

## COMPTES RENDUS - BOEKBESPREKINGEN

WARD, P.D. - **The call of distant mammoths. Why the Ice Age mammals disappeared.** *Copernicus, Springer-Verlag, New York.* 1997. Hardback, 241 p. ISBN 0387949151. Price DM 39,80.

Ward's book, *The call of distant mammoths*, is a popularised attempt to examine the causes of some major extinction events in the history of the earth. *The call of distant mammoths* comprises a prologue, 10 chapters, an afterword and a very short reference list.

In the first chapter Ward looks at the first modern people in South Africa 115.000 years ago, the ancient fauna of Australia and its discovery by modern humans 35.000 years ago and the peopling of North America 11.000 years ago. The second chapter deals with the Permo/Triassic and the Cretaceous/Tertiary extinction events. For the latter, Ward is a fervent proponent of the asteroid impact hypothesis. According to Ward «to understand the passing of the mammoths, one must first understand the passing of the dinosaurs» (chapter 3, p.52). Chapter 4 discusses the impact event at the end of the Cretaceous and the influence on the landscape the extinction of the dinosaurs had. «With the disappearance of all the dinosaurs, plants were no longer trampled and eaten, browsed and destroyed by the herbivorous dinosaurs.» (p.70). «The death of the dinosaurs unleashed an evolutionary torrent.» (p.73). Ward gives accordingly a snap view of the Tertiary evolution of mammals, lingers on the primate, human and proboscidean history and finishes the chapter with a description of the Pleistocene world. In chapter 5 Ward outlines the role of chance in evolution and extinction. Once more he zooms in on the evolution of man: the impact of fossil hominids on African ecosystems, the Out of Africa saga with the colonisation of Europe, Asia and America. In chapter 6 Ward imagines the invasion of the first humans in North America: «You came armed, for your people have hunted big game for a thousand generations, and in all that time they have never once raised a crop.» (p.119) and discusses the issue of the cause of the mammoth disappearance in that continent: «Did the Clovis people actually hunt down healthy adult mammoths, mastodons, camels and horses, using their stone implements to kill these largest of land creatures? (p.126). The extinctions in North America coincide with two major events: the climate change at the end of the Ice Age and the arrival of the first humans. Ward clearly favours the overkill hypothesis (extinction by human hunters) over the climatic changes hypothesis that blames the climatic changes and their influences on the environment at the

end of the Ice Age for the disappearance of the larger mammals. Chapter 7 treats with computer modeling of extinction rates in the geological past. Ward mentions the theory of Haynes that the Late Pleistocene hunters sought out waterholes where in periods of stress weakened mammoth herds gathered. There the animals were an easy prey in the difficult seasons. Chapter 8 gives a description of Wrangel Island which was a refuge for a mammoth population until 4.000 years ago. These mammoth herds could survive the end of the Last Ice Age since this island, situated in the Arctic Ocean north of the Siberian coast, retained a flora similar to that which covered much of northern Eurasia and America during the Ice Age. Chapter 9 considers the current destruction of the biodiversity of our planet. In chapter 10 Ward comes to his conclusion, based on the research of the isotope composition of the growth rings in mammoth tusks, that humanity caused the extinction of the mammoth. In his epilogue Ward foresees the extinction of the elephants.

Although the title of the book is *The call of distant mammoths. Why the Ice Age mammals disappeared* much more is written about dinosaurs and the Cretaceous than about the mammoths of the Last Ice Age. Not all mammoths are treated equally by Ward. He pays more attention to the mammoths of North America than those of Eurasia. Primary data on Europe and especially Siberia are seriously underrepresented. Ward cites very few European and Russian sources. Ward is clearly a proponent of the overkill hypothesis. He uses only the perspective and data that support his view. Important works such as those of Guthrie (1990), Hopkins *et al.* (1982), Kurten & Anderson (1980), Sher (1974), Ukraintseva (1993) and Vereshchagin & Baryshnikov (1991) are not discussed in his text. Most of the illustrations are from Figuier (1864). Although in their naïveté they are attractive, recent reconstructions and pictures of fossils with a more scientific value are too sparse. The cover illustration shows an *Amebelodon* that lived during the Miocene. In short, Ward's book is a well written, popular book, that does not need to describe all the details of scientific research. However, it offers an unbalanced view of the causes of the extinction of the large mammals from the Ice Age.

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WALLISER, Otto H. (Ed.)- **Global Events and Event Stratigraphy in the Phanerozoic**. Springer - Verlag, Berlin, Heidelberg. 1996. 333 p., 86 figs. ISBN 3-540-59056-0. Hardcover. Price DM 128.00

Vingt-neuf auteurs apportent leur participation à cet ouvrage dont l'ensemble constitue une brillante synthèse critique des données relatives aux événements globaux jalonnant l'histoire phanérozoïque de la terre. Les événements biologiques déjà reconnus au siècle des lumières et durant le 19ème sont à l'origine du découpage stratigraphique en unités - Systèmes, Séries et Etages - dont un grand nombre restent encore valides de nos jours. Même si actuellement plus personne ne remet en cause la réalité des événements biologiques, leur causalité, leur nature catastrophiste et leur synchronisme global à l'échelle de la planète restent des sujets très controversés.

Cinq contributions axées sur des thèmes généraux constituent la première partie de l'ouvrage. Le lecteur profane appréciera particulièrement l'article d'introduction de Otto H. Walliser : il présente une vue générale de la stratigraphie événementielle et définit de manière très claire la nomenclature propre à ce thème de recherche. Les deux contributions suivantes se focalisent sur les mesures de biodiversité et d'amplitude d'extinction autour des «bio-events». L'accent est mis sur la densité d'échantillonnage qui apparaît comme un facteur déterminant quant il s'agit de discriminer les phénomènes graduels des événements abrupts. Par une compilation des paramètres biologiques, physiques et chimiques, la quatrième contribution examine les causes telluriques et extra-telluriques susceptibles d'être à l'origine des événements globaux enregistrés durant le Phanérozoïque. Un catalogue des événements isotopiques

( $\delta^{13}\text{C}_{\text{carb}}$ ,  $\delta^{18}\text{O}_{\text{carb}}$ ,  $\delta^{34}\text{S}$ ,  $^{87}\text{Sr}/^{86}\text{Sr}$ ) clôture cette première partie. Dans la mesure où plus de la moitié des 60 événements isotopiques recensés appartiennent à l'histoire du carbone, une part importante de cette contribution est consacrée aux processus responsables des variations du  $\delta^{13}\text{C}_{\text{carb}}$ .

Dans la deuxième partie de l'ouvrage, les événements globaux sont détaillés dans les différents Systèmes du Phanérozoïque. Au total, 9 contributions spécialisées traitent successivement des événements ayant affecté la biosphère précambrienne, de la transition Précambrien-Cambrien et des événements cambriens, de la période ordovicienne, des «bio-events» siluriens, des événements globaux dévono-carbonifères, des «bio-events» permien, des événements majeurs du Trias et du Jurassique et des événements crétacés. Comme épilogue à cette deuxième partie, un court chapitre pour le moins inhabituel dans un ouvrage de géologie de ce type, traite du futur de l'homme. Dans une optique préventive d'un «événement holocène terminal» possible pour l'humanité, Otto H. Walliser souligne l'importance de connaître en détail les mécanismes qui ont conditionné les grandes catastrophes écologiques du passé.

Une synthèse de l'ensemble des données géologiques relatives à chacune des 65 extinctions globales reconnues dans le Phanérozoïque clôture cet excellent ouvrage.

Marc ROCHE

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**Theophrastus' Contributions Volume II.** *Theophrastus Publishing & Proprietary Co, S.A., 33 J. Theologou Street, Zographou, 15773 Athens, Greece.* ISBN 960-7457-12-9 (hardbound). 282 p. Price 45 US\$.

The aim of this series, and of other Theophrastus publications animated by Prof. Augustithis with the cooperation of an international group of reputed, non-mainstream scientists, is to present original and novel ideas in all possible geological disciplines. This includes articles by plate tectonics critics (although some articles on sedimentation included in the present volume tacitly accept the plate tectonics paradigm). Most contributions are made by scientists studying geological phenomena and problems from fundamental, physical or chemical concepts, also from chaos theory. Indeed, several contributions stress the importance of self-organising processes and even point in this respect to the similarity between organic and anorganic structures. Furthermore, the volume is strongly oriented towards textural analysis and geometrical organisation of crystalline rocks, and - why not - banded iron ores. This includes some reflections on metasomatic properties of igneous rocks, and thus on their possible transformation by the process of granitisation. Periodicity

of ore formations is correlated to fossil fuel deposition and related to the superplume hypothesis. The volume ends with a plea to question mainstream science paradigms, and to restore the traditional values of the hard rock geologists, based on careful observation and mapping, and preservation of the links to mineral exploration.

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Clément MATHIEU et Françoise PIELTAIN - **Analyse physique des sols - méthodes choisies**. 1998. *Tec&Doc Lavoisier*, 11 rue Lavoisier, F-75384 Paris Cedex 08, France. 280 pages (y compris 8 annexes, 29 tableaux, 86 figures, 9 photos, bibliographie, index et table des matières). ISBN 2-7430-0283-2. Prix: 295 FF

Les auteurs, ayant tous deux une grande expérience du sujet, ont voulu réaliser un manuel pratique d'analyses et de mesures physiques, réalisées soit *in situ*, soit en laboratoire, afin de caractériser les sols et de comprendre leur dynamique actuelle.

L'ouvrage commence par un chapitre consacré au prélèvement et à la préparation des échantillons de terre, qui permet d'emblée d'apprécier l'esprit très pratique et très concret qui a présidé à sa rédaction.

Les différentes rubriques portent successivement sur l'analyse granulométrique, les mesures de la porosité, les tests de stabilité structurale et de percolation, les limites et indices d'Atterberg, les limites de retrait, les tests de filtration et enfin les mesures des humidités caractéristiques. Chaque chapitre est construit sur le même schéma: une présentation générale du sujet, la description des différentes méthodes retenues par les auteurs (principe, matériel nécessaire, mode opératoire, calculs, présentation des résultats et discussion de synthèse) et les références bibliographiques.

L'intérêt principal de ce manuel est d'une part de regrouper les méthodes de l'analyse physique des sols et d'autre part, à côté de méthodes classiques (granulométrie, limites d'Atterberg, ..), de présenter des techniques récentes comme les tests de filtration de l'eau pour lesquelles les auteurs se sont adressés à des spécialistes reconnus (J. ASSELINE, J.C. CHOSSAT et Ch. VALENTIN).

Ce manuel intéressera évidemment les responsables de laboratoires spécialisés, mais aussi tous ceux qui sont confrontés à l'analyse de documents traitant du sol en général.

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A. NICOLAS - **The Mid-Oceanic Ridges. Mountains below Sea Level**. *Springer-Verlag Berlin Heidelberg*, 1995. 200p. 92 figs. Softcover. ISBN 3-540-57380-1. Price DM 58,00.

This easily accessible edition translated from French introduces students in the fascinating world of divergent plate boundaries, where plate spreading takes place and new slivers of sea floor are produced.

The introductory chapters outline the basic principles of plate tectonics (Chapter 1) and subjects as mantle convection, hotspots and mantle plumes (Chapter 2). In Chapter 3 the major characteristics of mid-ocean ridges emerge from the description of the sea floor topography and transform faults. The significance of the more than 60000 km long network of oceanic ridges for a better understanding of the structure of the oceanic crust, hydrothermal venting and ecosystems associated with active deep-water hydrothermal systems is highlighted in Chapter 4.

As the exploration of the ocean floor is a high-cost business, it is clear that portions of oceanic plates that are preserved on the continents as obducted slices in ophiolite complexes are of invaluable scientific interest. Ophiolites are therefore documented in Chapter 5. The analysis of the structural deformations that affect ophiolitic peridotites furthermore permits us to reconstruct mantle movements under the ridges and provides data on melting of the mantle and extraction of basalt (Chapter 6).

Chapter 7 examines how diapirs rise and spread out under the ridges, and elaborates on the scenario of the formation of mineral deposits and the emplacement of magma chambers below ridges. The final chapters of the book concentrate on problems with regard to the expansion of rifts (Chapter 8) and the major pulsations that shaped the earth (Chapter 9). At the back of the book, students will find a non-extensive Glossary of terms.

Subjects covered in the volume will be of interest to students, teachers and scientists in the broad field of geosciences. The text is lavishly illustrated with figures, diagrams and photographs, most in colour, of excellent quality and significance.

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HERZ, N. & GARRISON, E.G. - **Geological methods for archaeology**. *Oxford University Press, Saxon Way West, Corby NN18 9ES*. 1998. 343p. ISBN 0-19-509024-1.

The book aims to serve as an introduction to the many fields where geology has been successfully applied to archaeology. It is divided into four major parts: I. The archaeological site and its environment, II. Dating tech-

niques, III. Archaeological site exploration, and IV. Artifact analysis.

The part of the book devoted to the archaeological site and its environment (chapters 2-3) focuses on geomorphology and sedimentology, two disciplines that offer the tools to determine the appearance of ancient landscapes. To establish the chronological history of a site both relative and absolute dates are important. A substantial part of the book is therefore concerned with the description of relative and absolute dating techniques. In the order, chemical methods (chapter 4), radioactive methods (chapter 5), radiation-damage, cosmogenic, and atom-counting methods (chapter 6), and other chronological methods (chapter 7) are outlined.

Modern site exploration requires the use of wide range of geophysical and geochemical techniques. Geophysical methods of potential usefulness in archaeological prospection fall within the following classes: seismic, electrical and electromagnetic, magnetic, radar, microgravity and thermography (chapter 8). As human activity chemically modifies the composition of the soil, it is obvious that the study of soil phosphate and other chemical compounds are of ever increasing power to locate abandoned ancient settlements, even where no visible evidence remained (chapter 9).

Rocks, minerals (both nonmetallic and metallic) and ceramics are commonplace archaeological materials. Determining the provenance of raw materials used in the manufacture of lithic artefacts and pottery yields invaluable information on ancient cultures. The distinctive fingerprints of the cited archaeological materials and their potential source areas are usually based on petrographic, magnetic, geochemical, and many other physical properties. How these characteristics can be determined is shown in chapters 10-14.

The book is well-documented and illustrated, and includes bibliographical references and an index. It will equally be appreciated by archaeologists and geologists. The former will become acquainted with the available analytical techniques, including their shortcomings and virtues, that can be used to solve specific archaeological problems. The latter will learn about fascinating applications of their profession that they perhaps never imagined. It is regrettable, however, that from time to time the authors disregard or ignore the existence of some excellent handbooks published recently in Europe about techniques they are dealing with in the text.

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R.U.Gent

Ph. A. CHARLEZ - **Rock Mechanics Volume 2. Petroleum Applications.** *Editions Technip, Paris, 1997.* Hardback, 170x240 mm, 704 p., 586 fig., 11 tabl. ISBN 2-7108-0586-3. Prix 780 FF.

Le deuxième volume de l'ouvrage de Ph. Charlez sur la Mécanique des Roches est le complément pratique indispensable du volume 1, publié en 1991. Ce deuxième volume est consacré à l'application de la mécanique des roches au domaine pétrolier. Le livre se concentre sur trois thèmes principaux : forages, fracturation hydraulique et «reservoir engineering». Après un rapide rappel de la formation du pétrole et des bases de la thermoporomécanique, on aborde le problème de la stabilité des puits, en particulier dans les régions à tectonique active. Le développement des puits est traité au chapitre 4. La solution géomécanique, faisant appel au couplage pression de pore/déformation, est comparée aux données de terrain. Une extension aux problèmes thermiques fait l'objet du chapitre 5.

La fracturation hydraulique (chapitres 6 et 7) est traitée en détail, avec des nouveautés telles que les mesures de contraintes, la réinjection de cuttings, la fracturation acide et l'effet thermique lié à l'injection d'eau.

La seconde partie du livre traite de problèmes non-linéaires et non élastiques tels que la stabilité des puits en roches plastiques, la production de réservoirs poroplastiques, l'effet de la compaction sur la récupération d'huile, la production de sable (envahissement de puits), la rupture de tubages en formations salines. La fin de l'ouvrage est consacrée à l'examen des conditions initiales, c'est-à-dire aux mécanismes induisant l'état de contraintes de la croûte terrestre. Cette approche est faite à partir d'éléments de tectonique globale mais aussi en étudiant les diverses origines possibles des pressions de pores anormales observées de par le monde.

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A. PARKER & J.E. RAE (Eds) - **Environmental Interactions of Clays. Clays and the environment.** *Springer-Verlag, Berlin-Heidelberg, 1998.* Hardcover, 271 + 14 p., 74 figs., 10 tabs. ISBN 3-540-58738-1. Price DM 128,00.

This 271 page book is a multi-author book and is the second in a Clays and the Environment series. The book intends to cover a wide range of clay topics having in common their role in environmental studies. This is undoubtedly an ambitious objective. In a short introduction the editors define the different fields of importance of clays in environmental studies. They distinguish industrial use, natural and manmade environmental pollution. The interactions of clays and pollutants are considered in natural occurring situations and when added to the environment for remediation.

Chapter 2, by R. Pusch, deals with radionuclide transport in smectite clays (29 p) and mainly deals with work performed in the Swedish programmes for nuclear waste management. Chapter 3, by J.B. Dixon, deals with clay and oxide minerals in topsoils (15 p) and is a modified reprint from an earlier paper published in 1991. Chapter 4, by W.A. House, deals with interactions of nonvolatile micro-organic pollutants and clay minerals in surficial environments (37 p). The sorption mechanisms and kinetics are discussed in laboratory situations and in a case study with complex sediments. Chapter 5, by T.A. Jackson, deals with the biogeochemical and ecological significance of interactions between colloidal minerals and trace elements (113 p). In this long chapter information is given on many physico-chemical items such as sorption and desorption behaviour, the influence of complexing organic molecules, surface coatings, flocculation, scavenging etc and on biological consequences of mineral-trace element interaction. The chapter ends with some practical applications such as disposal and containment of wastes, metal removal from wastewater, remediation of polluted environments and an example of disease control. Chapter 6, by J. Arch, deals with clay barriers in landfills (36 p). After having discussed some of the key required properties of clay liners and cappings in landfill projects the author illustrates his practical experience by discussing in detail a case from which a good insight in the successive steps of the procedures is obtained and also the need for quality control and maintenance. The final chapter 7, by J.C. Wagner, K. McConnochie, A.R. Gibbs and E.D. Pooley, deals with clay minerals and health (23p). The biological effects of exposure to different clay minerals are reported. Fortunately a glossary is given for those readers unfamiliar with specific medical terms. A subject index is included at the end of the book (5 p).

The book treats a lot of important properties of clays which all are of importance in environmental studies. The treatment of several subjects by different authors in different chapters may have the advantage of concentrating the book around specific topics but the disadvantage is a poor structuring of the information contained in the book. The book can be recommended to those looking for an orientation in the field of clays in environmental studies although the user may find it difficult to get a comprehensive treatment of a particular clay property.

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BROWN, James H. & LOMOLINO, Mark V. - **Biogeography Second edition**. Macmillan Distribution Ltd, Houndmills, Basingstoke, Hants, RG21 6XS for Sinauer Associates, Inc. Publishers, Sunderland, Mas-

sachusetts. 1998. xi + 691 p. ISBN 0-87893-073-6 (hardcover). Price £ 35,95.

The first edition of *Biogeography* by J.H. Brown & A.C. Gibson was published more than 20 years ago (1983) but became seriously out of date. Disciplines as ecology, evolution, systematics, paleobiology, geography, and physical earth sciences which form the underpinning of biogeography, have seen important advances in the last decades. These new insights forced the authors to completely rework the former edition, including conceptual changes of chapters and substitution and adding many figures, tables and references. The outline of the book is identical with that of the first edition. Chapters are unified in units, giving the 700 pages thick book more transparency, but, in contrast with the first edition which contained 4 units, a fifth one is added in the new edition.

The first unit (2 chapters) gives the reader an introduction to the discipline, with besides basic definitions by which the discipline is introduced and placed within the framework of other sciences, a historical overview of the main ideas and concepts formulated by famous philosophers.

Unit 2, comprising 5 chapters, introduces the reader to the environmental and historical aspects of the earth. In 2 chapters we learn about the physical environment and the geological dynamics of the earth. Special attention is paid, in a separate chapter, to the youngest geological series, the Pleistocene, and its impact on the present day distribution of the biomes. In the two other chapters distribution patterns of species, populations and communities are described. Herein, the reader is introduced to basic ecological concepts such as range and range extension, population growth and fluctuations, and the niche concept.

Historical patterns and the processes behind them are dealt with in the third unit. After an introduction in the first chapter which summarises concepts about speciation and extinction, the second chapter in this unit opens with the much-debated issue about dispersal versus vicariance, and continues with the ideas behind dispersal and its limitations. The two last chapters in this unit deal with the evolutionary history of lineages and the reconstruction of biogeographic histories.

Contemporary patterns and their processes are the topic of unit 4. Two chapters are devoted to island biogeography, and two summarise diversity in continental and marine habitats and the processes behind. Unfortunately, something went wrong with the assignment of chapter 16 to one of the units. This chapter clearly belongs to the unit dealing with «Contemporary Patterns and Processes», but is listed in the contents (p. x) with the following unit 5. A future printing should correct this.

New in the edition at hand is the fifth unit (Chaps. 17 to 19): «Biogeography and Conservation». The first

chapter is an introduction to the concept of «Biodiversity crisis». This chapter tries to summarise what has been written in the last decade about this topic. An almost gigantic task when this happens on 25 pages. Finally, applications from the study of biogeography (designing nature reserves, predicting effects of climatic change and surveys) are briefly introduced, which clearly demonstrate that biogeography is not a closed subject, and has an exciting future.

Throughout the texts, topics such as «Phylogenetics» or «How to construct phylogenetic trees», are elucidated in separate boxes, allowing the reader to have quick access to the methodology discussed or to refresh his or her basic knowledge. The book closes with an elaborated glossary of 12 pages, 36 pages of references, and a detailed index covering 17 pages. Glossary and index largely facilitate access to this 700 pages thick volume.

In general, the second edition of *Biogeography* is an easily reading, profusely illustrated and detailed account about one of the most intriguing aspects of our dynamic biosphere. Its place is not on the shelves, but within immediate reach for all those who have interest and concerns about our environment.

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RASOLOFOSAON, P., ed. **Actes du Huitième Atelier international sur l'anisotropie sismique. Septembre - Octobre 1998.** *Revue de l'Institut Français du Pétrole (numéro spécial).* Editions Technip, Paris. 1998. Pp 539-763. ISSN 0020-2274. Abonnement 1500 FFR; vente au numéro 290 FFR.

Ce numéro spécial de la Revue de l'Institut Français du Pétrole regroupe 18 papiers présentés lors du 8e Atelier International sur l'anisotropie sismique à Boussens (France) du 20 au 24 avril 1998. Les actes comprennent des contributions sur des observations expérimentales, des articles théoriques et de modélisation et des essais de synthèse.

Les effets de l'anisotropie de certaines couches (d'argile en particulier) sur les profils de sismique-réflexion commencent à être mis en évidence, mais la manière d'en tenir compte lors des traitements reste encore un sujet de recherches (par rapport aux structures isotropes). Les modèles anisotropes montrent généralement une variation des temps de propagation, ainsi qu'un phénomène de biréfringence des ondes S. Les articles sélectionnés présentent des résultats récents d'auteurs connus sur ce sujet important pour l'industrie pétrolière.

De très bonne présentation, ce volume n'intéressera cependant que les géologues déjà spécialisés dans ce domaine.

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Steven M. STANLEY - **Earth System History.** *W.H. Freeman and Company, New York (Macmillan Distribution Ltd., Houndmills, Basingstoke, Hants. RG21 6XS, England).* 1999. 615 p. ISBN 0-71673-377-3. Price 25.95 £ (including New Active learning CD-ROM).

This is a new and innovative manual on historical geology, aimed at undergraduate students, starting from the principle that the abiotic and biotic components of the planet Earth belong to a single, interactive system. This work is tributary to the Gaia hypothesis; arguments supporting this system approach abound at all parts of the text.

The manual intends to provide teachers and students with a comprehensive guide to Earth system history. It is subdivided in two almost equal parts, the first part analytical and the second part historical.

The first part is composed of 10 chapters, introduced by a chapter with a synthetic overview, followed by chapters on the origin and diversity of lithosphere and biosphere, life and sedimentary environments, stratigraphic principles and dating, biological and geodynamic evolution including plate tectonics and continental accretion, and major chemical cycles. This part is based on previous work of the author, explaining stratigraphy as the basic concept for understanding earth's history. It could be questioned whether this part of the manual is really adapted for students studying geology as the themes presented normally will be studied in much greater detail. The insights in the basic concepts of the system earth as presented by the author, however simplified they may be, are outstanding and will certainly seduce lecturers as well as interested students or laymen.

The second part is also composed of 10 chapters presenting the history of life in chronological order, starting with the Archean (the rise of life) and ending with the Holocene (up to the twenty-first century). It is certainly not intended as a palaeontology course; the relation of fossils to the strata in which they are found and the influence of external (climate, sea level) and internal (plate tectonics, paleogeography) geodynamics on fossil occurrences and evolution of life form the backbone of this part. Therefore the linking of both parts in a single textbook seems justified.

Easy reading not requiring prior knowledge, coupled with intelligent lay-out, abundant colour illustrations and photographs, cover artwork all contribute to make this work extremely attractive and almost irresistible to glance at, even for those who have no real intention to study the subject. The flexible cover and robust binding allow to use this book in different situations. Un-

fortunately, these qualities make the CD-ROM in its plastic case all the more vulnerable. Beware of cracked CD-ROM's and keep them in a better protected environment.

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**H. WACKERNAGEL - Multivariate Geostatistics.** 2nd completely revised edition. *Springer-Verlag, Postfach 140201, D-14302 Berlin*. 1998. 291 p. ISBN 3-540-64721-X. Hardcover. Price DM 89,00.

Het boek bestaat uit 32 korte hoofdstukken opgedeeld in 5 delen, bevat 76 figuren en 5 tabellen.

In het eerste deel wordt het verband uitgelegd tussen statistiek en geostatistiek met basisconcepten als het gemiddelde, variantie, covariantie, lineaire regressie en kriging.

Deel B bevat 13 hoofdstukken. Volgende aspecten van geostatistiek worden besproken: het concept regionale variabele en random function, variografie, anisotropie, extentie- en dispersievariantie, verschillende aspecten van kriging, het lineair coregionalisatiemodel en kriging van spatiale componenten.

In het deel C wordt vooral aandacht besteed aan de multivariabele analyse. In het bijzonder komen de correspondentie, de canonische en component analyse aan bod.

Deel D bespreekt volgende elementen van de multivariabele geostatistiek: covariantiefuncties, verschillende vormen van cokriging, coregionalisatie analyse en complex kriging.

In een laatste deel wordt in drie hoofdstukken de non-stationaire geostatistiek behandeld.

In de appendices wordt basis matrix algebra gegeven, lineaire regressie theorie, enkele oefeningen en de oplossingen ervan, referenties naar software en een uitgebreide bibliografie. (295 referenties).

Het boek is de aangepaste versie van een eerste uitgave die was gebaseerd op cursusmateriaal en gepubliceerd werd in 1995. Verschillende veranderingen werden aangebracht en deze uitgave is overzichtelijker en beter gestructureerd dan het eerste werk.

De auteur brengt de problematiek op een intuïtieve wijze aan en introduceert vervolgens de achterliggende mathematische concepten.

Enkele praktische voorbeelden van toepassingen van geostatistiek worden uitgebreid besproken: een regionale geochemische bodemstudie (arsen) en een studie van de januaritemperatuur in Schotland in functie van de geografische positie.

Het boek richt zich tot ingenieurs, geofysici en statistici die een goede wiskundige bagage bezitten. Studenten geologie en geografie zullen er baat bij hebben dit boek te lezen in combinatie met een basiswerk zoals dit van

Isaaks en Srivastava (1989) of Goovaerts (1997).  
Isaaks, E.H. & Srivastava, R.M., 1989. *An introduction to Applied geostatistics*. Oxford University Press, Oxford.  
Goovaerts, P., 1997. *Geostatistics for Natural resources Evaluation*. Oxford University Press, Oxford.

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**M. ARMSTRONG - Basic Linear Geostatistics.** *Springer-Verlag, Postfach 140201, D-14302 Berlin*. 1998. 155 p. ISBN 3-540-61845-7. Softcover. Price DM 49,90.

Het boek bevat 59 figuren verdeeld over 10 hoofdstukken. In de introductie wordt de geostatistiek in een ruimere context geplaatst, dit wordt geïllustreerd met enkele voorbeelden. Vervolgens wordt het concept «regionale variabelen» kort besproken. In de volgende drie hoofdstukken komen achtereenvolgens aspecten van de variogram, de experimentele variografie en de structurele analyse aan bod. In hoofdstuk 7 en 8 worden de theoretische achtergrond en de praktische aspecten van kriging (negatieve gewichten, het «screen effect», de kwaliteit van een kriging configuratie) besproken. Tenslotte volgen enkele voorbeelden uit de mijnbouwsector en een uiteenzetting van de methode om de globale reserves te berekenen.

Het boek is de weergave van de basiscursus lineaire geostatistiek die gegeven wordt bij de postgraduaatstudie in mijnbouwgeostatistiek in het Centre de Géostatistique van Fontainebleau.

De verschillende aspecten worden op een zeer eenvoudige wijze aangebracht, het boek is rijk geïllustreerd en bevat een minimum aan mathematica. Dit werk is een eenvoudige introductie tot lineaire geostatistiek sterk georiënteerd op de mijnbouwsector. De lineaire geostatistiek vormt een echter zeer klein deel van geostatistiek in het algemeen. Non-lineaire, non-stationaire geostatistiek en simulaties komen niet aan bod. Deze laatste vermelde technieken hebben een veel groter toepassingsgebied. Lineaire geostatistiek is bijvoorbeeld niet het correcte instrument om studies die verband houden met een normoverschrijding uit te voeren. Aangezien professionelen in de milieusector geconfronteerd worden met bodemsaneringsnormen en risicoevaluaties vormt de literatuur die de non-lineaire geostatistiek en simulaties bespreekt een noodzakelijke aanvulling. Voorbeelden hiervan werden bij de vorige boekbespreking gegeven.

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Peter D. WARD - **Time Machines: scientific explorations in deep time.** *Copernicus, Springer-Verlag, Postfach 140201, D-14302 Berlin.* 1998. 241 p. ISBN 0-387-98416-X. Hardcover. Price DM 49,00.

Comment connaît-on l'âge d'une roche ou d'un fossile? Comment peut-on reconstituer la Vie sur Terre il y a plusieurs millions ou centaines de millions d'années? Géologues et paléontologues sont constamment confrontés à ce type de questions du grand public. Et il est toujours difficile d'y répondre. S'il existe actuellement sur le marché une multitude d'ouvrages, souvent très complets et richement illustrés, sur l'évolution de la Vie sur Terre, la plupart d'entre eux laissent malheureusement l'aspect méthodologique de côté. Le grand intérêt du livre de Peter D. Ward est de tenter d'apporter une réponse claire à ces questions, en décrivant quelques unes des principales techniques utilisées par les géologues et les paléontologues - les «machines à remonter le temps» - pour faire revivre le lointain passé. Chaque chapitre décrit une de ces machines à remonter le temps: échelle des temps géologiques, datations absolues, paléomagnétisme, tectonique des plaques, mesure du niveau des mers, paléoécologie, cladisme, analyse de l'ADN, étude des isotopes.... Pour décrire ces différentes techniques, Peter D. Ward part d'un exemple très concret: l'étude du Crétacé supérieur marin au large de l'état de Washington. A partir de sa propre expérience, il montre au lecteur quelles sont les questions que se posent les géologues de terrain et comment les différentes techniques apportent des réponses à ces problèmes. L'auteur montre de façon très intelligente la complémentarité de ces machines à remonter le temps. Au fil des chapitres, se dévoile ainsi un monde depuis longtemps disparu. Peter D. Ward s'inspire très largement du style narratif développé notamment par S.G. Gould, tout en évitant les excès théâtro-mégalomanes propres à ce dernier. En abordant les questions scientifiques comme un roman, Peter D. Ward prend le lecteur par la main dès la première page et l'intrigue l'amène sans se lasser jusqu'à la dernière. Certaines machines à remonter le temps sont malheureusement moins clairement expliquées que les autres: ainsi, le lecteur non averti devrait-il aborder avec quelques difficultés le chapitre sur la tectonique (sujet, il est vrai, particulièrement ardu). On peut également regretter la qualité moyenne des illustrations. Certains graphiques se révèlent incompréhensibles pour le lecteur non averti, parce que accompagnés d'une légende trop succincte, voire incomplète. En résumé, ce livre devrait intéresser un large public, dont l'intérêt pour les sciences naturelles ne faiblit pas. Son côté pédagogique devrait également inspirer les enseignants et les géologues professionnels.

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RYDER, G. ; FASTOVSKY, D. and GARTNER, S. (Eds.) - **The Cretaceous-Tertiary Event and other Catastrophes in Earth History.** *Geological Society of America, P.O. Box 9140, Boulder, Colorado 80301, Special Paper 307.* 1996. Paperback, 541 p. ISBN 0-8137-2307-8. Price \$ 149.00.

Contrairement à ce que pourrait suggérer son titre, cet ouvrage est essentiellement une compilation d'articles traitant de la limite « K/T ». En toute logique, il s'adresse aux spécialistes de cet intervalle stratigraphique et aux amateurs dinomaniaques catastrophistes exaltés par l'une des plus grandes crises de l'histoire de la biosphère: élimination finale des ammonites, des bélemnites, des rudistes, extinction planctonique majeure, disparition de plus de 60 % des espèces d'angiospermes + et, bien sûr, extinction des dinosaures.

Quatre contributions axées sur des questions clés telles que la résolution des données paléontologiques, les causes, les effets et la sélectivité des extinctions massives introduisent l'ouvrage. La théorie unificatrice liant les grandes crises de la biosphère à des impacts de grands astéroïdes est développée en détail. Elle est illustrée par un scénario type des bouleversements qui se manifesteraient en cascade après l'impact d'un astéroïde. Une revue historique des conjectures relatives à la limite « K/T » conduit à reconnaître le caractère consistant et unificateur de la théorie de l'impact par rapport aux autres hypothèses.

La structure circulaire enfouie de Chicxulub (Yucatan, Mexique) est reconnue comme le cratère géant résultant de l'impact qui a eu lieu à la limite Crétacé-Tertiaire. Une dizaine d'articles spécialisés traitent de manière plus ou moins directe de Chicxulub. Deux articles sont consacrés à l'étude géophysique et morphologique de ce cratère d'impact ainsi qu'à la minéralogie et au magnétisme des impactites. Les autres contributions traitent plus spécifiquement de la pétrographie des produits d'éjection liés à l'impact, du dégazage des roches encaissantes et de la balistique des produits éjectés lors de la collision. Les dépôts présumés liés au tsunami géant engendré par l'impact et qui sont décrits sur plusieurs sites répartis sur le pourtour du Golf de Mexico, dans le Sud des USA et au Brésil font l'objet d'une suite de six contributions. Par la suite, il devient plus difficile d'établir un classement thématique des articles relatifs à la limite « K/T » tant les sujets abordés sont disparates: études de l'extinction des foraminifères planctoniques et du nannoplancton calcaire, réflexion quant à la signification évolutive à donner à l'extinction des dinosau-



res, analyse granulométrique des quartz choqués dans les sédiments de la limite « K/T », oxydation du Fer dans les tektites +

Parmi les quatre articles qui ne traitent pas de la limite « K/T », il convient de souligner la contribution consacrée à la géochimie de la limite Frasnien-Fammienien de la coupe d'Hony, Belgique.

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PAQUET, H. & CLAUER, N., eds. - **SOILS AND SEDIMENTS, Mineralogy and geochemistry**. Springer-Verlag, Berlin, 1997, 369 p. ISBN 3-540-61599-7. Hardcover. Price DM 178,00.

This textbook is dedicated to the memory of Georges Millot, who was for almost 40 years one of the most prominent French geologists, leaving an impressive scientific heritage in the field of sedimentology and soil science in general and of clay geochemistry in particular.

Dedication volumes usually treat the topic(s) of interest of the honoured scientist. Hence, almost inevitably, the range of subjects is generally too limited to give the publication the status of a real « handbook ». Yet, in this case, Georges Millot's scientific career was such a rich one, that the topics displayed in this work, give a quite complete overview of the current state of the art in « surficial geochemistry ». Most of the contributing authors are French, and it is striking that in most of the chapters, French or at least « non-Anglo-saxon » publications are relatively abundant among the listed references. As mentioned in the preface, one of the main ideas of the volume was indeed to give an English presentation of the « French school » in surficial geochemistry.

Chapter 1 gives a general overview of the clay mineral types in weathered rocks and soils and their genesis and their importance on texture, CEC. Chapter 2 deals with the formation of calcretes, where the research by Millot and his collaborators showed that these represent a weathering system, developed mainly by isovolumetric replacement of minerals by calcite (calcareous épigénie) rather than by impregnation of porous media.

Chapter 3 is a synthesis of the formation, evolution and degradation of laterites and bauxites. The geochemical processes, affecting the bauxite profiles, and their influence on economic value of the ore, as well as the relationship with tropical landforms are described.

The role of soil covers and pedogenesis on the tropical landscape is the subject of chapter 4. Two large systems of soil cover evolution processes are recognised, i.e. soils in dynamic equilibrium and soils in transfor-

mation systems. The processes, leading to increasing planation of tropical landscapes or to the formation of « half-orange » landforms with convex hills, though not yet very well understood, are described.

The following chapters 5, 6 and 7 are focusing on 3 specific evolutionary types of lateritic deposits, eventually evolving to economic manganese, nickel and gold ore deposits. The geochemical processes, influence of bedrock lithologies, landscape and climate are described together with several typical ore deposits from Africa and S.-America.

Chapter 8 compares the ecology of 2 semi-arid regions in Brasil and the Sahel. Of totally different nature is chapter 9, as it deals with weathering of building stones in sandstones and the importance of pore structures.

Chapter 10 gives an interesting review of the different forms of continental silicifications (pedogenetic, groundwater and evaporite silicifications). The mechanisms, leading to oversaturated Si-solutions and the processes of Si-precipitation as quartz, opal or amorphous silica are presented. Silcrete formation is also returning in the next chapter, where the Paleogene continental deposits in France are placed in their geochemical frame. A concise and clear overview of different typical facies (mottles and kaolinitic clays, silcretes, calcretes) and the factors affecting their formation (climate, topography, erosion, detrital influx, vegetation) is given.

In chapter 12, the origin of sedimentary apatite and phosphorites is presented in a condensed but well structured way. The conclusion consists of a very interesting « model » for phosphogenesis presented by the authors.

Chapter 13 is basically a summary of data published on clay mineral marine sedimentation, one of the most important fields of research of Georges Millot. The different marine environments and their common clay mineral groups (bediellite, smectite, glauconite,+) are described. Special tribute is paid to detrital supply of terrigenous clays and to origin, behaviour, diagenesis of smectite. Finally, the contribution shows how marine clay minerals can provide information about the paleoenvironmental records (paleoclimate, continental sources, paleocurrents, tectonics).

Chapter 14 deals with different isotopic dating methods (Rb-Sr, Sm-Nd, K-Ar, <sup>87</sup>Sr/<sup>86</sup>Sr, Pb-Pb, <sup>40</sup>Ar-<sup>39</sup>Ar) on clay minerals, carbonates and phosphates.

Chapter 15 illustrates how clay minerals and organic matter could be affected by the same alteration mechanisms, during early diagenesis. Fluid migration as a process to explain hydrocarbon accumulations may be one of the mechanisms transforming inorganic matter as well.

The book « Soils and Sediments » is an interesting textbook, well illustrated and documented, certainly useful for students, teachers and researchers working in the range of issues listed above.

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Günther A. WAGNER - **Age Determination of Young Rocks and Artifacts**. Springer-Verlag, Berlin, 1998, 466 p. ISBN 3-540-63436-3. Hardcover. Price DM 148,00.

Günther A. Wagner presents to the interested reader a clear and concise introduction to the subject of archaeological and Quaternary numerical dating. As expected from the wide experience of the author in the field of the so-called «physical methods based on radioactivity» (e.g. fission-tracks) a high scientific level, combining clarity and concision with strictness is achieved for all the subjects covered by this methodological domain. However, Wagner did not hesitate to present also the so-called «chemical» methods based on radioactivity (e.g. K-Ar, C14 ... ) and the dating methods based on other physical and chemical processes. Even though this exceeds the field of competence of most scientists involved with one or the other of these applications, the author managed to cope with these other subjects with maestria. It is a pity, in such conditions, that, since this work has originally been published in 1995, the most recent technological developments are insufficiently discussed, but this concerns essentially the Ar-Ar method. The unity of the book is given by the applications, not by a physical principle at their base. However principle and applications cannot be dissociated. The laws of physics decide when an attempt at dating fails or is successful. Thus the user should be sufficiently acquainted with the physical principle of the method used and the book will provide him this initiation. The author makes an exception to the principle of conciseness by mentioning the applications twice (more precisely, the materials usable for dating which exceed 50 in number). They are described in the first chapter after the introduction, and subsequently, in relation with the applicability of one or several dating tools to their case. Indeed, we know that the same «dating technique» (a highly subjective notion) is usable on several minerals, artefacts, or both, while the same mineral or artefact can be dated by several methods. This makes a clear account of such complicated matter uneasy. Günther Wagner was however successful in making all basic notions on physical background and applications easily accessible, as well as their mutual relation, avoiding as much as possible repetitions. This book is highly recommendable to all scientists interested in a vast interdisciplinary subject.

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L. CREVECOEUR & J. STEVENS (Ed.) - **LIKONA, Limburgse Koepel voor Natuurstudie, Jaarboek 1998**. Provinciaal Natuurcentrum, Zuivelmarkt 33, 3500 Hasselt. 1999. 133 p. ISSN 0778-8495. Prijs : 400,- BEF (rekeningnummer 000-0400447-31 van het Provinciaal Natuurcentrum, Ontvangsten).

Het achtste jaarboek van de Limburgse Koepel voor Natuurstudie (LIKONA) biedt opnieuw een boeiend overzicht van recent feitelijk materiaal over de Limburgse natuur. LIKONA is een samenwerkingsverband van werkgroepen die actief zijn rond natuurstudie en door het provinciebestuur worden ondersteund.

Het hoofdartikel geeft een overzicht van het geologisch en paleontologisch belang van het stratotype van de Mergels van Gelinden. Dit werk moet aan de basis liggen van de inrichting van het site als geologisch monument. Herstel van natuurwaarden langs de Grensmaas is een beleidskeuze sinds de overstromingen van 1993-95. Dit genereert heel wat onderzoek zowel in België als Nederland. Gepubliceerde voorbeelden hiervan zijn geautomatiseerd geoelektrisch onderzoek uitgevoerd vanop een hovercraft met als doelstelling de dikte van het grindbed te bepalen en landschaps-ecologie van maasoevers en maasdijken en mogelijkheden om deze te optimaliseren. Verder komt de verspreiding van fauna en flora in Limburg aan bod.

Aanvullend zijn er nog een becommentarieerde literatuurlijst en activiteitsverslagen van verschillende werkgroepen, o.a. geologie.

De LIKONA jaarboeken onderscheiden zich door hun uitermate verzorgde grafische vormgeving. Vooral onder impuls van Roland Dreesen worden in deze traditioneel meer biologisch gerichte uitgave steeds meer specifiek geologische onderwerpen opgenomen.

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Jean FAVENNEC (co-ordinator) - **Biodiversité et protection dunaire**. Lavoisier TEC & DOC, F-75384 Paris Cedex 08, 1997. 311 p. ISBN 2-7430-0196-8. Price: 320 FFR.

The book presents the oral and poster contributions of a seminar held in Bordeaux in 1996 and which concluded an action programme selected by the European Commission, financed under the LIFE programme and co-ordinated by the «Office National des Forêts». The topic of the programme was the management of non-vegetated coastal dunes along the Atlantic coast and Pas-de-Calais including the humic and vegetated areas at the landward side of the dunes. The aim of the programme was to realise management works and plans in 6 pilot areas and to validate and generalise the local acquisitions.

The first part of the book gives the presentation of the management works carried out in 6 pilot areas and results of the action plans which apparently turned out to be very successful, each with different interdisciplinary approaches, presentation of the problems, methodology and action plans. The importance of different factors contributing to the biodiversity of the dunes is illustrated by maps and photographs.

For the pilot area of Mimizan and Messanges (Landes) where the coastal dunes are subject to heavy tourist pressure, the use of original techniques are described and illustrated. In «Les Ensablés au Cap-Ferret» (Gironde) which suffered from general regression of the dunes due to a combination of marine and wind erosion, human frequent use and the absence of maintenance work, a wide range of dune restoration techniques was implemented now resulting in the control of wind deflation and sand invasion and the development of a diversified vegetation. The pilot area «La Courbe et Oléron» (Charente-Maritime) has been mapped and comparison of aerial photographs and satellite images over a period of 35 years revealed an overall coastal retreat of as much as 400 m in 45 years. On the island of Oléron, the study of dune dynamics, the production of ecodynamic maps, coastal monitoring and visitor frequency studies contributed to manage the retreat of the dunes. On the Arvert peninsula, different approaches were used in different zones to manage the very marked coastal retreat. For the pilot area of the dunes of Merlimont (Pas-de-Calais), a study concerning the geomorphology, hydrobiology and vegetation of the different dune areas is presented as well as the recent evolution of the coastal retreat and different proposals for management actions. For the pilot areas of the Pays de Monts (Vendée) and the Landes de Lessay (Cotentin peninsula in Normandy), the dynamics and the maintenance of floral diversity in the dunes is presented and the action plans proposed.

The second part of the book presents the knowledge and management of coastal dunes by way of 6 contributions. The first article recalls the main factors controlling the general conditions of coastline evolution. The second article explains with plenty of coloured maps and photographs the methodology and use of ecodynamic maps as graphical summary of the dune context. The third article presents the plant diversity along the Atlantic coasts of France and the different managements to consider with respect to the diversity. The fourth chapter deals with conservation management focusing on variable action plans according to the dynamics of the dunes. The fifth article presents the Coastal Conservancy and its main principles to guide action plans. The last article proposes a sustainable management of coastal forests.

The third part of the book deals with education at an European level and collaboration for coastal management. It starts with a paper (in English and French)

dealing with management and dynamics of coastal dunes in Europe and in France showing results of long-term experiments in the Netherlands and France. The second paper shows an example of a model of temporary beach stability which was developed on basis of the relationship between coastal forms, the microforms and their floral associations. The following paper mentions the remarkable similarity between the evolution of the Atlantic coasts of Portugal and France, and stresses on the fact that exchange of ideas and sharing experiences are fundamental to achieve successful control of coastal evolution phenomena. The fourth, and somewhat more elaborated paper recalls the use of an appropriate terminology to describe dune morphologies, gives a brief statement about the general conditions of formation and evolution of coastal dunes in western Europe, and a definition of 5 groups of dune complexes on basis of their morphological characteristics, vegetation and classification of the forms. This paper adds a reference list of papers concerning dunes in general and specific papers on dunes in the European countries. This part ends with a summary of the discussions about the oral communications.

The last part of the book presents the poster session grouped under the headings of «Dune ecology and dynamics», and «Management, follow-up and geography». Particular case studies mainly concerning fauna and flora, dune protection, management techniques and vegetation restoration are presented from France, Portugal, United Kingdom, Lithuania, Poland and Brazil, some of them with well-documented illustrations.

In the general conclusions, the various results and approaches of dune management are recalled.

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VELDE, Bruce & DRUC, Isabelle C. - **Archaeological Ceramic Materials**. Springer Verlag, Berlin. 1999. 299 p. ISBN 3-540-64469-5. Price hardcover DM 169.00.

Cet ouvrage est conçu comme une introduction à l'origine et à l'analyse scientifique du matériel le plus abondant mis au jour en archéologie : la céramique.

Les critères d'évaluation, principalement typologiques, de ce matériel ne suffisent pas toujours à l'archéologue pour répondre aux éternelles questions de la problématique: A quoi et à qui ces céramiques étaient-elles destinées, d'où viennent-elles, quelles techniques étaient utilisées pour leur façonnement, ...

L'étude des propriétés chimiques et physiques du matériel céramique permet de répondre en tout ou en partie à bon nombre de ces questions.

La recherche archéométrique nécessite une connaissance de la matière première, l'argile sensu lato, mais

aussi de l'artefact, roche métasédimentaire. Ainsi, suivant ce plan, les auteurs déterminent la nature et la pétrogenèse des argiles pour s'intéresser ensuite à leurs propriétés technologiques (plasticité, comportement lors de la cuisson ....). Bien connues des géologues, les méthodes d'analyse sont présentées en tant que moyens d'identification des caractéristiques physico-chimique de la céramique. Cette identification permet par exemple le groupement ou la différenciation de productions ainsi que l'évaluation de leur degré de technicité.

En guise d'illustration, des cas d'étude sont présentés comme les poteries de l'âge de fer dans le sud-ouest de l'Angleterre ou les célèbres productions de sigillées de la Gaule romaine.

L'archéométrie de la céramique, recherche pluridisciplinaire par excellence, trouve ici toute sa dimension. Cet ouvrage offre au néophyte un aperçu de cette science trop peu connue et un *vade-mecum* au chercheur.

Benoît MISONNE

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Georges BUSSON and B. Charlotte SCHREIBER (eds.) - **Sedimentary deposition in rift and foreland basins in France and Spain.** *Columbia University Press, New York.* 1997. 479 p. A4 cloth, ISBN 0-231-06786-0. Price \$ 230.00.

Contributors: M.-M. Blanc-Valleron, G. Busson, A. Curial, D. Geisler-Cussey, G. Dromart, D. Dumas, R. Moretto, D. Nury, F. Orti, J.-J. Pueyo, L. Rosell, J.-M. Rouchy, J.M. Salvany, P. Santanach, B.C. Schreiber, M. Schuler, J.G. Veigas.

This book deals with evaporite-related deposits, such as limestone, dolomite, gypsum and halite found in the rift and foreland basins of France, Spain and parts of Germany. The book is divided into four parts.

Part 1 presents an overview of different depositional facies in marine, mixed, and non-marine environments. These represent useful examples of modern evaporite sedimentation that support the understanding of the Paleogene and Lower Neogene deposits.

Parts 2 and 3 cover a series of comprehensive individual basin studies. The geological setting, structural evolution, facies distribution, geochemistry, and sedimentary dynamics of these basins are examined. In part 2 various locations in France from north to south, i.e. from the Alsace to the Basse Provence, are examined. Many of the deposits here seem to be non-marine in origin. In part 3 the Ebro Basin and the south Pyrenean foredeeps are examined. These Spanish locations reside within a very different tectonic framework and are characterized by thick sedimentary deposits formed in marine, alluvial, paludial, lacustrine and sabkha settings.

Part 4 summarizes the general features of the evaporitic deposits examined in this book. It reviews the distribution of lithofacies, depositional settings, climate, diagenetic aspects and the presence of organic matter in these evaporite sequences. The information is also summarized in useful tables.

The authors have presented a wealth of data, figures, photographs, microphotographs, seismic sections and discussions focusing on Paleogene and Lower Neogene evaporitic deposition in France and Spain. I consider this book an invaluable contribution to researchers and professionals interested in the geology of carbonate and evaporite deposits.

Peter Nielsen

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GROSHONG, R. H. Jr. - **3-D Structural Geology. A Practical Guide to Surface and Subsurface Map Interpretation.** *Springer, Berlin.* 1999. 324 pp. 366 figs. 10 tabs. ISBN 3-540-65422-4. Hardcover. Price DM129,-

This manual describes a number of practical techniques for the geometrical analysis of three-dimensional structured geological bodies, eventually enabling the best possible interpretation of (sub)surface maps and cross sections.

The book is directed towards professionals who are confronted with the three-dimensional geometry of geological bodies which they have to understand thoroughly *e.g.* for exploration purposes, to resolve geotechnical problems, or to assess seismic hazards.

Because of the particularity of the target group special emphasis is put on «rapid» and easily implemented quantitative, and moreover computer-oriented, techniques to produce and evaluate maps and cross sections starting from incomplete data sets, such as outcrop measurements, and different kinds of subsurface data (well logs, two-dimensional seismic profiles).

The first chapter aims at people not familiar with structural geometries and deals with some basic structural concepts useful for map interpretation, such as unconformities, folds, faults, their mutual geometrical relationships, and their appearance on maps and cross sections. In chapter 2 the fundamentals of any geometrical interpretation are treated. Besides a discussion of different coordinate systems to determine the localisation (x, y, z) of an observation point, emphasis is put on attitudes of planes and lines, as well as on thickness of strata. With respect to attitudes of structural features the graphical representation, applying stereographic projection, and the graphical derivation of attitudes on maps, is discussed. A rather uncommon technique to represent attitudes, the tangent diagram, is extensively discussed. Chapter 3 gives an introduction to different contouring techniques. Chapter

4 focuses on a number of geometrical elements related to folding. Again, the application of the tangent diagram is emphasised. Furthermore, the dip sequence analysis, using Statistical Curvature Analysis Techniques (SCAT), is treated with respect to the recognition of folds in well logs. Chapters 5 and 6 deals with different aspects of faulting. Again the application of SCAT is discussed. Techniques to determine fault displacement on maps and cross sections are treated. Finally, the influence of faults on map contouring is discussed. Chapter 7 gives a general introduction to cross-sections. Subjects, such as choose of cross section, vertical and horizontal exaggeration, and the extrapolation to depth, are dealt with. Chapter 8 examines the principles of restoration and validation of cross-sections. A basic introduction to cross-section balancing is given.

At the end of each chapter the basic analytical derivations of the techniques described are given, primarily to enable a «translation» of the particular approach towards e.g. spreadsheets or other computer applications. The knowledge acquired can subsequently be tested with a number of problems to be solved. Finally, a reference list for further reading is included.

This handbook raises some mixed feelings. On the one hand, it gives a rather good synthesis of all geometrical techniques, used in map and cross section interpretation, to analyse three-dimensional structured geological bodies. On the other hand, the intention of being complete results in a rather superficial treatment of some subjects (such as contouring techniques, stereographic projection, cross-section balancing), thus hampering a thorough understanding of the technique concerned, or in the treatment of uncommon techniques (such as the tangent diagram), causing some confusion. Despite this critical note, this book is unique in its kind and is therefore definitively an asset for any professional confronted with three-dimensional structured geological bodies.

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F. Jerry LUCIA - **Carbonate reservoir characterization**. Springer-Verlag, Tiergartenstrasse 17, D-69121 Heidelberg. 1999. 226 p. ISBN 3-540-63782-6. Hardcover price DM 149,00.

This book focuses on carbonate rocks and on its reservoir characteristics but, unlike many books with similar title, petrophysical features form the backbone. The author intends to bridge the gap between sediment-petrologists who describe sedimentary features and diagenesis and reservoir geologists or engineers who rely on such petrophysical characterisation.

In chapter 1, rock parameters such as porosity, (rela-

tive) permeability, capillary properties and fluid distribution are briefly reviewed. They are subsequently discussed in the context of rock-fabric and porosity classification in chapter 2. Here the difference between reservoir characteristics in limestone and dolomite is discussed as well as the existence of unusual porosity types (collapse features), and the relationship between interparticle porosity and water saturation. Nice illustrations are presented of different vug pore space types, linked to their petrophysical characteristics. The author has considerable experience in this field, as is reflected by the number of own papers referred to at the end of the chapter (about 1/3 of the papers are from the author; however, there are some key papers missing here from other researchers). In chapter 3, one-dimensional core description and wireline log interpretation form the main subject. Much attention is paid to the core/log calibration for the most commonly used logging types. In the following chapters the control of depositional framework and diagenetic modifications on petrophysical parameters is discussed. Here, a 3-D approach is followed. In chapter 4, the cyclicity in carbonate systems is addressed as well as the impact of calcite mineralogy on the potential generation of porosity. In chapter 5, a brief overview is given on cementation, compaction and secondary porosity development in the «Ca-carbonate» world. It is a rather brief summary of what has been discussed in many other papers and books, e.g. Moore (1989) and Longman (1980). Some nice reservoir examples are briefly reviewed at the end of this chapter. Dolomitisation and evaporite mineralisation are known to obliterate many of the Ca-carbonate features in reservoirs. These are addressed in chapter 6 which is completed by some very briefly discussed case histories. Before developing reservoir models attention is drawn to the highly reactive nature of carbonate and associated evaporite rocks in chapter 7 (i.e. massive dissolution, collapse and fracturing). Here the case examples are all from the U.S as was also the case in the previous chapter. The concluding chapter 8 is certainly the most exciting. Geostatistical methods are presented and attention is paid to scale problems and the difficulty to work with average results derived from heterogeneous carbonate strata. The development of rock-fabric reservoirs is explained by some remarkable examples. This final part is particularly well illustrated. This book is not only highly recommended to undergraduate students specialising in reservoir characterisation, but also to those researchers and reservoir geologists/engineers who need detailed background on carbonate reservoir characteristics. Also geoscientists involved in karst or in groundwater research in carbonate systems can use this book as a reference document.

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FRATER, Harald - *Natural disasters*. Springer Verlag, Tiergartenstrasse 17, D-69121 Heidelberg. 1998. Multimedia Program on CD-Rom for Macintosh and PC. ISBN 3-540-14609-1. Prix DM 98.85.

On quitte ici l'approche traditionnelle du manuel de référence au profit d'un CD-Rom didactique qui reprend les principaux aspects des catastrophes naturelles. Il s'agit d'une vulgarisation remarquable, qui s'adresse plutôt aux étudiants et enseignants du secondaire. Des photos accompagnées de commentaires parlés ou de textes, des séquences vidéos, des simulations, des schémas, des cartes, constituent le grand intérêt de ce document multimédia. Les textes vont à l'essentiel. Un glossaire très complet éclaire le profane sur les termes techniques.

Des cartes donnent la répartition mondiale des princi-

paux types de catastrophes. Pour chaque type, les causes, le déroulement et les conséquences sont analysées. Les moyens de contrôle et de prévention et les mesures de sécurité sont discutées. Des simulations interactives permettent d'apprécier l'effet du réchauffement climatique sur la remontée du niveau marin ou sur le déplacement des zones climatiques et de comprendre les mécanismes des tremblements de terre. Enfin, des liens hypertextes facilitent un accès rapide aux sites internet traitant des mêmes sujets.

Parcourir ce CDROM constitue un plaisir. On espère en découvrir d'autres, ayant trait à toutes les facettes de la géologie. Pour les étudiants, à l'apprentissage scientifique se greffe celui de l'anglais.

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