
Schlumberger: The History of a Technique

By L.A. Allaud and M.H. Martin
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The history of the Schlumberger brothers and their development of electrical geophysical prospecting methods, provides fascinating reading for anyone engaged in the exploration for hydrocarbons. Conrad Schlumberger began his work in France, prior to the first world war, and initially developed surface mapping techniques, still used by most mining exploration companies. The story unfolds as he progresses from "back yard" experiments to studies of known mineral deposits, and finally to commercial prospecting enterprises, with his brother Marcel, both in France and in the rest of the world. While the rest of the exploration industry stalled during the Great Depression, hard work and mappable results kept the Schlumberger group busy in Russia with contracts that ensured their survival and allowed new developments and techniques to proceed. To this day, surface electrical techniques developed by Schlumberger play an important role in Soviet Petroleum Exploration.

Subsurface (wire line logging) techniques developed in 1927 and after many years of experimentation and field testing, the petroleum industry gained a tool which revolutionized exploration. The Great Depression slowed research and development of these new tools. Spontaneous potential and resistivity devices, measuring relative permeability and formation resistivity respectively, dominated the logging of boreholes until the end of the second World War. When Germany invaded France, Schlumberger moved most of the research group to Houston. The frantic search for petroleum reserves during the second

World War provided the incentive to develop new logging devices. From 1945 to 1957 the first porosity tool was developed. The Gamma-Ray Neutron log allowed shale content and porosity measurements, and combined with the SP-resistivity logs allowed quantitative reservoir calculations to be made for the first time in the borehole without core information.

The sonic tool, first experimented with in 1937, made its entrance to the exploration scene in the late 1950s. As well as being an excellent porosity measuring device, this tool made a tremendous impact on seismic techniques which were becoming more important in the exploration for petroleum.

The advent of sophisticated computer techniques for interpretation and the refinement of early tools has allowed the petroleum industry to make significant strides in the understanding of the distribution of oil and gas accumulations. Many companies have benefitted from the perseverance of the Schlumberger brothers. They have to be acknowledged as the pioneers and leaders of almost all the borehole measurements which we take for granted today. In addition, their role in pioneering surface electrical prospecting techniques is often overlooked but of equal importance.

This book is an attempt to credit them and although the authors succeed, their tedious style provides difficult reading. A natural subdivision of the book could have been a historical account followed by a description of their scientific techniques. However the intermeshing of these two aspects of the story tends to destroy the flow of the historical narrative and limit the technical continuity necessary for its use as a geophysical textbook. I do feel, however, that the relevant aspects of both could be sorted out and used for the basis of an informative and essential part of the education of students in the earth science disciplines.

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Aspects of Ecology and Zoogeography of Recent and Fossil Ostracoda

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This book contains all the 51 papers given at the sixth International Symposium on Ostracods (Saalfelden, Salzburg, July 30th to August 8, 1976), which was discussed on the ecology and zoogeography of both living and fossil Ostracoda. This volume consists of five parts. The first ("Introduction", p. 3-14, one paper), deals with the "Zoogeography of Ostracodologists". The second ("General aspects and morphology", p. 15-146) consists of 10 papers; the third ("Ecology and zoogeography", p. 147-308) of 14 papers; the fourth ("Paleoecology and paleozoogeography", p. 309-490) of 15 papers; and the fifth ("Abstracts of the Discussion sessions", p. 491-499) of three Discussion reports.

In part two, three papers discuss ostracod ornamentation as an indicator of different (paleo) ecologic parameters. The paper by A. Rosenfeld and B. Vesper on "The variability of the sieve-pores in recent and fossil species of *Cyprideis torosa* (Jones, 1850) as an indicator for salinity and paleosalinity", points out the relationships between the percentage of "round", "oblong and irregular" pores and salinity, "irregular" pores being predominant in hypersaline waters. The influence of salinity on the ostracod shell was also documented by G. Carbonnel and M. Jacobzone, in their paper "L'ornamentation chez les Loxoconchidae: un moyen de prédiction (paléo)écologique". They demonstrate that cluster and correspondence analyses of the relationships between the ornamentation in some Loxoconchidae and ecological

parameters, suggest that coarsely pitted species are mostly affected by salinity, whereas reticulated /costulated ones are more affected by temperature and depth. The third paper studying ostracod ornamentation, by A. Liebau, is entitled "Carapace ornamentation of the Ostracoda Cytheracea: principles of evolution and functional significance". It examines, from an evolutionary point of view rather than an environmental one, the different levels of sculpture components which occur in primitive and advanced Cytheracea. Three evolutionary levels are observed with respect to the differentiation of the ornament genetics. The indicative first-order ("coarse") reticulation is most primitive ("proto-reticulation") in the Limnocytheridae, transitional from "proto" to "meso-reticulation", in the Bythocytheridae and very advanced ("macro-reticulation") in the Trachyleberididae and related Cytheracea.

Part three papers describe the ecology and zoogeography of ostracod single species or populations from several areas located in different continents. Among these, only two papers ("Zoogeography of Macrocyprididae (Ostracoda)" by R.F. Madocks and "Diversity of benthic myodocopid Ostracodes" by L.S. Kornicker), deal with zoogeography and ecology of ostracod families or super-families on a world-wide scale.

The papers of the fourth part concern the paleoecology and paleozoogeography of Ostracoda. Examples are given from the Devonian to Pleistocene, but most papers concern Cenozoic sediments. "Paleoecology of marine and freshwater Holocene Ostracodes from Lake Champlain, Nearctic North America", by F.J. Gunther and A.S. Hunt, points out that Lake Champlain bottom-mud freshwater ostracod species are common to both the North American and European Pleistocene-Holocene lake deposits, whereas marine species from the same bottom-muds appear circumpolar in distribution. Ostracod assemblages permit reconstruction of post-glacial environments, ranging from periglacial Lake Vermont to the marine-estuarine Champlain Sea and to the modern Lake Champlain.

The fifth and last part of the Symposium volume abstracts the three discussion sessions, which focused on "sampling methods", "ostracod terminology" and "Paleozoic Ostracods". The reports on the discussion sessions on "sampling methods" and "ostracod terminology" are informative, but the technical part of the report on the discussion session on "Paleozoic Ostracoda", which was taped and involved the contribution of 20 participants, consists of only five and a half lines of written text: a masterpiece of concision!

As in most Symposium volumes, no discussion on the "state of the art" of ostracod (paleo)ecology and (paleo)zoogeography is reported, assuming that this took place. Also because there is no discussion at the end of several papers presenting new approaches, we cannot tell what was the general feeling of the participants on the new scientific approaches presented at the Symposium. Are these discussions omitted because of lack of space or did they not take place? Likewise, we do not know whether the participants held a session to discuss the direction of future studies of ostracod (paleo)ecology and (paleo)zoogeography. Were guidelines established, or at least proposed, for planning more coordinated ostracod research, aimed at meeting not only the individual scientific interest, but also the interests and the needs of the scientific community? This cannot be determined from the Proceedings. Rather one is left with the impression that the Symposium organizers only wanted to collect and discuss as many papers as possible which were pertinent to the main themes. After that, they presumably felt that their mission had been fully accomplished. We believe that a general discussion on the "state of the art" of the science should be one of the main aims and achievements of any Symposium. We also feel that any Symposium should be organized in such a way that the expertise of the Symposium participants should be utilized not only for reporting and discussing their past research, but also for proposing, discussing and establishing new themes and guidelines for future research. This

should be carried out or at least initiated between the end of the previous Symposium and the beginning of the next one. The important thing is that guidelines are established for stimulating and concentrating the research of different individuals towards some aims of common interest between consecutive Symposia. If a Symposium succeeds in doing that, than it is fully successful. Whether the 1976 Ostracod Symposium was a full success in this respect, is doubtful, judging from the Symposium Volume.

In conclusion, this volume, which is well illustrated, provides 51 collected papers (several of which are of high scientific standard) on the (paleo)ecology and (paleo)zoogeography of Ostracoda. It is undoubtedly a much needed and welcomed contribution to the advancement of ostracod research, particularly in the fields of ecology and zoogeography, which have been somewhat neglected in recent years.

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