

know that the chance of it happening is small. I suggested weighting the risk by the number of people involved. Under this criterion, the asteroid impact risk should dominate public concern more than all other risks so far calculated.

The "risk bill" that has just been passed by the US House of Representatives and that will shortly come before the Senate would force such comparisons. The bill is already being attacked by those who prefer the *status quo* and want to stop particular activities they hate even if the risks are minuscule. This volume should play its part in that debate. Whatever the result, it makes interesting reading and will stimulate further ideas about the Universe we live in, however temporarily. □

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Growth factors

Mark Nesbitt

The Emergence of Agriculture. By Bruce D. Smith. W. H. Freeman/Scientific American Library: 1995. Pp. 231. \$32.95, £19.95.

THE search for the origins of agriculture has fascinated archaeologists, geographers and biologists for the past 40 years. This is partly because farming had a critical role in creating the agricultural surpluses that underpinned the evolution of towns, cities and empires from the first villages, and partly because recent advances in understanding have been fuelled by the intriguing interplay of evidence from both archaeology and the natural sciences.

Although the concept of well defined areas of origin remains central to ideas about the beginnings of agriculture, a welcome feature of this book is that it also assesses other candidate regions still poorly known. The origins and spread of farming are set firmly in the archaeological context of the first farmers and their hunter-gatherer predecessors. This is an ambitious task, and it is hardly surprising that it is the first such survey aimed at a general audience to have appeared in a generation. A real strength of the book is that it successfully provides worldwide coverage, not just for plants but animals too. The regional case studies are supported by good maps and many well chosen photographs; this is a handsome and readable book.

Beginning with the earliest known and most fully studied region of agricultural origins, the Near East, Bruce Smith clearly outlines the evidence of the distributions of wild ancestors of domesticated

plants and animals. The simple principle — that a species will probably have been taken into domestication within the native area of its wild ancestor — has been refined by the use of biochemical markers, as elegantly demonstrated by recent work unravelling the history of maize in Central America. When biological information of this type can be combined with the study of excavated plant and animal remains from archaeological sites in the same area, the region, date and modes of domestication can be identified with some precision. As the author carefully points out, however, this ideal state is rare. In large parts of the world, few early sites have been excavated, and from these even fewer biological remains have been recovered. In sub-Saharan Africa and all of the tropics, we can only speculate about agricultural origins, drawing on modern botanical evidence of wild ancestors. Surprisingly, there is no mention of recent advances in the identification of vegetative plant remains that are likely to transform our understanding of the origin of root crops in the tropics.

A range of new techniques have transformed the study of ancient organic remains. Use of the scanning electron microscope is illustrated by looking at new evidence for indigenous domesticates in eastern North America, such as marsh elder, sunflower and goosefoot. Accelerator radiocarbon dating, which can reveal the age of individual seeds or bones, has dramatically reduced many of the most famous Middle and South American plant remains, now found to be two or three thousand years younger than first thought. The use of these two techniques has stimulated a major re-evaluation of agricultural origins in eastern North America, establishing the region as an independent centre of domestication before the arrival of maize agriculture from the south.

Agricultural origins are particularly subject to archaeological nationalism — it seems as if everyone would like to claim the first farmers for their own country. Smith adopts a refreshingly cautious approach to archaeological evidence, and takes care to explain problems in dating and identifying early domesticates. But the cautious approach is dropped for archaeological evidence for plant domestication in the Near East. The focus on a

narrow region of the Jordan valley ignores increasing evidence of early Neolithic sites elsewhere in the fertile crescent. The choice of the Israeli site of Netiv Hagdud for a case study of a "typical" early agricultural site is unfortunate: analysis of the plant and bone remains strongly suggests that this was a purely hunter-gatherer village. Similarly, the author is uncritical in his approach to the origins of rice agriculture in China, for



Entitled *Wheat*, this 1967 painting by Thomas Hart Benton illustrates many of the ways in which domesticated plants respond to deliberate planting and harvesting by humans: the plants develop a uniform size and their seeds ripen uniformly in time, are retained until harvesting and become conveniently packaged in terminal clusters. The picture is reproduced from the cover of *The Emergence of Agriculture*.

which both the dating (here pushed back to 8,000 years ago) and the region are likely to be controversial until direct radiocarbon dating and adequate publication of plant remains from the Far East becomes the norm.

This book brilliantly and lucidly synthesizes a huge scattered literature on the where, when and how of agricultural origins. In an all too brief consideration of the why — the reasons for the beginning of farming — Smith points to the origin of many early farming societies in sedentary, hunter-gatherer villages. Although perhaps overplaying the ease of the transition to agriculture, this is a welcome statement that agriculture needs to be studied in the context of a continuum of relationships between plants and people. Anyone interested in exploring human interaction with the environment, or the application of interdisciplinary techniques to an important problem in human behaviour, will enjoy this book. □

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