The seeds of agriculture

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The Neolithic Transition and the Genetics of Populations in Europe.
By Albert J. Ammerman and L.L. Cavalli-Sforza.
Princeton University Press: 1985. Pp.176. $25, £18.
Neolithic Europe: A Survey. By Alasdair Whittle.
Cambridge University Press: 1985. Pp.363. Hbk £27.50, $44.50; pbk £9.95, $17.95.
Prehistoric Farming in Europe. By Graeme Barker.
Cambridge University Press: 1985. Pp.327. Hbk £27.50, $44.50; pbk £9.95, $14.95.

THE advent and adoption of agriculture have been viewed consistently as marking a theshold in human evolution. Since the middle of the nineteenth century, archaeologists and anthropologists have considered agriculture as providing the essential foundation for the emergence of social differentiation and specialization, cultural complexity and urbanism. After the adoption of agriculture, hunters and gatherers rapidly gave way to more complex, sedentary societies, which in areas such as the Near East and Mesoamerica developed into the world's first states. Attempts to explain agricultural origins have been environmental and cultural, monocausal and multicausal, testable and untestable. Faunal, floral and cultural evidence has been collected at increasing rates, either to support or refute these explanations.

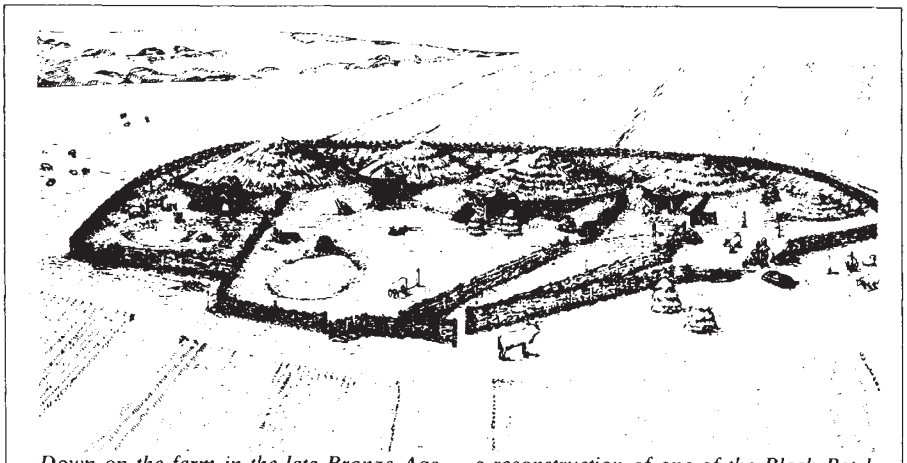
In Europe the study of the origins of agricultural societies, and their subsequent development, has benefited from over a century of data collection and analysis. According to the diffusionist model, the spread of plant and animal domestication, as well as technological and social changes, could be traced through a process of diffusion from the Near East. Radiocarbon dating has led archaeologists to reject diffusion for the later technological and social changes of the Neolithic and Bronze Ages, but a Near Eastern origin for agriculture has remained a preferred interpretation. Is this justified? What processes of innovation and adoption took place in Europe? How can we explain the cultural evolution witnessed in the European Neolithic? These are some of the important questions addressed in recent archaeological research, as seen for example in publications by Colin Renfrew (among them *Problems in European Prehistory*; Edinburgh University Press, 1979) and Robin Dennell (*European Economic Prehistory*; Academic Press , 1983).

The diffusion model for European agriculture, from *c.*6000 to *c.*3500 BC, is adopted by Ammerman and Cavalli-Sforza in their highly original and thought-provoking book. Analysis of the earliest dates for cereals from archaeological sites across Europe suggested to them that there has been a constant rate of spread, from south-east to north-west, averaging out at 1km per year. In addition there was regional variation, with areas such as central Europe and the west Mediterranean showing faster than average rates. The model used to account for these observations is one of demic diffusion (that is a physical expansion of population, rather than a diffusion of culture and economy through essentially stable, immobile populations), and the specific form taken by this process is referred to as a "wave of advance" model. This is derived from genetics and is delightfully simple: given the assumptions of logistic population growth and small-scale local population movement (for example through marriage), the model predicts a wave of population expansion from initial centres at a constant rate in all directions. As the authors claim, the model suggests "how local processes such as population growth can produce what in some respects is a form of colonization without colonists". The initial test of the model, with a number of specified growth and migration rates, produces a wave of advance closely comparable to that observed from the archaeological data.

In addition the authors argue that demic diffusion would have had implications for the distribution of gene types within Europe, the movement of population from south-east to north-west (and interbreeding with local hunter–gatherer populations) producing a cline of genetic similarity. In the absence of information on prehistoric gene frequencies, the authors analyse modern gene systems and, surprisingly, reproduce a pattern comparable to that predicted. The implication that "major patterns detected in synthetic gene maps probably have meaningful histories behind them" is of great importance and suggests a fruitful area for future cooperative research by archaeologists and geneticists.

Overall Ammerman and Cavalli-Sforza have presented one of the strongest and clearest arguments for the demic diffusion model for European agricultural origins. But can we accept it? The evidence collected in recent years for intensification towards agriculture in the later Mesolithic is little discussed, nor indeed is the context of adoption as opposed to innovation in subsistence economies. Communities did not accept agriculture just because it was there. The swidden model (long fallow cultivation combined with frequent settlement relocation) for agricultural dispersal has been severely criticized in recent years and the implifications of the alternative model of fixed plot cultivation are not considered. Further the cultural evidence for continuity in the west Mediterranean is directly contrary to a demic diffusion model.

All of these objections are contained in Alasdair Whittle's "wide-ranging interpretative introduction" to Neolithic Europe, though he does not cite any papers by Ammerman and Cavalli-Sforza. Whereas the latter concentrate on the detailed application of one model to agricultural innovation and colonization, Whittle has written a detailed and commendable synthesis of colonization and cultural change from *c.*8000 to *c.*2000 BC, from late hunters and gatherers to metal-using, hierarchical societies. There is much useful detail on the basic archaeological record of different areas and periods, and this will be plumbed with profit by students. In contrast to Ammerman and Cavalli-Sforza, Whittle believes that, in order to explain cultural change in the past, we must focus on the determining role of the society in accepting or rejecting



Down on the farm in the late Bronze Age — a reconstruction of one of the Black Patch farmsteads in Sussex, southern England, drawn by Lysbeth Drewett.

From *Prehistoric Farming in Europe*