

BOOK REVIEWS

Quaternary Dating Methods

by M. Walker

John Wiley & Sons, Ltd., 2005, 286 pp.
ISBN 0-470-86926-7 (HB), 0-470-86927-5 (PB)

A thorough knowledge of dating methods is immensely useful to quaternary geologists and other earth scientists. It constitutes the basis for assigning ages to events in the distant past, as Professor Mike Walker states in his book preface: "My principal purpose is to describe the various dating techniques that are routinely employed in Quaternary science ...". The present book has a predecessor in J. Lowe & M. Walker earlier classic *Reconstructing Quaternary Environments* (1997) and contains topics of another book of him entitled *Late Quaternary Environmental Changes* (1992).

The book begins with a documented historical background (Chapter 1) that reviews the development of various dating methods and some fuzzy problems like duration of the Quaternary period, stratigraphy and terminology. Chapters 2 to 4 provide a detailed presentation of different radiometric dating methods, each with its basic principles, problems, and specific applications. Chapter 2 is entirely dedicated to the Radiocarbon dating and describes various types of measurements, sources or error, how to calibrate the radiocarbon timescale, and how to handle some problematic dating materials. Fourteen case studies are covered under the practical aspects related to this method.

Chapter 3 describes dating methods using long-lived (K/Ar, $^{40}\text{Ar}/^{39}\text{Ar}$, U-series, and cosmogenic nuclides) and short-lived (^{210}Pb , ^{137}Cs , and ^{32}Si) radioactive isotopes. Radiation exposure dating methods (luminescence: TL, OSL; ESR, and fission track) are explained and exemplified in Chapter 4 along with fifteen relevant applications. Chapter 5 provides a thorough and systematic presentation of six dating methods that make use of regular additions of material to organic tissue or sedimentary sequences (dendrochronology, varve sediments, lichenometry, annually layered glacier ice, speleothems, corals, and molluscs). Although, these techniques are basically used for dating Holocene events, some of them (i.e., varves, ice-layers, speleothems, and sometimes tree-rings) are widely used to date pre-Holocene sequences. Five relative dating methods (rock surface weathering, obsidian hydration, pedogenesis, amino acid, and fluoride dating) are gathered in Chapter 6. Of these, the author prepared a longer presentation for the amino acid geochronology, for which method, four

applications were examined. Chapter 7 is devoted to an in-depth treatment of the techniques for establishing age equivalence, such as oxygen isotope chronostratigraphy, tephrochronology, and paleomagnetic dating.

The book is rounded off by Chapter 8 that is dedicated to *Dating the future*, in which the author is prospecting how the Quaternary dating methods will look a few decades from now on. The book also includes a useful bibliography and at the end of each chapter a series of *Notes* explain specific terms. The book's structure proves very workable and all chapters are carefully illustrated.

The new book by Mike Walker is well written, the style is clear and easy to read. Therefore is an important contribution to our Quaternary community either as an introduction textbook for both undergraduate and postgraduate students or for other earth science specialists (when considering the large number of specific examples for each dating method). In conclusion, I welcome the publication of this book and highly recommend it to those who are fascinated by locating in time and space different Quaternary events, but not only.

Bogdan P. ONAC

A Geologic Time Scale 2004

by F.M. Gradstein, J.G. Ogg, and A.G. Smith (Eds.)

Cambridge University Press, 2005, 589 pp.
ISBN 0-521-78142-6.

As a result of the wide experience of 40 contributors, the new edition of the Geologic Time Scale represents a complete up-to-date reference on the most important standards and conventions in stratigraphy.

The introductory part (F.M. Gradstein, J.G. Ogg, A.G. Smith) presents an historical overview of geologic time scales, time and rock relationship, standardization of the Chronostratigraphic Scale, and major subdivisions of the Geologic Time Scale.

The second part of the book deals with the stratigraphic concepts and methods: biostratigraphy (F.M. Gradstein, R.A. Cooper, P.M. Sadler), orbital parameters and cycle stratigraphy (L.A. Hinnov), geomagnetic polarity ((J.G. Ogg, A.G. Smith), radiogenic isotope geochronology (M. Villeneuve), strontium isotope stratigraphy (J.M. McArthur, J. Howarth), and geomathematics (F.P. Agterberg).

Part III gives specific and consistent information on geologic periods, illustrated with beautiful charts: the Archean and Proterozoic Eons (L.J. Robb, A.H. Knoll, K.A. Plumb, G.A. Shields, H. Strauss, J. Veizer), Precambrian time scale (W. Bleeker), Cambrian (J.H. Shergold, R.A. Cooper), Ordovician (R.A. Cooper, P.M. Sadler), Silurian (M.J. Melchin, R.A. Cooper, P.M. Sadler), Devonian (M.R. House, F.M. Gradstein), Carboniferous (V. Davydov, B.R. Wardlaw, F.M. Gradstein), Permian (B.R. Wardlaw, V. Davydov, F.M. Gradstein), Triassic (J.G. Ogg), Jurassic (J.G. Ogg), Cretaceous (J.G. Ogg, F.P. Agterberg, F.M. Gradstein), Paleogene (H.P. Luterbacher, J.R. Ali, H. Brinkhuis, F.M. Gradstein, J.J. Hooker, S. Monechi, J.G. Ogg, J. Powell, U. Röhl, A. Sanfilippo, B. Schmitz), Neogene (L. Lourens, F. Hilgen, N.J. Shackleton, J. Laskar, D. Wilson), Pleistocene and Holocene Epochs (P. Gibbard, T. van Kolfschoten).

Part IV (F.M. Gradstein, J.G. Ogg, A.G. Smith) summarizes the construction of the Geologic Time Scale, by showing the components, calibration methods and possible future trends.

The book includes appendixes with recommended color coding of stages (F.M. Gradstein, J.G. Ogg), orbital tuning calibrations and conversions for the Neogene (L. Lourens, F. Hilgen, N.J. Shackleton, J. Laskar, and D. Wilson), geomathematics (F.P. Agterberg), 99 pages of references, and a stratigraphic index.

GTS 2004 has already become a top stratigraphic reference.

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The chapter on Biostratigraphy and Regional Zonal Scales gives a detailed and very well documented image on the biostratigraphy of the most important basins: North Atlantic petroleum basins, Arctic Ocean, western North Atlantic, Eastern Atlantic ODP sites, Western Tethys, and pelagic limestones. Zonal schemes and acme events are summarized, and very well illustrated with color range charts and statistic data.

The most consistent part of the book gives the systematic taxonomy for 129 species. It represents a complete, up-to-date, detailed and very well illustrated work. Taxa are presented with the revised name, illustration of the type specimens, original designation, type level and locality, diagnostic features, size, synonyms, occurrences, bathymetry, discussions and remarks. Plates of a very good quality are a very good support for the text.

Complete references and taxonomic index conclude the Atlas.

Probably one of the most important books in the history of Foraminiferal literature, the Atlas of Paleogene Cosmopolitan Deep-water Agglutinated Foraminifera should be found on the favorite shelf of every micropaleontologist.

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Atlas of Paleogene Cosmopolitan Deep-water Agglutinated Foraminifera

by M.A. Kaminski, F.M. Gradstein and collaborators.

Grzybowski Foundation Spec. Publ., 10, 547+vii pp.
ISBN 83-912385-9-X.

As a result of the wide experience of the authors and a very careful revision of fossil assemblages collected from the most representative locations, the Atlas provides the best and most complete reference on Paleogene deep-water agglutinated foraminifera.

The introductory part presents the importance of the agglutinated foraminifera, an illustrated history of the investigations, and the source of the material.

Agglutinated Foraminiferal Biofacies and Ecology chapter gives a specific image on the abyssal, "flysch", scaglia, and slope types of assemblages in relation to the substrate, CCD, functional morphology and feeding strategies, disturbance, interactions with macrofauna and paleobathymetry.