ically based view of alchemy has disappeared. Included as an appendix is the text of an interview, in which the series editor Dominique Lecourt talked to the author; this is a plea to the effect that even modern scientists should give some attention to earlier and quite different forms of knowledge. However, I am not convinced that this book will achieve that goal.

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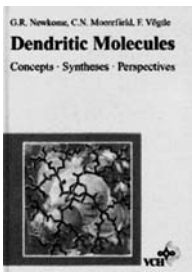
**Dendritic Molecules.** By *G. R. Newkome, C. N. Moorefield,* and *F. Vogtle.* VCH Verlagsgesellschaft, Weinheim, 1996. 261 pp., hardcover $ 140.00.—ISBN 3-527-29325-6




The authors of this first book to be totally devoted to dendritic molecules have themselves previously contributed important seminal papers to the rapidly developing field of these highly branched molecules emanating from a central core. This comprehensive book on concepts, synthesis, and future perspectives of dendrimers is an excellent overview, describing essentially all the published work up to early 1996. In its approximately 250 pages the book contains detailed information on all the known synthetic schemes and dendrimers, using a very clear "Beilstein-type" subdivision, as well as an informative introduction for those not (yet) active in the field of dendrimers. Research in this field now involves a rapidly increasing number of groups in chemistry, physics, and bio-related disciplines. New discoveries in synthesis, characterization, properties, and applications are reported almost every week. Therefore, we often have to reconsider our ideas, insights, and concepts. As the authors write in their preface, " there is little doubt in our minds that the surface of this topic has just been scratched". In view of this, the authors have rightly decided to focus their book on a state-of-the-art description of the research performed so far, without trying to define the scope and limitations of dendrimers or to discuss different conceptual aspects in detail. With an astonishing accuracy and a very elegant subdivision, all dendrimers that have been synthesized up to early 1996 are discussed and presented in the many figures and schemes, with space-consuming, but esthetically pleasing representations of the molecules.

The book starts with an excellent introductory chapter by W. L. Mattice on the masses, sizes, and shapes of macromolecules from multifunctional monomers. Since many researchers interested in dendrimers have had their training in organic chemistry, they will be very pleased with this chapter on some basic aspects of polymers. Molecular weight distributions, branching, radius of gyration, shape analysis, and a number of other important features of macromolecules are introduced. Although these aspects are all very crucial to the understanding of the properties of dendrimers, the topics of Chapter 1 are not really used in the following chapters. In Chapter 2, both the historical perspectives of dendrimers and the fractal geometry of macromolecules in general and of dendrimers in particular are discussed. Obviously, an account of the history of the development of a new field, written by scientists who were and are still involved themselves, is always colored with some personal preferences. Despite this, the reconstruction of events in the development of dendrimers as given here is reasonably objective. Chapter 3 discusses the nomenclature of dendrimers as proposed some time ago by the same authors. The names are very useful for IUPAC, but they use almost as much space as the structures of the molecules in the many figures of the book. Thus, for dendrimers one still awaits a proposal for a concise nomenclature and more compact structural schemes.

The appetite of the more knowledgeable reader begins to be stimulated in Chapters 4–6, in which the different synthetic methodologies are described in 133 pages. As well as following the well-known division into the divergent (Chapter 4), convergent (Chapter 5), and one-step or hyperbranched (Chapter 6) procedures, the authors subdivide each chapter systematically according to branching and connectivity, thus making the book very useful as a reference source. For most of the dendrimers, a complete synthetic scheme is given, while some details of the properties are discussed. All dendrimers given in the figures are presented in their perfect, defect-free structure. However, many samples, especially those obtained from the divergent procedures, will contain structures with statistical errors as a result of the repetitive synthetic schemes. Unfortunately, the treatment of this topic is very limited as a consequence of the many omissions in the original papers chosen for reviewing. Nevertheless, Chapters 4–6 provide an excellent insight into the different synthetic methodologies of dendritic molecules.

Chiral dendritic macromolecules (Chapter 7) and dendrimers containing metal sites (Chapter 8) are discussed as special topics. Although there is some overlapping with the earlier chapters, these dedicated chapters nicely illustrate those areas that deserve special attention and are generally accepted as being very important, both conceptually and with respect to possible applications in catalysis and in the pharmaceutical or medical sciences. In Chapter 9 the concepts of dendritic assemblies and dendritic networks are discussed. The authors predict that these higher-order architectures will contribute to the field of nanotechnology and supramolecular materials, and it is clear that considerable progress is being made through the stimulus of making the connection with topological dendrimers.

Early work on dendrimers led to speculations about possible applications, and recent developments hold out prospects for future discoveries and uses. Therefore, the book ends with a very useful chapter listing illustrative references to papers and patents describing applications, as well as an appendix listing earlier reviews on dendrimers.

Overall, this book is required reading for research scientists active in the field and for those interested in joining the dendrimer community. They will appreciate the accuracy of this overview of dendrimers, and the book will become a major reference source. Furthermore, the topic of dendrimers is of broad general interest, and therefore the book is highly recommended for all chemistry libraries.

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**The Responsible Conduct of Research.** By *Doré Beach.* VCH Verlagsgesellschaft, Weinheim, 1996. 162 pp., paperback DM 48.00.—ISBN 3-527-29333-7

Doesn't it make sense, in the interests of scientific advancement, that one should (for instance) supply a library with the coordinates of the atoms of a protein whose structure one has determined, so that others might use them? Or that one doesn't rush into print in a quicker publishing journal a synthesis of a prized target molecule the moment one has learned from a refereee in a "slower" journal that

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someone else has completed such a synthesis?

Such unethical but not illegal actions happen. They are rare (still more rare is real fraud), but they happen. Interesting is the implicit hubris of the way in which I asked the question—"Doesn't it make sense?"—thus in a way assuming that ethics is logic.

Ethics is not logic. And scientists are not born with ethics (nor with logic for that matter). Science is an eminently successful social structure for inquiry, done by curious, intelligent, but fallible people, who need all the help they can get in learning ethical behavior—from their parents, friends, religious counselors, teachers, books. And who need to talk to each other, not so much of moral principles but of specifics, often unpleasant. Non-trivial ethical problems involve the collision of obvious goods of different people. So ethics is inevitably shaped in dialogue with others.

In response to journalistic exposure and governmental concern (most scientists think both overdone, if not malicious) about prominent cases of misconduct in science, we now at last have several carefully reasoned reports on ethics and responsible conduct in science, governmental mandates (in some fields) for structured instruction, and some books for the scientist.

The book by Doré Beach and associates indeed addresses most of the important ethical issues in scientific research. It does so in a way that I find partially unsatisfactory, but before I get to that let me say what is in this book.

The book contains ten appropriately brief chapters, covering subjects ranging from a definition of ethics and a brief sketch of its place in philosophy, through ethical issues in publication and the legalities of intellectual property protection, on to a discussion of misconduct. Given the short, readable format, the coverage is comprehensive—the only serious omission in my view is the absence of a discussion of the contentious, but very much ethically founded, issues of animal rights and animal testing.

Five of the ten chapters are written by Dr. Beach, who is the Director of Responsible Conduct of Research and Applied Ethics at the University of South Florida. The other five chapters were written by her colleagues, mostly in administration or the "Division of Sponsored Research" (the people who help you get research grants). The orientation of the book is understandably very American.

Each chapter ends with one or more case studies. These are detailed, realistic, and often fascinating. And each is accompanied by some questions aimed at guiding discussion.

The book is intended for the practicing researcher with perhaps more emphasis on university than on industry. Amusingly, there is a glossary of philosophical terms (including words such as "duty" or "truth"!), but none of the technical terms around patent law.

The book is balanced in tone, a real virtue. With this subject, one could easily turn polemical or defensive, or overly preachy (as I am when I write about ethics). It is understandable that a multi-author book might be uneven in style, even when obviously edited for coherence (as the consistent case study format suggests). So why do I come away partially unsatisfied?

Something to get out of the way first, a bad beginning. A book that discusses, inter alia, ethical problems of authorship, should leave us with a clean feeling about its own authorship. Half the book is written by Beach, half by her colleagues. Their names appear in the Table of Contents but not on the book cover or title page. It could have been done better.

Beach's own writing is uneven. At times she is authoritative, as in the discussion of ethics within philosophy, and the important focus on the Nuremberg code of ethics of experimentation on human subjects. It is good to be reminded that the ideas of informed consent and risk/benefit analysis derive from that 1946 code. And that for 20 years the US failed to implement guidelines for American researchers to adhere to this code.

At times, however, the author just lapses into making lists or chronologies, often taking the list from a (properly credited) US agency report. The bolder task of pointing out the inconsistencies in these lists and of criticizing them—be they of ethical practices in data "management" or what constitutes safe chemical practice—is avoided.

Beach argues (and I agree) that ethical behavior is shaped by casuistry (particular case analysis, not the other meaning of the word), or what I would call situation ethics—a free dialogue by concerned people around a specific issue. This is the rationale for this book's Case Studies with their "Questions for Discussion." What I just longed for after a while was a verbatim account of the discussion of a case. Providing not an answer for all time, but the arguments (logical or not) of various sides. Interesting (problematic) ethical questions are those in which agreed-on goods collide—for example, the banning of thalidomide vs. the efficacy of thalidomide for leprosy and maybe AIDS. I wanted to read how intelligent but impassioned people argued such a case, and I wanted to see how someone trained in ethics, while not resolving the problem, might at least steer the discussion in a productive way.

I found traces of this in the text, in Beach's discussion of David Keen's bullets that would pierce bullet-proof vests and shred flesh. And I found a good bit along these lines in the best written chapter in the book, by Lawrence R. Oremland, on intellectual property rights. He intrudes into his cases, in just the direction I wanted. And Oremland has an account of "The Texaco Case" that will make you think twice about copying for your files eight articles from the *Journal of Catalysis*!

In a way ethics is like science, and unlike law or politics. Faced with a difficult (and therefore interesting) question with seemingly irreconcilable arguments, science can say "I'm not yet sure who is right; come back and ask me next year." And ethical discourse will guide you to see the validity of the side you are not on, the moral claims of the various positions. But the law doesn't have the luxury of just describing anguished alternatives, or waiting. It must decide—"guilty," or "not guilty." And politicians all the time make compromises between irreconcilable interests; the compromises you and I hate to make. I respect both judges and politicians for that.

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**Stereochemistry of Radical Reactions** by D. P. Curran, N. A. Porter and B. Giese. VCH Verlagsgesellschaft, Weinheim, which was reviewed in *Angew. Chem. Int. Ed. Engl.* **1996**, *35*, 2542 is now also available in softcover (DM 98.00, ISBN 3-527-29409-0).

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