mapped by Menard himself, and by the late 1950s it was known that there were magnetic anomaly offsets across them. Yet the significance of these great seafloor escarpments as transform faults was only recognized nearly ten years later, in 1965, simultaneously and apparently independently by Coode and Wilson. One contributory development came from seismology: the observation that the earthquakes on transform faults occur only on the section between offset ridges. Indeed, one reason why the key concepts in plate tectonics were formulated when they were was the advances in other areas of the Earth sciences. Progress in isotope geochemistry, experimental petrology and seismology occurred in parallel but without much reference to the events in marine geology; yet without them the plate-tectonics revolution could not have occurred.

Seismology was to play another important role through the work of McKenzie and Parker, who in 1967 published a paper in *Nature* in which the basic elements of plate tectonics were first set forth. Whether or not this was independent of Morgan's work, which appeared a few months later in a journal that takes longer than *Nature* to turn manuscript into print, is debated at length by Menard. He concludes that this is another example of simultaneous discovery, but here the honours were evenly divided. Neither McKenzie and Parker nor Morgan could be as safely ignored as Morely or Coode had been.

In his final chapter, Menard considers the lessons of the history he has described. He notes that those who took to the seas did not play a major role in developing the concepts of seafloor spreading and plate tectonics — this was left to physicists, whose minds were uncluttered by geological detail. Menard also examines why ideas often occurred simultaneously to different scientists; why credit and recognition do not always fall where they are due; how persistence and concerted efforts at selling the product are as important as having the spark of originality; and how publishing quickly and in the right place — and chance with the reviewers — has led to today's common conceptions of priorities. Young scientists can learn much here.

Menard had intended to continue the story up to the present. His death at the age of 66 prevented him from doing so, but it does not distract. Aftermaths of revolution are messy affairs, often dominated by lesser characters. To end with the events leading up to the start of the revolution was appropriate indeed. □

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Technical triumphs

Thomas A. Baillie

Mass Spectrometry in Biomedical Research. Edited by Simon J. Gaskell. *Wiley: 1986. Pp.492. £38.50, $72.95.*

In 1913, J. J. Thomson, the acknowledged father of mass spectrometry, predicted in his treatise *Rays of Positive Electricity and Their Application to Chemical Analyses* that "... there are many problems in Chemistry which could be solved with far greater ease by this than by any other method". History has proved Thomson to be correct. But even he could scarcely have envisaged the enormous impact that mass spectrometry, then in its embryonic stage, was to make on biomedical research in the late twentieth century.

Traditionally, biomedical research has been dependent upon analytical methods with which to elucidate the molecular structure of biologically active substances. It was appreciated early on that the sensitivity and high specificity of mass spectrometry make it especially well-suited to the investigation of structural problems, and to the quantitative determination of trace components of complex biological matrices. But it was not until the late 1960s, when gas chromatography was combined with mass spectrometry and on-line data processing systems were first introduced commercially, that mass spectrometry began to be truly indispensable to the biomedical scientist.

Yet a fundamental limitation remained through the 1970s — the analyte of interest had to be sufficiently volatile (that is, non-polar) to be introduced into the gas phase within the mas spectrometer and undergo ionization. This requirement effectively restricted the accessible mass range of analytes to around 1,000 daltons, a severe limitation indeed.

This picture changed dramatically with the advent of new techniques for the generation and analysis of gas-phase ions from samples in the condensed phase. These powerful new methods permit the study of biological molecules which are neither volatile nor thermally stable. As Dr Gaskell states in his preface to the book under review, "The impact on biomedical research has been such that the advancement of mass spectrometric techniques and of certain areas of biomedical research are now inextricably linked and the demands of the biochemist constitute the principal driving force in the development of mass spectrometry". The purpose of this volume, therefore, is to impart a sense of the current state of play in the field, and a glimpse of future directions.

The book is divided, somewhat arbitrarily, into three sections, each of which is preceded by an introduction from the editor. Part I covers the analysis of labile and polar compounds of biological interest, and includes discussions of the role of mass spectrometry in studies of leukotrienes, bile salts, nucleic acid constituents, acyl carnitines, coenzyme A thioesters and polar drug metabolites.

Part II, the heart of the volume, focuses on analyses at high mass, and deals largely with the relative merits of different ionization techniques and mass analysers for the investigation of molecules in the range beyond 1,000 daltons. Examples are drawn from work on various biological oligomers, including peptides, carbohydrates, glycoconjugates and nucleic acids, and practical aspects of the analysis of these complex biopolymers are discussed by several of the contributors. The book concludes with a section on trace analyses, where mass spectrometry has been employed for the quantitative determination of relatively low-molecular-weight analytes, of both endogenous and exogenous origin, in biological fluids and tissues at the parts-per-billion level and below.

Despite the inevitable problems with continuity in a book of this type, Dr Gaskell has done an admirable editorial job. The 26 chapters are written by active researchers and are well-balanced, clearly presented and appropriately illustrated. Together they give an accurate impression of the current capabilities (and limitations) of mass spectrometry for research in the biomedical sciences. The technique has indeed come a long way since the observation of "rays of positive electricity" derived from helium and other inert gases. Protein biochemistry has arguably been the primary beneficiary of these advances; recent accomplishments have included the analysis of enzymes such as porcine trypsin, which was determined by ^{252}Cf-plasma desorption time-of-flight mass spectrometry to have a molecular weight of 23,406 ± 140 daltons. Were J. J. Thomson still alive, he would surely be impressed. □

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- *The Oxford Companion to Animal Behaviour* edited by David McFarland. Publisher is Oxford University Press, price is £12.95 ($19.95; to be published in July). For review see *Nature* **294,** 501 (1981).