easily with the mouse. The quality of the screen image is excellent. Numerous templates are available and others can be easily added. The speed with which structures can be added compares very favorably to that of comparable systems on mini or mainframe computers.

ChemBase is complex as one would expect for such a sophisticated program. A very complete 425-page manual and 46-page "quick guide" are provided. The system also includes more than 400 screens of online help. A tutorial database which contains 100 molecules and 100 reactions is included along with an easy to follow and well designed "tutorial" which takes about an hour and deals with constructing molecules and reactions, searching substructures and data, and constructing databases. ChemBase allows for the construction of a wide variety of highly personalized databases. Although this is fairly complex, several models are provided which can easily be adapted to most uses.

The tutorial database file is 88K bytes which suggests that a molecule file requires roughly 250 bytes and a reaction file roughly 500 bytes. Therefore a 10 Megabyte hard disk dedicated solely to the use of ChemBase could hold a database of roughly 35 000 molecules or 18 000 reactions. This is obviously a very crude estimate since the storage capacity depends on the size of the molecules and amount of accompanying text.

ChemBase provides a very attractive solution for those who wish to maintain a structure based data base and carry out substructure searching on a PC rather than a mini or mainframe computer.

Barry B. Snider, *Brandeis University*

Business Filevision. Version 1.0. Telos Software, 3420 Ocean Park Blvd., Santa Monica, CA 90405-3395. List Price $395.00, upgrade from Filevision $200.00.

Chemists have traditionally been graphically oriented in all aspects of their work. The rising popularity of Apple Macintosh[1] computers in the laboratories and offices of chemical professionals and students is a testament to this fact. Its popularity with chemists results not so much from its ease of use and intuitive architecture but more so in the graphic method of interfacing the computer world to the user. It is because of this that Filevision[1] and the recently released upgraded Business Filevision[1] from Telos Software Products should endear itself to many users in the chemical community. The original Filevision[1] program, one of the first programs available for the 128K Mac, was and still is useful for educational purposes and personal filing projects. However, the original Filevision[1] was revolutionary in concept because of its unique ability to associate personally composed and edited graphic images and icons with textual and numerical information. Anyone who has used a map realizes that more information can be conveyed by the use of combined text and graphics. It would be difficult to navigate with stacks of index cards with each stack representing for instance roads, cities, landmarks, and rivers. However, this is precisely the way traditional databases are organized. A Filevision[1] file is similar to a map, with a drawing containing graphics representing different types of information, but it contains more depth than a map. An object may be associated with textual or numeric information, or it may be connected with another graphic with its own layers of information. Information or additional related graphics for a selected screen object are obtained either by pointing and double clicking the object with the mouse or by clicking on the "Info" or "Link" buttons in the lower right hand corner of the screens drawing window (Figure 1). Results of searches can be printed in a report or shown on the screen by highlighting (showing in outline) the graphics representing the searched data types.

With the release of Business Filevision,[1] which requires a 512K Mac or Mac Plus and an external drive, this graphical concept is extended to the realm of powerful full featured databases. A few of the features not available in the original release include the ability to calculate fields, pop-up graphics (hidden graphics which only appear when clicking the mouse on another graphic), an 8 × 10 inch drawing area, a pattern editor, "and" as well as "or" highlighting, record sorting, records without an associated graphic, and annotation fields. The access menu allows the searching, sorting, and highlighting of graphics with combinations of conditions relating to the fields stored in the records. A Business Filevision[1] database can contain up to 16 data types each with its own record format. The program can search or sort 200 records in about 40 s although the user is limited to searching one type at a time. Each record can contain up to 99 fields with up to 2000 characters per field or 4000 per record. The total size of a file is limited to 4 megabytes and up to 32 000 records, but with linked databases the effective size would be only limited to the disk space at hand.

(1) Macintosh, Imagewriter, MacDraw, Macpaint and Laserwriter are trademarks of Apple Computer Inc. Excel, Microsoft Word and Microsoft File are trademarks of Microsoft Corporation. Fontastic is a trademark of Altsys Corp. Filevision and Business Filevision are trademarks of Telos Software Products. MacChemistry is a trademark of Fortnum Software.

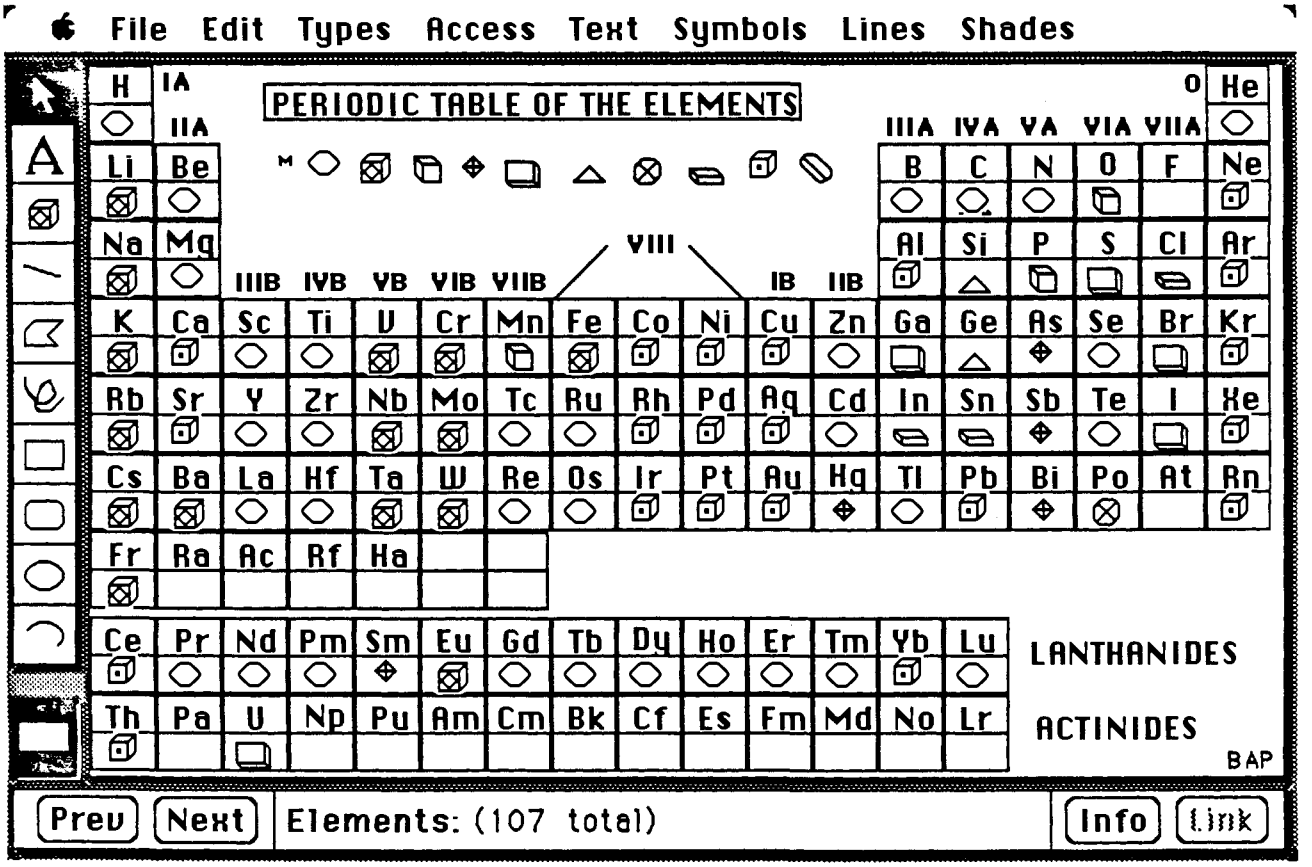

Figure 1. A screen dump of the Business Filevision periodic table template.[1] Information about a given element is obtained by pointing and double clicking the mouse on the element. Each element also has an isotope field, located in the lower part of its rectangle, containing information about the elements four most abundant or long lived isotopes. The crystal structure of the element is given by symbols created with the symbol editor. The page icon (above the "Prev" button) allows the user to position the window to any part of the 8 × 10 inch drawing area. The pull-down menus are located at the top of the screen. The "Prev" and "Next" buttons allow stepping between records or graphics in the order that they are stored or sorted. The drawing tools are located at the left of the screen.

The drawing capabilities are not nearly as extensive as MacDraw[1] or MacDraft,[1] but Business Filevision[1] was not meant to be just a drawing program and the user will find that creating graphics which are recognizable as the object is fast, fun, and easy. The mouse selectable drawing tools include a line, rectangle, ellipse, text, polygon, freehand, arc, and rounded rectangle. A variety of editable fill patterns are available in the shades menu. Rulers, a grid, and alignment features are available for precision drawing. Graphic objects may be foreground, background, or hidden and also grouped as in MacDraw[1] or "gathered" to stretch and move groups of graphics together without affecting their records. Graphics can be imported from MacPaint[1] or MacDraw[1] although they are always imported as one object and as such MacDraw objects cannot be ungrouped. The program also includes a symbols menu in which up to twenty small symbols (16 × 16 pixels) for frequently used graphics can be created and edited. Additional symbols, not generated within Filevision, can be incorporated by the use of customized fonts created with a font editor program such as Fontastic.[1] The first eight fonts loaded into the system file are available in the "Fonts" menu and can be formatted in styles familiar to the Macintosh user (bold, italics, underline, etc.). A limitation for chemists is that text in fields cannot have subscripts and superscripts, but this can be overcome by using the MacChemistry[1] font (a Chicago font with many Greek and chemical symbols plus built in subs and supers) available from Fortnum Software.

Telos Software maintains a public domain collection of Filevision[1] files obtainable from them for a nominal cost. Many of these files are useful, educational, fascinating, and clever. Files of use and of interest to chemists include a periodic table of the elements (Figure 1) containing information about the properties of elements and their most abundant isotopes[2] and a chart of the nuclides. By linking other Filevision[1] files to the elements in the periodic table a chemical "textbook" could be developed which has visual information concerning the structures and reaction chemistry of each of the elements. The educational value of such a file is immediately obvious. Such a file would allow the student or researcher to quickly work their way to a specific type of information or simply learn by perusing the file by clicking on whatever looks interesting. Other potential uses for a chemical professional would be tracking the location and quantity of chemicals and equipment in the laboratory or a group of laboratories. The location of, for instance, all the expired cans of ether in a laboratory building could be highlighted and the best route for their recovery would be immediately obvious. Chemical storage safety could be checked by first highlighting all flammable materials and then highlighting oxidizers to see if there are instances where they are stored too close together. In an educational setting the progress of the students in a laboratory course could be monitored by moving the icons representing students from experiment to experiment with the information on their lab reports and scores on other experiments immediately accessible by double clicking on their icon. The specifications of any instruments and instructions for the experiments could be obtained by clicking on icons representing the equipment. Linked data files might include graphics about the physical principles behind the experiment and act as guide for performing calculations, with the use of Business Filevisions[1] ability to calculate fields (although it is limited to simple arithmetic functions and square roots). The students final grade and average could be easily reported at the end of the class plus the statistics on the grades and lab results of the whole class.

Perhaps the greatest advantage of a visually oriented data base is that location of the information and its retrieval and manipulation are immediately obvious even to an untrained user. The small overhead for learning this program makes it ideal for use in an educational setting. Time is spent not learning the program but learning the subject. Learning a subject is made enjoyable since information can be explored at the users own pace and in either a random fashion or in a specific direction and depth. With most personal computer software, extensive use of the program is intermittent and the specific commands and formats are easily forgotten or confused. The Macintosh standards substantially increase productivity by facilitating recall of commands through perusal

(2) The periodic table template was created by this reviewer and is available (with the old or new numbering system) to anyone willing to send a self-addressed stamped envelope with a blank disk: B. A. Parkinson, E. I. DuPont de Nemours, Inc., Central Research and Development Dept. E328/105, Wilmington, DE 19898.

of the menus and standardizing commands and menus in all applications. Filevisions[1] only blatant departure from the usual Macintosh menu standard is the lack of a "Save" command. The same result is accomplished by closing and returning to the file, which takes no longer than a save, and may be confusing to the first time user of Filevision[1] who is familiar with the Macintosh. A back-up of the file may be created at any time by a "Save a copy in ..." command. There are extensive keyboard shortcuts which are learned gradually while initial use of the mouse makes learning the program quick and easy, but the well-written and illustrated manual is necessary to learn some features of the program such as creating pop-ups. The program has a nice method for setting up report formats and the data fields simply by dragging and sizing report and annotation fields on the screen. Reports and labels can be embellished with graphics and printed with up to four columns with impressive results on the Apple Imagewriter[1] printer and publication quality results on the Apple Laserwriter.[1] It also has the options of reviewing the printout on the screen, creating a text file, and saving up to 20 report formats in the print library. Form letters can also be printed in a mail merge from highlighted objects; in fact mail merges are more easily accomplished than in Microsoft Word.[1]

Business Filevision's higher cost compared to the original release is certainly justified because several of its additional features are insdispensable. Business Filevision[1] is not copy protected and is compatible with hierarchical file system (HFS) and the Switcher, and it also works well with a graphics tablet rather than the mouse as the input device. It has an on-line help file which shows many of the basic commands and keyboard shortcuts. A convert utility comes with the program for converting old Filevision[1] files to Business Filevision[1] files. Telos has also recently made available an import–export program for converting files to and from other Macintosh[1] programs such as Jazz,[1] Excel,[1] Overvue,[1] Microsoft File,[1] or text only files. So if you have already invested the large amounts of time required to build a database with any of these programs you can still convert them, add graphics, and enter the world of the graphic database. Telos also sends registered users a quarterly magazine with tips and information about Filevision[1] and its use. In summary if you are looking for a database system which is fun and easy to learn and use, Business Filevision[1] will be the perfect selection. If the potential application involves building complex relational databases with huge amounts of data, some of the other powerful relational databases (and probably a more powerful computer), with their additional expense and learning overhead, would be more appropriate.

B. A. Parkinson, *E. I. DuPont de Nemours, Inc., Wilmington*

*Book Reviews**

Organotitanium Reagents in Organic Synthesis. By Manfred T. Reetz (Universität Marburg). Springer-Verlag Inc.: New York. 1986. x + 236 pp. $76.50. ISBN 0-387-15784-0.

For many years the chemo-, regio-, and stereoselective addition of carbanions to organic electrophiles has been of major concern to synthetic chemists. One extremely useful advance in this area has been the development of organotitanium reagents (of general formula $RTiX_3$). In a wide variety of cases, these organotransition metal complexes exhibit greater selectivity than the more traditional organolithium and organomagnesium reagents. This "progress report" by Professor Reetz (Volume 24 in the series *Reactivity and Structure concepts in Organic Chemistry*) offers a concise summary and analysis of recent developments in this field that will certainly be of general interest to both organic and organometallic chemists.

The emphasis of this book is on understanding how a change in the electronic environment of the transition metal alters the reactivity of the alkyl group. For example, alkyltitanium trichlorides are stronger Lewis acids and thus more reactive than the less Lewis-acidic alkyltitanium trialkoxides. The reactivity patterns of a wide variety of organotitanium systems are compared and contrasted with those of other organometallic reagents.

After a brief, general introduction to organotitanium chemistry in Chapter 1, methods of synthesis and physical properties (e.g., bond energies, bond angles and lengths, aggregation states) of organotitanium compounds are presented in Chapter 2. Much of the author's own work concerning the chemoselective and stereoselective addition of organotitanium reagents to carbonyl compounds is presented in Chapters 3 and 5. The material presented in these sections goes well beyond what is normally found in the primary literature. The discussions of carbonyl differentiation and diastereofacial selectivity are particularly noteworthy. The practicing bench chemist will find the brief section concerning "hints on how to use organotitanium compounds" to be very informative. In Chapter 7, substitution reactions involving organotitanium reagents are presented.

There have been very few investigations of the kinetics of organotitanium additions. Chapter 4, which discusses rates of reactions, focuses primarily on the addition of $MeTi(OCHMe_2)_3$ to carbonyl compounds.

This book would have been more complete if the discussions of 1,4-addition reactions in Chapter 6 and Wittig-type methylenation reactions in Chapter 8 were more extensive. The reader is referred to other reviews which the author feels have adequately presented recent results in these areas.

It is often difficult for the practicing synthetic chemist to keep up with recent advances in methodology, especially when such advances occur at a very rapid pace. This book is an excellent place to turn for a brief, well-referenced review of *Organotitanium Reagents in Organic Synthesis*. It outlines recent developments in the field and in many instances points out areas where further work is needed. In addition, the general structure/activity principles that are presented in this treatise should be useful as a guide to the rational alteration of the reactivity patterns of other organotransition metal reagents.

Daniel F. Harvey, *University of California, Berkeley*

Organic Structures from Spectra. By S. Sternhell and J. R. Kalman. John Wiley & Sons: New York. 1986. x + 202 pp. $29.95. ISBN 0471-90644-1.

This is a textbook based on the concept of teaching by means of problem-solving seminars. The first 61 pages contain succinct presentations of the basic principles of absorption spectroscopy followed by the experimental features of UV, IR, NMR, and MS, together with much tabulated information of use in interpreting spectra. The bulk of the book is found in the spectra, which are arranged as problems, starting simply with methyl ethyl ketone and proceeding gradually to quite complex structures. For each unknown compound, the four types of spectra are presented graphically, with a minimum of supplementary numerical data. Both ^1H and ^{13}C NMR spectra are included. These problems are intended to be used in a class that meets regularly for working on assigned problems, with a faculty member present only to give help when it is asked for, not to lecture. The authors claim greater success for this method of teaching, which is modeled on that used at the E.T.H. in Zürich, than conventional teaching. The large number (131) of problems gives great scope for such a method.

Chromatographic Methods. Fourth Edition. By A. Braithwaite and F. J. Smith (Trent Polytechnic). Chapman & Hall/Methuen Inc.: New York. 1986. x + 414 pp. Cloth: $65.00. ISBN 0-412-26770-5. Paper: $27.00. ISBN 0-412-25890-0.

This new edition responds to the developments since the previous edition (1974) with a rewritten chapter on plane chromatography, an expanded one on gas chromatography, and a new chapter on HPLC. A chapter titled "Spectroscopic techniques and chromatography" reflects the substantial growth of instrumentation and combined techniques. The rapid growth in importance of data processing, as applied to chromatography with the aid of computers, is the subject of another chapter. The final chapter, "Model or Practical Experiments in Chromatographic Techniques", has been revised and expanded. It contains complete experimental descriptions of a comprehensive variety of procedures (e.g., under Paper Chromatography there are five, each using a different technique). They serve well as models to show the reader how to carry out a procedure, but they can also be used as experiments in a laboratory course.

This book is well suited to be a general reference source of first resort, which will provide answers to most questions and show the user how to get going at a practical level as well as how to understand the basis for the procedures. As a textbook for instruction, it appears to be aimed at the advanced undergraduate or graduate student, but such students are likely to want to retain the book as a permanent reference.

*Unsigned book reviews are by the Book Review Editor.