



Journal of Sedimentary Research

An International Journal of SEPM

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Review accepted 2 May 2007

Encyclopedia of Quaternary Science, by Scott A. Elias (Editor-in-Chief), 2006. Elsevier, Amsterdam, The Netherlands. Hardbound, 4 volumes totalling 180 + 3365 pages. Price complete set EUR 1,280.00; USD 1,540.00; GBP 880.00. ISBN vol. 1 978-0-444-51920-7; vol. 2 978-0-444-51921-4; vol. 3 978-0-44-51922-1; vol. 4 978-0-444-51923-8; set 978-0-44-51919-1.



Four large-size books of almost 900 pages each (each volume has 45—identical—introductory pages) are not a work that one can review in any detail. This becomes even more apparent if one realizes that the Editor-in-Chief, Scott Elias, has been supported by not less than 17 Associate Editors and 8 Section Editors. Together they had to handle the contributions of some 400 specialists.

Such a large amount of people involved easily results in a work that is difficult to handle by the users, for instance because the individual topics are hardly to trace. Elsevier's 2005 *Encyclopedia of Geology* was a work with such a disadvantage. It is therefore a pleasant surprise that lessons have clearly be learned. The structure of the *Encyclopedia of Quaternary Science* is in itself not so much different from that of the *Encyclopedia of Geology*, but it is much more accessible. The articles are limited in number, so that data are presented in their full context. Thanks to apparently careful editorial instructions, the authors have subdivided their contributions in sections that can—for a large part—also be read on their own. The main problem that such a structure may raise (and the *Encyclopedia of Geology* suffered too much from it), is that it is difficult to find specific data without a very well thought over index system. The editors of this new encyclopedia have successfully adapted a new approach: not an endless list of alphabetical entrances in an overall index (which is, in the *Encyclopedia of Geology* so huge that it becomes almost impossible to handle, particularly because of the countless composed entries with commas, such as “glacial deposits, till, terminology”), but an index of restricted size (at the end of the fourth volume) and, in the first volume, a contents list by subject.

This contents list consists of 18 main items (Introduction and History of Science; Paleoclimatology; Dating Techniques; Quaternary Stratigraphy; Quaternary glaciation; Fluvial Environments; History of Quaternary Glaciations; Sea Level Studies; Paleosols and Wind-blown Sediments; Lake Level Studies; Paleobotany; Paleolimnology; Vertebrate Studies; Insect Fossil Studies; Paleooceanography; Ice Core Studies; Stable Isotope Research: Carbonates; and Humans in the Quaternary). Each of these main items is subdivided in sub-items (the item ‘Dating Techniques, for instance, is subdivided in: Radiometric Methods; Geomagnetic Excursion and Secular Variations in the Magnetic Field; Biological Methods; Annual Layer Methods; and Chemical Methods). These sub-items are, in turn, subdivided in third-level items (Biological Methods, for instance, are subdivided in: Amino-Acid Dating; Lichenometry; and Dendrochronology). Each of the individual topics provides a reference to the volume and page where the subject is dealt with. This makes it truly easy to find specific data.

Obviously, a good accessibility is a prerequisite for an encyclopedia. It is, however, not the most important. Far more important are the reliability of the data provided, their completeness, and the up-to-date character. Such aspects are very difficult to evaluate, as it is physically impossible to read through the whole work. A judgement on these aspects must therefore,

unavoidably, be based on test samples. I took such test samples, but I must admit that these were not entirely unbiased: my own interests and specialisms have, without doubt, influenced my choices. On the other hand, I feel that a judgement is—at least in principle—more reliable if you are aware of recent developments.

The test was made by checking some entries in detail. As each manuscript referee will know, it is practically impossible to check all data; this holds even more for an encyclopedia, where the text and figures are—or should be—a compilation of all the existing knowledge, as far as relevant and as far as fitting within the space available. I chose 5 items for this test: (1) Time Scales of Climate Change (as this is highly relevant for the present-day discussions on the rate of global warming), (2) Quaternary Chronostratigraphy (as this topic should be dealt with with utmost care in this encyclopedia), (3) Subglacial Landforms (as this is an area with rapid developments), (4) Late Glacial Events in Northwest Europe (as I am already longtime involved in this research), and (5) Neanderthal Demise (as this is a topic of interest for several disciplines).

The entry “Time Scales of Climate Change”, by P.J. Bartlein, covers 10 pages. It is an interesting contribution (because of the mathematics not always easy reading), which clearly and convincingly explains the causes of climatic cycles over different time scales, emphasizing that not only do climate fluctuations increase with increasing lengths of the time intervals considered, but also that the climate variability itself changes with time. Differences between “Steps”, “Oscillations”, “Fluctuations” and “Events” are explained in a logical way; one need not agree in detail with these distinctions to recognize that categorization can be useful. What I dearly missed in this—otherwise instructive—contribution is the absolute rate of climate change; it was (at least in Greenland) some 6 °C within a few decades at the end of the Younger Dryas, and such data are, in my opinion, essential if either recent or ancient climate changes are evaluated. Bartlein’s contribution ends with a 1-page reference list, with works up to 2006. It can therefore be concluded that this contribution presents the state-of-the-art, which was also the impression that I got while reading the text.

The four other items mentioned above did not change my view. All texts had been written carefully, and were well readable. Probably the editors have been very active, because it is almost impossible to imagine that all contributors are gifted writers. The editors can be congratulated with the result.

Browsing through an encyclopedia like this is tempting. There is so much interesting material included that it is difficult to lay the book(s) aside once one has started browsing. Of course, it are not only the texts that attract attention. The well bound books have a pleasant typography, there is a good balance between text and illustrations, and the illustrations (both photographs and line drawings, commonly in full colour) are well reproduced. In such a large work, some things must go wrong; typos are extremely rare, however, and only few figures are misprinted (such as the photo on p. 1986, which shows a blue color that is certainly not natural). Finding such errors is a time-consuming task, however: the books may not be perfect, but they come fairly close.

I cannot refrain from making a remark on the title of this huge work. Many earth scientists may have gotten the impression (particularly from the recent flow of publications by the IUGS International Commission on Stratigraphy, ICS (with their 2004 book as the most prominent example) that the Quaternary does not exist anymore, but that it is rather an obsolete name for the younger part of the Neogene. In fact, Elsevier had suggested so already in the 2005 Encyclopedia of Geology, where stratigraphic time tables on the inside cover show this. Such time tables are, fortunately, absent in the Encyclopedia of Quaternary Science. Fortunately, because the Quaternary still is a formal chronostratigraphic unit, and so is the Tertiary (suspension of these units, as proposed by the ICS, was never formally ratified by the IUGS). Consultation between ICS, the Subcommittee on Quaternary Stratigraphy, and INQUA has initiated recently a process of formally defining and establishing the Quaternary. A formal decision is most likely soon to come.

Obviously, this sensitive subject had to be dealt with in the Encyclopedia. The item is dealt with by B. Pillans, who could not do much else than navigating between Scylla and Charybdis. Both in Figure 1 and in the text, Pillans calls the Quaternary a “sub-erathem” (or “sub-era”,

depending on litho- or chronostratigraphic usage), but also mentions statements that “The Quaternary should have the rank of either System/Period above a shortened Neogene, or Sub-Erathem/Sub-Era within the Cenozoic and correlative with the upper party of the extended Neogene.” The situation becomes even more complicated in Pillans’ Figure 2, where the late Pliocene forms part of the Quaternary. It is time, indeed, that the stratigraphy of the last few million years of the Earth’s history get an unambiguous and logical stratigraphic terminology!

Much more is to be said about this monumental work. Most of such works—and this one is no exception at providing objective data. A human touch is consequently sometimes difficult to find. I think therefore that the editors should be praised for the fact that they have dedicated this encyclopedia to the memory of Nick Shackleton, and that they show that science—and thus also Quaternary science—is an activity of humans: “It is fair to say that Quaternary scientists have been standing on Nick Shackleton’s shoulders for the last 40 years.”

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