

terial of broader interest, as the former discusses the work of Leibniz and its influence in eighteenth-century Russia, while the latter stresses "the formal identity" between certain nineteenth-century theories of "sound change and the theory of natural selection" (p. 438), as indicated by John C. Greene (p. 499). If some of the articles lack the methodological sophistication and depth of analysis of some of the more recent literature relating to, for example, the work of Galileo and Newton, it is more a reflection of the tradition on which historians of physics have to build than a criticism of the work of these linguists. And the articles of Stocking, an historian at the University of Chicago, and especially of Aarsleff, an eminent historian of language at Princeton University, are as sophisticated and insightful as one would wish.

The volume concludes with a section on "Complementary Perspectives" to the history of linguistics, with chapters on the history of science (by John C. Greene), sociology of knowledge (by Kurt H. Wolff and Barrie Thorne) and an invited "sermon" by Stocking on "Transcending 'Textbook' Chronicles and Apologetics." These chapters, addressed primarily to linguists interested in the history of their discipline, are quite good overviews of what can be learned from the traditions in which their authors work. For example, in his article Stocking characterizes "the central question of intellectual history" as "what was bugging him?" and "the central methodological problem" as the "sort[ing] out [of] what is bugging us . . . from what was bugging him" (p. 515). One wishes all historiographic prescriptions were so terse, and so accurate.

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■ PREHISTORY

Alexander Marshack. *The Roots of Civilization. The Cognitive Beginnings of Man's First Art, Symbol and Notation.* 413 pp., illus., bibl., index. New York: McGraw-Hill; Lon-

don: Weidenfeld and Nicolson, 1972. \$17.50.

The story of how Alexander Marshack came to write this book will be of great interest to its readers. For more than a quarter of a century Marshack had been a journalist, a reviewer, a photographer, and a science writer, and he was therefore obviously a suitable person to be asked to prepare a text supplying the historical and scientific background for the first lunar space programs of 1962. Such a project called for some very necessary research. Some of his early questions in this new field of study amazingly disclosed to him that no one knew exactly *why* they were going into space. Following further textual research, he was literally appalled at the inadequacy of the records concerning the early history of mathematics, astronomy, and science generally, despite the fact that there was no essential difference between earliest modern man of 40,000 years ago and ourselves, either in brain size or skeletal measurement.

So then, how, when, and where did these things actually begin? All he could find out was that they appeared to have happened "suddenly!" so that in his subsequent references to them, he calls them "the suddenlies," among which he includes the following: mathematics, with the ancient Egyptians; astronomy, with the Babylonians; science, with the Greeks; medicine, with Hippocrates; writing, with Egyptian hieroglyphs and Babylonian cuneiform; agriculture, and with it the calendar, in Europe ten thousand years ago; art and decoration, perhaps thirty or forty thousand years ago; and so on.

All started "suddenly," according to the historical texts, and because of this, Marshack concludes that something is missing in the archaeological records. Are we to assume that one day, some member of *Homo sapiens* sat down and said, "Now I am going to invent writing," or a calendar, or a number system? That could scarcely have happened. Many millennia of prior preparation must have been necessary. For example, knowledge of calendrical and seasonal detail, by the Egyptians, the Mesopotamians, Chaldeans, Hindus, Chinese, Mayans, and Incas all suggest that there must have been some earlier calendrical traditions. Lack of knowledge of what went before was not the fault of the

scientist but was due to the inadequacy of prehistoric archaeological evidence, since a proper study of archaeology is only one century old.

However, Marshack finished his text in 1963, and then set about the self-imposed task of solving the problem of how science had begun in Egypt and Babylon and other countries. He then spent five years examining collections of Paleolithic and Mesolithic materials in some seventy-odd museums and other depositories scattered over France, Switzerland, Spain, Italy, Austria, Czechoslovakia, Poland, Belgium, Sweden, Denmark, the United Kingdom, and Germany. Somewhere was the evidence he was seeking. It was a massive study! Among his finds there was one particularly marked or engraved bone, from a Mesolithic site near Lake Edward on the headwaters of the White Nile in the Congo, which deeply interested him. It dates from 6,500 B.C., more than two millennia before the first recorded dynasty of Egypt, and is thus 8,500 years old; now familiarly known as the Ishango bone, it is named after the place where it was found.

What did all these engraved markings signify? They might have been some form of art, decoration, records, counting, calendar, writing, or whatever. No one knew or expressed an opinion. Marshack spent a long period of intense study, endeavoring to decode or translate these engravings in a lost language more than two thousand years older than hieroglyphic writing. Now at last, Marshack writes, he has cracked the code of the Ishango bone (his own words). If he is correct, it will be necessary, he thinks, to rewrite much of the history of science, art, and religion. He further has looked back at the available evidence of the past thirty, forty, and fifty millennia and thinks he has also solved some of the notations of the Upper Paleolithic artifacts.

On the advice of Professor Hallam L. Movius, some introductory papers were published in scientific journals and read at universities and learned institutions, all of which appeared to lead to the conclusion that "his breakthrough was thought likely or possible." Movius thought that here also was the breakthrough they had been waiting for regarding the high intelligence of the Cro-Magnon man.

And what were these cryptographic engraved marks on the Ishango bone? They were a series of parallel lines in groups

of different numbers, as shown here:

11	13	17	19				
3	6	4	8	10	5	5	7
11	21	19	9				

Whatever they were supposed to mean, the ordinary unprofessional observer would undoubtedly be reminded of the cryptogram in Edgar Allan Poe's "Gold Bug" in his *Tales of Mystery and Imagination*, where the "code was cracked" by William Legrand. Having similarly performed on the Ishango bone, Marshack concludes his first chapter with "What follows is the tale of a deduction into the insights, hunches and questions, that were in the beginning, not yet science, but which slowly evolved a new technology."

The succeeding fourteen chapters cover the author's thought processes in cracking the code, through the possibilities of numbers, writing, art, decoration, ritual, female sequences, symbols, calendars, messages, recordings. The totals of the numbers of the Ishango bone being 60, 48, 60, together with number sequences from the Kulna Bone, Gontzi Tusk, Blanchard Plaque, Arbri Lartet Bone, Barma Grande Pebble, Placard Batons, the Fourneau Bone du Diable, and the Solutrean, Parpallo, and Isturitz Bones, led to the concept of a time-factored record of lunar phrasings and seasons, of which no two were ever exactly alike.

But the author is never dogmatic. For each important discussion, he asks a series of questions: Could it be _____? Does this depict _____? Why is the _____? Did the ibex _____? Was it the _____? Or was it a journey _____? And his answer? "The possibilities are vast, and probably none is the truth. What I have stumbled upon might be correct." Then the more complex markings of the Hollow Eagle Bone and the Tèviec Fish Bone with the heavily engraved Ugerlose Antler, suggested lunar phrasing in sets and subsets. "But," he concludes, "I urge caution, and do not assert that these incomplete analyses have yet proved the case, or indicated a direct line to Stonehenge. We end where we began—with the Mesolithic Ishango Bone."

But this is not really the end of this most elegantly produced volume, with not even one discernible typographical error. Forty

pages follow, which include an index of one hundred Paleo- and Mesolithic collections examined over five years, in twelve different countries, then a ten-page list of more than 250 archaeology texts, followed by a catalogue of some 200 sites of Paleolithic art in Europe. There is also an index of the 225 illustrations and fifteen pages forming the quite detailed and helpful general index. A five-page postscript refers to the thousands of cognitive time-factored examples included and speaks of the complexity of the vast body of evidence which "has only been hinted at in this volume."

Marshack modestly concludes, "What I have done is to offer an introduction to a few new concepts and techniques."

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choice between guessing as to the respects in which Delambre's view might be most sadly outdated, and chasing the research tradition through the French and German literature with the help of O. Neugebauer's critical bibliography (in *The Exact Sciences in Antiquity* [Princeton, 1951]) and a long-suffering Interlibrary Loan staff. With Olaf Pedersen's *Survey of the Almagest*, this dilemma has been resolved.

Given the nature of the enterprise—a blow-by-blow account of the *Almagest*—there is not a great deal of room for organizational originality; so in its gross features, Pedersen's survey bears a strong resemblance to Delambre's. There are, however, several respects in which it is not simply an updating of Delambre. Most important is the fact that Pedersen at least *attempts* to maintain an historical setting. His speculations concerning the context of discovery of Ptolemy's various results are by no means uniformly convincing, but they

