scale derived from oceanic microfossils may not be correlated to continental index fossils. The current oceanic distribution of microfossils and the lack of macrofossils on the ocean bottom is likely due to the mechanism of the Flood and its aftermath. There also is the common problem of reworking and the tendency to give multiple names for the same micro-organism if found in different aged layers.[3] All this needs to be sorted out within creationism, which will not be easy.

Larry focuses on oxygen isotope ratios as indicators of oceanic temperatures, as well he should since this ratio usually is the main variable of interest to uniformitarian scientists. However, the meaning of oxygen isotope ratios needs to be kept in perspective. It is probably true that oxygen isotope ratios are a general indication of temperature. However, there are many variables that can affect the down-core measurements of oxygen isotopes,[4] several of which Larry describes. I believe the general increase in the oxygen isotope ratio in micro-organisms up-core, and hence decreasing temperature is a good trend with time, but the magnitude of the derived temperature change is questionable. Hence, the Tertiary and Quaternary wiggles superimposed on the general trend (Figures El and E2) may be due to the other variables that affect oxygen isotope ratios. Even some uniformitarian scientists have concluded that oxygen isotope ratios can be way off when compared to fossil information.[5]

This is a good monograph to acquaint the reader with the differences between the uniformitarian and creationist models of oceanic sediments. It is preliminary, but a good start in hopefully incorporating oceanographic data sets within the creationist paradigm.

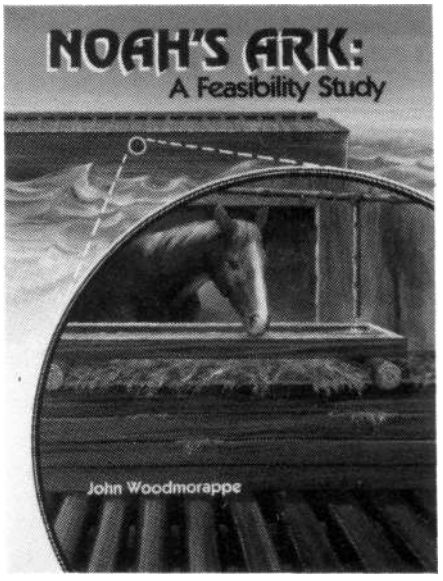
REFERENCES

1. Oard, M. J., 1990. **An Ice Age Caused by the Genesis Flood,** Institute for Creation Research, San Diego, California.
2. Roth, A. A., 1985. Are millions of years required to produce biogenic sediments in the deep ocean? **Origins, 12:48-56.**
3. Tosk, T., 1988. Foraminifers in the fossil record: implications for an ecological zonation model. **Origins,** 15:8-18.
4. Oard, M. J., 1984. Ice Ages: the mystery solved? Part II: the manipulation of deep-sea cores. **Creation Research Society Quarterly,** 21:125-137.
5. Adams, C. G., Lee, D. E. and Rosen, B. R., 1990. Conflicting isotopic and biotic evidence for tropical sea-surface temperatures during the Tertiary. **Palaeogeography, Palaeoclimatology, Palaeoecology,** 77:289-313.

Noah's Ark: A Feasibility Study

by John Woodmorappe

Reviewed by Michael J. Oard



There is no doubt that this book is the definitive work on the Ark and its feasibility. John Woodmorappe analyses, numerically where possible, about every conceivable question Christians and critics, alike, have ever asked about the feasibility of the Ark. Woodmorappe really shines with those aspects of the Ark that critics deem the most contradictory to reason, such as the number of animals on the Ark, the gathering of the animals, how could the eight people care for all the animals, and waste management.

He also does not take the easy way out of difficulties. In the possible problem of the care of the animals, for instance, he does not opt for hibernation (although a possible solution, at least for some animals), but goes through the rigour of working out the problem without this easy solution.

The types and number of animals needed for the one-year survival voyage are perhaps the most asked questions. Some critics go the extra mile in making up objections, such as Noah had to carry deep-sea creatures. However, the Genesis account says that '. . . *all that was on the dry land, all in whose nostrils was the breath of the spirit of life, died'* (Genesis 7:22). Marine creatures, thus, would be excluded.

One does not have to read much biology before he realises that the taxonomic definition of the species is restrictive and vague, usually with the phrase 'reproductive isolation' an integral part. Successful interbreeding or potentially successful interbreeding is not necessarily part of the definition of a species, as one not trained in biology would have expected. The test of interbreeding is rarely performed anyway. So, critics really cannot claim that millions of 'species' had to board the Ark. Genesis uses the word 'kind' to describe distinct groups of animals.

For the purpose of identifying the number of animals needed for the Ark, Woodmorappe equates the taxonomic unit of the genus to the 'kind', which in most cases is likely to be conservative (that is, giving an overestimate of the number of kinds on the Ark). By considering which animals were clean or unclean, John calculates that 16,000 animals were on the Ark, including dinosaurs (the young of the largest dinosaurs would do just fine). Interestingly, seabirds need not have been on the Ark, but John includes them anyway. From a body-mass analysis of all these animals, Woodmorappe finds that the average size is that of a small rat! This in-depth calculation makes Whitcomb and Morris's[1] size estimate of a sheep quite conservative.

Sixteen thousand animals, averaging the size of a small rat, is quite manageable, as John shows in detail, by eight people who were intelligent. Woodmorappe describes various methods for caring for the animals, providing food and water, and waste disposal. Such esoteric but important questions as ventilation, heat management, and lighting are dealt with. Chapter 13 on feeding challenges for animals with specialised diets is a good example of multiple, reasonable possibilities for several frequently-asked questiohs.

Woodmorappe dedicates seven chapters to questions on how aquatic organisms could have survived the Flood outside the Ark and the recovery of the biosphere after the Flood. For instance, some questioners wonder how plants could have grown in salty soil, left over from the Flood. This is one of the topics in Chapter 19. The amount of salt in the soil, of course, is open to question, but the problem has an easy solution. Salt can be readily leached out of the soil by rainwater.

The non-biologist in me had trouble with the fourth part of the book — the adequacy of single pairs of animals to repopulate the earth. A glossary for quick reference to technical biological definitions would have been handy. This part is directed towards a whole series of questions of whether there was enough genetic potential to repopulate the whole Earth from single-pair founders. John gives us a lot of possibilities for that past event, but it seemed to me as I was reading this part, that scientists do not know enough about genetics to even question whether Christians have a problem here. Scientists, including creationists, do not know exactly what is a potentially interbreeding unit (the /'kind'?). That is why John can offer rapid 'speciation' as a viable solution for repopulating the Earth after the bottleneck of the Flood. (I wish we could use a different word for speciation because the word carries a lot of 'baggage' and causes some to accuse creationists of believing in evolution that is, macroevolution![2])

I highly recommend this book for all Christians who want to defend their faith with reasonable arguments against one of the most attacked parts of the Bible — the adequacy of the Ark. Not only are there simple solutions to many problems, but also with regard to difficult questions, there are reasonable possibilities. It helps to be a possibility thinker.

REFERENCES

1. Whitcomb, Jr., J. C. and Morris, **H. M,** 1961. **The Genesis Flood,** Baker Book House, Grand Rapids, Michigan, pp. 65-69.
2. Ross, H., 1994. **Creation and Time,** Navpress, Colorado Springs, Colorado, pp. 73, 83.

Editor's Note: A Comprehensive Study Guide to **Noah's Ark: A Feasibility Study** is now available on the Internet (http://earth.nettrek.net.au/~rik/cyber/faqark.htm).

QUOTABLE QUOTE: Peer Pressure in Science

'Outsiders to the research community need to provide criticism on the fundamental issues, because debate within that community operates within definite limits. Scientists are highly vulnerable to peer pressure because their careers depend on favorable peer reviews. To become a scientist at all requires satisfying dissertation and appointment committees. Thereafter, professional standing depends on one's ability to satisfy the anonymous referees who decide what is to be published in journals and the study groups that decide what projects are to be funded. The system of peer review has important virtues, but it means that even a very esteemed scientist who goes too far in criticizing fundamental assumptions can be effectively excluded from the research community. (I have personally seen this happen.)'

Johnson, Phillip E., 1995. **Reason in the Balance: The Case Against Naturalism in Science, Law and Education,** InterVarsity Press, Downers Grove, Illinois, pp. 95-96.