

Drug Discovery. A History

by Walter Sneader
John Wiley, Chichester, UK 2005.
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Scientific books, as with many other things come in the categories of good, bad and in-between. The bad ones are rare but unfortunately so are the good ones so it is a pleasure to report that this volume is outstandingly good. Indeed the amount of effort expended in amassing the material by a single author is quite staggering and it would have been notable even in a multi-authored volume.

The book is divided (like Gaul!) into three parts. The first concerns the use of natural materials such as herbs and simple inorganic compounds from prehistoric times, through the Greeks and Romans to the Arabic physicians of the early Middle Ages and then to their eventual transmission to Western Europe in the 15th and 16th centuries with the early stirrings of the modern era led by such figures as Paracelsus. The second part, which is the biggest section, starts at the late 18th and early 19th centuries when for the first time chemists managed to extract (more or less) pure medicinal compounds such as quinine, morphine and digitalis from plant materials. The ability to do this led to a much more rational approach to the use of drugs instead of the “more ingredients the better” approach which had been prevalent until then. The availability of these pure natural products led in turn to their structural elucidation by generations of organic chemists whose skill, in the absence of modern analytical instrumentation, was truly remarkable. Having elucidated these complex structures they then proceeded to demonstrate their virtuosity further by synthetic modification and preparation of analogues which may, or may not have had superior properties to the original prototypes. In addition to their remarkable skill, the sheer quantity of the work is quite staggering. Statement such as “in the next 3

years X synthesised 1500 analogues, of which five showed some promise” abound. It must be remembered that much of this work took place in an era when 100mL quantities were “micro”. This second part takes us up to the present day and one can understand why big drug companies need staffs of thousands in their research laboratories and why fewer but “smarter” drugs are now being developed. The third part of the book is concerned with totally synthetic drugs and compounds such as dyestuffs which, by serendipity, have been found to have therapeutic value. The book closes with a 20-page comprehensive and easy to use index.

One final general comment is that in the past organic chemistry was defined as the chemistry of carbon compounds. By a similar simplistic definition, pharmaceutical chemistry could well be described as the chemistry of nitrogen compounds.

This is a book that should be read by all those concerned with drug development and by all medical practitioners, although I suspect that this latter case will not apply. A final word of warning – like many of the compounds described this book should be taken in small doses since otherwise it may lead to mental indigestion.

E. R. Adlard

The Nanotech Pioneers

by Steven A. Edwards
Wiley-VCH, Weinheim, Germany, 2006.
Pp 244. ISBN 3-527-31290-0
Price: EUR 24.90

I enjoyed reading the introduction to this book until I reached page 13 and came across a sudden outburst against Europe in a sub-chapter on sceptics (note the correct spelling). The total lack of understanding the author shows for Europe in these few sentences makes me ask, does he actually know where Europe is? In a recent survey 80% of Americans thought Europe was somewhere in London; is he one of these? When he goes on to say that Canada, “a European country located by chance in North America” then it

really shows he doesn't know what he's talking about concerning events outside the USA. In Chapter 2 after talking about all the European Sceptics he destroys his own arguments about them when he goes on to discuss points made by the great American names in nanotechnology such as Eric Drexler, Ralph Merkle and Ray Kurzweil. In this chapter he acknowledges far more Americans than others from elsewhere. Even when talking about Mike Roco he has to make a dig that he speaks in heavily accented English; is this a problem?

The third chapter goes on to pick certain milestones on the road to nano-products and then Chapter 4 outlines the tools that are on the market now, such as nanomanipulators. These are interesting chapters but there is a major omission in not discussing any scaling laws that can work for and against us in the nano-world. I think the author should have discussed why we can see such large surface areas, how we can achieve such rapid mass transfer and why there is so much energy required to move atom against atom.

Chapter 5 discusses nanoparticles and of course one of the first is Buckminsterfullerene. He again shows his America bias by describing Harry Kroto as “having the peculiarly British honour of being awarded a knighthood”. This is a British honour that is part of our culture and heritage, but maybe Edwards doesn't understand the word heritage!

In the same chapter we are introduced to dendrimers. I really don't think dendrimers have a place in this book. To me they are molecules first named and patented by Donald Tomalia in 1970. If we do introduce dendrimers into nanotechnology then we really start to blur the interface and will also have to bring in colloids, the nanoparticles that have been worked on for hundreds of years. Finally in this chapter when describing quantum dots the author decides to describe chemistry. I would suggest that anyone having reached this point in the book would have a good knowledge of chemistry and most probably a far better understanding than the valence bond model described here.

Chapter 6 describes how we can learn from Mother Nature. As one who started work on packed GC columns it was particularly interesting for me to read the section on diatoms. When I consider what we are achieving today in our spherical silica production and monoliths and then look at the amazing structure of these diatoms it really shows the power of nature and how we still have nothing to match it. The next chapter deals with nanoelectronics, first of all taking us through memory chips and then on to the area of spintronics which will ultimately lead into nano-computing. Chapter 8 deals with nanotech-enabled biomedicine, again an interesting chapter, especially in the subsection on pumps and nano-arrays, although it would have been nice if some recognition had been given to workers outside America.

In the penultimate chapter, suddenly I was back on the same wavelength as the author when I read with amazement that an American understands something about global warming and I must congratulate him in his clear thinking on how the American demand for energy has warped the nation's foreign policy and very regrettably cost lives. Finally, the last chapter returns to the sceptics and the fear of nanotechnology. Just when I thought he had won me over again he lost me with his thoughts on quantum computers. He infers that it's ok for the USA to get one but it would be disastrous if any other country were to get one first as they would be able to break all codes, even American codes.

But after all I have said I really did like this book. The author has taken an emerging technology and has done well in bringing it all together. I was kept interested by the many examples of ignorance of any country outside the USA. For American readers it will be a good read but it should be read worldwide, especially at a price of 24.90 Euros.

P. Myers

Clean Energy

by R. M. Dell, D. A. J. Rand
Royal Society of Chemistry (UK) Clean
Technology Monographs (2004)
Pp 323. ISBN 0-85404-546-5
Price: GBP 89.95

Ever since the industrial revolution, society has relied on a plentiful supply of energy to support an ever-increasing standard of living, based on efficient power generation and transportation. As a consequence, mankind has become heavily dependent on fossil fuels, initially coal and more recently oil and gas. In their opening chapter, the authors

trace this history and outline the enormity of the issues lying ahead – to sustain mankind's ever-increasing appetite for energy at a time when there are mounting concerns about the environmental impact of such large-scale energy conversion. The deceptively simple title 'Clean Energy' leads the reader through a complex maze of issues and technical opportunities associated with this challenge, broadly summarised under three main targets – more efficient conversion of fuels to useful work, the progressive introduction of renewable alternatives possibly including nuclear, and CO₂ capture and sequestration. By focussing on 2020, they attempt to keep their analysis to relatively predictable technological advances, but there are few options that do not come with a list of drawbacks as well as potential benefits. It is apparent that it is often difficult to predict the pace of future advances in specific technologies, that individual technologies can only be assessed within the context of the complex interconnectivity of energy supply, storage and conversion, and their adoption is subject to the vagaries of public demand, political will and commercial investment. Consequently the book takes the form of a lengthy list of options and problems to be resolved, with no clear winners, simply an expectation of evolutionary technical advances across a broad front. During this period to 2020, oil and gas will remain plentiful and will continue to dominate energy supply. The question is whether the necessary developments towards clean energy solutions can be initiated in parallel at a sufficient pace. Dell and Rand conclude that politicians and the public at large need to take more seriously the issues surrounding future energy and to support the measures necessary to stimulate investments in creating a cleaner energy future to overcome the fact that the continuing relative cheapness of fossil fuels naturally inhibits the development of more costly alternatives.

Given the enormity of the subject matter, the authors manage quite well to cover the breadth of the subject within just 318 pages of text, drawing upon their experience in energy technologies in Harwell and CSIRO to analyse developments from both a scientific and practical perspective. However, their personal interests and prejudices impact on their selection and appraisal of material for inclusion. Significant emphasis is given to electricity generation from coal to nuclear, on energy storage, particularly electricity storage and its potential use in propulsion, and on hydrogen as an energy carrier. At times they dive into details of uncertain global significance and at other times they are rather dismissive of significant developments such as biodiesel or the development of tar and shale sands. In listing alternatives they risk underestimating

the considerable investment in supply infrastructure and in new vehicle fleets required to support non-standard fuels such as hydrogen or LPG. They imply LPG is a promising new transport fuel yet it has been in regular use for decades in a number of markets where sufficient government incentives apply. Its lack of global impact over such a long period serves to illustrate the difficulties facing solutions that might appear attractive on paper but do not satisfy the rigorous demands of commercial markets. Their analysis of hydrogen is substantially more thorough, from which they conclude that, despite often being described as the 'ideal fuel', hydrogen will have to compete against a moving target of improving alternatives and may struggle to gain the dominance that some expect.

Despite this slightly uneven emphasis, and the difficulties they readily acknowledge in predicting the future, they succeed in their stated goal of presenting material to stimulate lively discussion, and to encourage further inquiry into the specific topics they summarise here. The text should be very accessible to a wide range of readers and interest groups, restricting more scientific descriptions to separate boxes, and supporting the text with extensive glossaries and references. Statistics are compiled in numerous tables and graphs, making it a valuable compilation of reference material. In their words, 'It is up to those who are scientifically and environmentally aware, especially a new generation of well-educated young people, to take up the challenge of creating a sustainable energy future for generations yet to come.' This book would provide an excellent starting point for those keen to begin that journey, at least in the area of stationary power applications.

L. J. Clarke

Value Creation. Strategies for the Chemical Industry

by F. Budde, U.-H. Felcht, H. Frankemölle (eds)
Wiley-VCH Weinheim, Germany 2006
Pp 467. ISBN 3-527-31266-8
Price: EUR 85, -

The first edition of Value Creation, published in 2001, was based on the attitude that the chemical industry was a "bricks and mortar" dinosaur in its dying phases. This second edition is much more optimistic and describes the industry as one that has adopted new techniques to revive itself as competitive pressures from overseas rapidly changed the world picture.

An excellent example of these massive changes, as older readers will remember, is ICI. Some 35 years ago it was a world leading chemical company and the bell-weather company of UK industry. This very comfortable position was rapidly changed, resulting in a difficult exit from heavy chemicals combined with a split into two FTSE 100 companies. Currently ICI is listed at 76 and AstraZeneca (the old ICI Pharmaceuticals Division) listed at 10. The remaining yesterday divisions still operate, but now either as stand-alone companies or integrated into other less well-known company names. Totalling the quoted market valuations of these companies (but guessing at those without market quotation), it demonstrates just how economically successful the break-up of the old ICI has been.

In many ways the changes within ICI represent a model for the restructuring of the industry as a whole, and echo the structure of this book. The first edition was very much in the "McKinsey" style, i.e. a financial consultant's view of the industry, with cold logic dictating the agenda. It is to the benefit of this new edition that many more contributors

from the chemical industry are included; the McKinsey ruthlessness, economics and shareholder value issues remain, but with an overtone of the paternalism that was prevalent in the industry some 30 years ago.

With a total of 33 relatively short chapters, value creation, challenges and strategies, speciality chemicals, the agribusiness, industrial gases, and chemical distributors, all have self-contained chapters. Similarly feedstock availability, price variability, purchasing, aggressive price strategies, supply chain management, industrial biotechnology, restructuring using private equity, and many more, are dealt with as stand-alone issues. The newest chapters describe the hugely important new roles of the Middle East, Asia and China. These makes fascinating reading. In petrochemicals, very low feedstock costs, coupled with low labour costs and fast growing Asian demand has forced Western companies to exit the market as fast as they are able, in turn forcing a shift from West to East.

In China the chemical industry is a principal pillar of its astonishing economic growth. It employs 3.5M people and con-

tributes 2.5% to the total value-added in 2004. This is roughly four times the figure in the USA and about twice that of Western Europe. This section finally concludes with an overview of the importance of the chemical industry to China, with an analysis of why the West's multinational chemical companies have been hesitant about China for so long, followed by suggestions of how to succeed in this attractive arena.

The contributors have a significant pedigree and wide experience of the issues now facing the chemical industry. The result is that anyone with ambitions to reach senior management, in whatever size of company, should make reading this book a priority, if only to understand the competitive pressures that currently apply throughout the industry and how to deal with them. Indeed even junior managers would benefit, if only to widen their horizons and accept with better grace the painful and difficult decisions that have to be made almost daily by their seniors as the industry restructures.

K. Jones