

From Nature to Culture, from Culture to Society

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INTRODUCTION

OVER THE PAST TWENTY YEARS, neo-Darwinian theory has brought about a fundamental change in the way that the concept of evolution is defined and applied in the social no less than in the natural sciences. It is not just that the macrosociological teleology common to Marxism and Social Darwinism alike (Runciman 1989) has been finally jettisoned, as has the unilinear neo-evolutionary anthropological theory of the 1950s and '60s (Shennan 1999; Yoffee 1993), but that Darwin's original insight about 'descent with modification' — or, as it is nowadays put, 'heritable variation and competitive selection' — has come to be widely recognized, including by archaeologists (Maschner 1996; Spencer 1990: 4), as the general paradigm for non-teleological explanation of qualitative change. I have discussed elsewhere some of the reasons why cultural and social evolution need to be clearly distinguished and separately analysed (Runciman 2001). In this chapter, I assume without further argument that cultural evolution is both analytically and historically prior to social evolution, and consider the theoretical implications which follow for the explanation of the origin of social institutions. In so doing, I draw on some of the ethnographic evidence on hunters and foragers which can, with due caution, be used in the attempt to reconstruct the behaviour-patterns of human beings between the Upper Palaeolithic and Neolithic 'Revolutions' (if such they were), and also on game-theoretic studies that can help to elucidate the co-operative relationships extending beyond kinship which can perhaps be inferred from the evidence of the archaeological record. Inevitably, I rely on the work of authors whose findings and interpretations I have no competence to dispute. But that is the normal predicament of all comparative and historical sociologists.

THE TWO TRANSITIONS

In cultural selection, in contrast to natural selection, the transmission of information affecting phenotype is from the mind of one organism to the mind of another organism by teaching or imitation (Boyd & Richerson 1985: 33). But despite the obvious differences between biological and cultural evolution, selective pressure acts in both cases on the more or less extended effects of heritable instructions affecting phenotype in such a way as either to enhance or to diminish the likelihood of the continuing replication and diffusion of those instructions. The term 'meme', although used elsewhere in this volume without commentary, is perhaps best avoided until there is less disagreement than at present about its precise definition (Blackmore 1999: 63–6). But, however and wherever encoded and stored (Lake 1998), and whether deontic or merely permissive in logical form, bundles of instructions affecting phenotype are constantly being transmitted to adjacent or successive populations by imitation or learning (or both). The mutations or recombinations which occur on transmission may (and often do) arise from active and conscious reinterpretation by the receiving minds, but their continuing replication and diffusion still depend on whether they are fit and hence selected.

So defined, 'culture' is not unique to humans, and long-term field studies of chimpanzees, in particular, have disclosed a far wider range of variations transmitted by genuine imitation and learning, as opposed to stimulus enhancement or operant conditioning, than previously supposed (Whiten *et al.* 1999). But only humans have a capacity for sustained and cumulative cultural evolution (Boyd & Richerson 1996), and once language was fully developed both the range and the speed of potential variation could not but be dramatically enhanced. For the purpose of this chapter, it does not matter when or how the capacity for grammar and syntax evolved. It is enough that it was a contingently sufficient condition of the social behaviour-patterns of the Middle to Upper Palaeolithic transition (Mellars 1996; Mellars & Stringer 1989).

These behaviour-patterns, however, are explicable without any reference to the institutional rules and associated inducements and sanctions which define the modes of production, persuasion, and coercion of the societies of the Neolithic and thereafter. It was not until human beings began to lead their lives in an emergent world of armies, markets, temples, estates, treasuries, assemblies, courts (in both senses), schools, officials (public or private), taxes (or tribute), and inherited differences in status that the instructions affecting phenotype came to be formulated in rules which for the first time explicitly prescribed the reciprocal behaviour of pairs of agents who, whatever their individual differences, now behaved towards each other as nobles and commoners, landlords and tenants, masters and slaves, rulers and subjects, priests and laity, judges and plaintiffs, and so forth. Except at rare times of constitutional

choice, individual agents such as these have no say over the rules which make them what they are: they grow up to find them already encoded in the practices constitutive of their society's economic, ideological, and political institutions. But heritable information affecting phenotype is once again being replicated and diffused to the extent that it is fit and hence selected, and the explanation of social, as previously of cultural, evolution depends on identifying the extended phenotypic effects of the bundles of instructions on which specific features of the environment bring selective pressure to bear.

The nature of the difference between natural, cultural, and social selection emerges distinctly from the different uses of the term 'role'. In the behaviour-patterns of animals, the instinctive capacity for mutual recognition of roles such as 'occupier' and 'intruder' is evident (Maynard Smith 1982: 204), and genetically transmitted instructions determine how individuals will respond in consequence of that recognition. In cultural selection, instinct is now supplemented by imitation and learning, and roles such as 'leader' or 'enemy', even if behaviour towards them may still be 'evoked' as well as acquired (Tooby & Cosmides 1992: 116–18), are not just biologically defined: individuals are chosen on the basis of personal attributes either as role-models to be admired or, on the contrary, as members of out-groups to be stigmatized. In social selection, roles are, as in the examples given above, defined by practices whose rules govern the reciprocal behaviour of both parties in a relationship underwritten by inducements and sanctions which may not always be effective in controlling the behaviour in every individual case, but still sustain the economic, ideological, or political institutions constituted by the roles carrying the practices. Furthermore, a social role can maintain its institutional existence even if no individual agent is occupying it at a given time, and social roles are at the same time parts to be performed in culturally variable ways and, in structural terms, vectors in a three-dimensional social space corresponding to the axes of economic, ideological, and coercive power. It is true that power is involved in natural and cultural as well as in social selection. Animals contesting for food or territory or access to mates are clearly engaged in a power struggle, as are preachers or prophets seeking to recruit adherents to their rival systems of value and belief. But in social selection, the inducements and sanctions are no longer interpersonal only.

In both transitions, from natural to cultural selection and from cultural to social, there must have been an originating event, just as in the evolution of the human species through natural selection there must have been a 'mitochondrial Eve'. Somebody must have been the first person to think of depicting something they had seen by drawing it on the wall of a cave (or elsewhere) and thus become the first representational artist, and some pair of persons must have been the first to exchange labour for payment on a contractual basis and thus to bring wage-labour into being. Although there is no way of finding out where

and when, it does not follow that the critical mutations which turned out to have a significant effect on the subsequent course of cultural and social evolution are to be treated as random. In both cultural and social selection, mutations are likely to be both conscious and deliberate. But that is no guarantee of their success. Social, no less than natural, scientists have to be wary of falling into the 'Genetic Fallacy' of assuming that to ascertain the cause of a novel event is thereby to explain its consequences.

CULTURE WITHOUT SOCIETY

The anatomically modern humans of the Upper Palaeolithic, however significant their differences from chimpanzees or from other hominid species, shared with them an inherited 'social' or 'Machiavellian' intelligence (Byrne & Whiten 1988; Whiten & Byrne 1997) and a disposition, shared with other apes and also with monkeys (de Waal 1996: 102), to maintain tolerably stable dominance orders while at the same time probing them for weaknesses and opportunities for advancement. This raises two related sociological questions about the human behaviour-patterns of the Upper Palaeolithic. First, why did they not more quickly evolve from kin-based, small-group interpersonal relationships into the social institutions which appear only many millennia later? Second, how, without such institutions, but with an inherited propensity to compete for dominance, did they remain as stable as they did?

The second question leads in turn to the further question as to how ongoing co-operative relationships can extend beyond kin-groups (including, it may be, adoptive or fictive kin) within which the incidence of altruistic behaviour can be predicted to follow Hamilton's Rule. Despite the claims made by or on behalf of Axelrod (1984) for tit-for-tat as an evolutionarily stable strategy in indefinitely continuing iterations of the Prisoner's Dilemma, neither tit-for-tat nor any other pure strategy is uninvadable (Binmore 1998). But that is not to say that co-operation cannot be sustained in groups of unrelated individuals. The likelihood that co-operative strategies will be able to resist invasion by more than small numbers of free-riders is significantly increased by non-random association of co-operators with other co-operators (Kitcher 1993), by beliefs about the proportion of co-operators in the population (McKelvey & Palfrey 1992), by group discussion (Caporeal *et al.* 1989), by the restrictions imposed on free-riders by search time and coalition time (Enquist & Leimar 1993), and by sufficient frequency of interaction for future strategies to be based on the past behaviour of others (Cox *et al.* 1999). Furthermore, co-operators who are prepared to punish both free-riders and non-punishers (Boyd & Richerson 1992; Hirshleifer & Rasmusen 1989) can stabilize a behaviour-pattern within a population despite the problem that if punishment

is costly to individuals selection might be expected to favour co-operators who decline to punish. More generally still, the disposition of conformists to act against non-conformists, if only through gossip, ostracism, or other forms of expression of moral disapproval, is too well known to need documentation, and the making and keeping of promises can be strengthened, although not guaranteed, by the mutual co-ordination and performance of ritual actions implying commitment to future co-operation (Watanabe & Smuts 1999: 101).

All this suggests that bands of hunters and foragers living under the environmental conditions of the Upper Palaeolithic could very well have maintained stable networks of co-operation extending beyond kinship without either a political sub-group imposing order, a religious sub-group maintaining conformity, or an economic sub-group controlling the distribution of resources. Such bands do not need to be strictly egalitarian in order to maintain their cohesion (Flanagan 1989). Not all their members will have had equal access to material goods or personal possessions, relative intellectual influence and prestige (Brunton 1989), or ability to inflict or resist physical violence, and such interpersonal differences can generate inequalities in individual life-chances just as great as those generated by systactic differences in the power attaching to institutional roles: unskilled band members whose performance of domestic tasks is controlled by their elders, unpopular band members denied participation in ceremonial events, or undisciplined band members singled out for physical punishment by their peers might as well, from their point of view, be subjected to the institutional domination of proprietors, priests, or police. But there will have been scope not only for coalitions of the kind observable in primate groups, but for the kind of long-term information-sharing not accounted for by kinship or reciprocal altruism which is observable in small human communities with a high degree of intertwined social relationships (Palmer 1991). There will always have been potential alpha-male 'aggrandizers' ready for opportunities to exploit 'prestige' technology and create for themselves the roles of an established, self-perpetuating elite (Hayden 1998). But there is, so far as I am aware, no evidence in the archaeological record to indicate that such opportunities were yet available to any significant degree, or that self-sustaining cycles of intergroup competition, production of surpluses for ritual feasting, expansion of social networks, and further intergroup competition (Lourandos 1988: 159) were yet under way. The sanctions deployed against 'aggrandizers' in numerous well-documented latter-day hunting and foraging bands (Boehm 1999; Sober & Wilson 1998: Chapter 5) may not be quite the same as the sanctions which were deployed in the Upper Palaeolithic (Binmore, this volume). But these were evidently effective unless and until there was a sufficiency of resources of the kind familiar from the well-documented aquatic societies of the north-west Pacific coast (Ames 1994) and elsewhere (Arnold 1996). In the words of Maschner and Patton (1996: 101), 'hereditary

social status will develop everywhere the social and economic circumstances will allow it'. But in the Upper Palaeolithic, the socially stratified behaviour-patterns of the Neolithic are, so to speak, not yet within sight.

The difficulty of extrapolating from the archaeological record the states of mind of the persons whose behaviour created that record has long been recognized by archaeologists. But the psychologically (Jolly 1999; Mithen 1996), as well as anatomically, modern humans of the Upper Palaeolithic cannot but have talked to each other about illness, death, the elements, the heavenly bodies, and the behaviour of birds and animals as well as about food, shelter, and sex, and their culture, however much of it is now irrecoverable, was unmistakably more sophisticated than what had preceded it. Suppose, therefore, that their concomitant behaviour-patterns were as complex as a generous interpretation of the archaeological evidence allows. Would that require the transmission of instructions affecting phenotype by anything other than interpersonal imitation and learning, perhaps accelerated by the mechanisms of frequency-dependence and indirect bias (Bettinger 1991: Chapter 8)? There could have been population increase, division of labour, long-distance exchange, warfare, communal activities, and consistent performance of ritual without institutional inducements or sanctions being necessary.

Population increase

If more women than hitherto survived for long enough to bear more children and band sizes increased, this did not need to lead to an institutionalization of social relationships, simply because of what Soffer (1989: 722) calls 'the most powerful cause of egalitarian socio-political relationships among hunter-gatherers: the ability to vote with one's feet'. Band size may have been kept low also by infanticide, post-partum sexual taboos, and senilicide. But given relatively low overall rates of population growth, such as have been hypothesized for the Palaeolithic, and the availability of adjoining territory, fission was the available alternative to potentially unmanageable increases in band size.

Division of labour

The performance of different tasks by different members of hunting and foraging bands, starting with hunting by men and gathering by women, is well documented in the ethnographic record. But it could extend a good deal further without requiring any institutional inducements or sanctions: harvesting of wild cereals could have been done by interpersonal agreement without anything approaching formal employment relations, and skilled craftsmen working in bone or ivory who decorated hunting weapons with the likenesses of animals did not need to be under the control of dominant groups in the way

that they were when 'craftsman' had become a specialized subordinate role of the kind familiar from palace and temple compounds. Nor did ritual specialists need to be the incumbents of distinctive institutionalized roles any more than individuals particularly skilled in hunting or persuasive in group discussion: divination, or prediction of the weather, or diagnosis of sickness, or choice of camp-sites or hunting-grounds could all have been done on a personal basis by whichever member of the band was informally agreed to do them best.

Long-distance exchange

The exchange of material artefacts between bands over long distances in the Upper Palaeolithic seems agreed among archaeologists to have functioned less as trade in an economic sense than as information exchange integrating bands which needed alliances for mating and for insurance against resource shortfalls (Gamble 1982). This was not the sort of long-distance traffic organized, for example, by the Maghribi traders of medieval Cairo through informal coalitions which functioned also as an information-transmission mechanism (Greif 1989). Nor was it the sort of 'diplomatic' exchange of high-prestige gifts between high-status 'guest-friends' familiar from post-Mycenaean Greece (Snodgrass 1980: 55–6). Symbolically valued materials, including the use of red ochre for body decoration, could, like linguistic codes (Nettle & Dunbar 1997), function as cultural markers differentiating one from another group without thereby giving rise to institutionalized roles.

Warfare

Lethal violence appears in the archaeological record from the earliest-dated burials of men, women, and children whose wounds, including wounds inflicted by projectile points, can only be explained as resulting from deliberate assault (Carman & Harding 1999; Keeley 1996: 37–8). If 'warfare' is defined in terms of specialized military institutions, professional generals, protracted campaigning, and formal chains of command, then there is no evidence for warfare in the Upper Palaeolithic. But lethal violence between mutually hostile groups requires nothing more than informal co-operation among males similar to the co-operation in chimpanzee groups raiding alien territory (Goodall 1986).

Communal activities

The use of designated public places for communal activity is unmistakably visible only when physically marked out in such a way that it becomes appropriate to apply to them terms such as agora, compound, precinct, arena, forum, plaza, stadium, or henge. By this time, the communal activities are likely to

include trading of goods or services, mustering of citizens or soldiers, and celebration of rulers or divinities, which all presuppose established practices defining acknowledged social roles. But the bands of the Upper Palaeolithic could have assembled regularly and in numbers at designated places for such communal purposes as consulting, celebrating, observing the elements, sharing food, or simply exchanging news, telling stories, dancing, or playing games. Again, all these behaviour-patterns are cultural but need not also be institutional. Their different forms of expression can be defined and regulated by imitation and learning alone: for example, young men could perfectly well perform co-ordinated gymnastic or athletic displays of the kind put on for the benefit of Odysseus by Homer's Phaeacians (*Odyssey* VIII, 256–65) without, as in that case, being summoned by a chief (*basileus*) and organized by a herald (*kerux*) and umpires (*aisymnetai*). Or, to cite an ethnographic example, the young men who come to dance at a Nyakusa funeral may 'feel the need to confront death with an assertion of life' (Metcalf & Huntington 1979: 39) without any institutional inducements or sanctions being needed.

Performance of ritual

It may be no easier to reconstruct what was going on in the minds of the men and women of the Upper Palaeolithic from their burials than from their art (Parker Pearson 1999). But even if the contents of their graves are taken to imply religious beliefs and values of an elaborate and systematic kind, it does not follow that the transition from culture to society had been made. Considerable cultural variation is possible in the choice of material objects interred with the corpse, treatment of children relative to adults, or inclusion of domestic animals, without the kind of institutional role-structure unmistakably reflected in such grave goods as bronze armour, gold death-masks, signet-rings, or miniature iron toy chariots (Morris 1998: 44). Even where children are buried with what look like valuables, this may be testimony to the mourners' grief rather than the child's social status (Jacobs 1995). Similarly, even if rock art implies shamanistic claims to arcane knowledge (Lewis-Williams 1995) and initiation ceremonies not accessible to every male, let alone female, band member (Owens & Hayden 1997), we are still a long way from a Weberian priesthood with its own corporate *Machtstellung*.

In summary, therefore, the behaviour-patterns of psychologically modern, linguistically competent, technically skilled human groups in the Upper Palaeolithic could well have been complex and variable in content, while at the same time sufficiently stable in form for continuity over successive generations, without there being any formally defined and institutionally sanctioned economic, ideological, or political roles. No doubt it is possible that there were transi-

tional forms of proto-institutional social organization: sons may have succeeded fathers as prominent warriors, craftsmen, or shamans, vigorous leaders may on occasion have mobilized substantial workforces for collective purposes, large descent-groups may have sustained ongoing claims to selected ritual sites, local 'big men' (Johnson & Earle 1989: 57) may have kept more women and distributed more food than other adult males, and some families may have devoted more work-time to making elaborately decorated clothing or bodily ornaments, or to collecting valued material objects. But the bundles of instructions affecting phenotype could still have been transmitted by interpersonal imitation and learning without being encoded in practices defining institutional roles. Moreover, imitation and learning could quite well have accounted by themselves for ongoing between-group, as well as within-group, co-operation adequate for the maintenance and renewal of long-distance, long-term tribal and inter-tribal relationships. Even 'super-networks' associated with extensive exchange systems (Lourandos 1997: 26) require only culturally transmitted greeting ceremonies and rites of entry (Peterson 1975) and interpersonally transmitted recollections of past encounters with members of other bands.

SOCIETY OUT OF CULTURE

What then happened to bring about the transition from a purely cultural to an institutional, as well as cultural, human world?

There is an extensive literature, both archaeological and ethnographic, on states and chiefdoms and their origins. But although the evolution of proto-states (Runciman 1982) and the subsequent diffusion of centralized coercive practices can be very rapid, particularly in response to selective pressure from other, already stratified societies, the first emergence of roles formally defined by rule-governed practices is the critical event which, like subsequent state-formation, evidently happened more than once in different parts of the world. Much of the discussion in the literature on the evolution of social complexity is concerned with the influence of the traditional 'prime movers': population growth, trade, warfare, and religion. But perhaps only a minimal extra accumulation of resources and differentiation of functions is enough to initiate the transition from culture to society. Not only does it not require 'chiefs' (however defined); it may not even require the emergence of 'rank' — a concept which in any case has imprecisions and ambiguities of its own (Renfrew 1982). Sociologically, the significant difference is that information affecting phenotype is now encoded and transmitted in such a way that different individuals can move into and out of, and be succeeded in by other individuals, ongoing roles whose defining practices are acknowledged by mutually responsive agents independently of personal characteristics.

The theoretical point can be illustrated by simple hypothetical examples. Household heads with control over a relatively larger quantity of stored food-stuffs might, in times of scarcity, start making distributions to less fortunate households on terms which involved subsequent repayment in kind and hence a recognized practice formalized in a system of debtor–creditor relationships. Or ritual specialists credited with divinatory powers might build up a following, centred perhaps around a shrine or sacred place, from among whom designated successors would be chosen in accordance with rules defining a formal master–disciple relationship. Or particularly redoubtable warriors might attach to themselves a permanent retinue who thereby enabled them to rely on continuing support from fellow-warriors without repeated demonstrations of personal prowess. The emergence of such relationships may well (again like subsequent state-formation) have been fluid, sporadic, and reversible. Where exactly is the line to be drawn between exchanges of favours between friends and the mutual obligations of patrons and clients, or between gift-exchanges and bridewealth or dowry payments, or between informal teaching of skills and formal training for full-time, specialized functions, or between services rendered to immediate family members and labour diverted to local corporate groups sharing a putative common ancestor? Where ethnographic, literary, or epigraphic evidence is available, the emergence of novel practices can be inferred from the vernacular terms for the roles which they define, like the Alaskan *umialik*, whose role is argued by Sheehan (1985: 142) to have been transformed by whaling from successful hunter to war leader, wealthy trader, and religious leader; and conversely, the repudiation of an available term for a role, as in the reluctance of the !Kung San to apply their word for ‘chief’ to themselves as opposed to Bantu headmen except ‘in a derisory manner’ (Lee 1979: 344), can confirm the absence of institutional relationships. But the epigraphic or literary evidence for roles with distinctive names attaching to them, such as the Homeric Phaeacians’ *basileus*, *kerux*, and *aisymnetai*, or the Sumerian *ensi*, or the Mycenaean *wanax*, is likely to come from a time when the origin of the practices defining them is already a long-past event.

One or more just-so stories about the evolution from culture to society must, however, be true; and what the archaeological record does suggest is that common to those which are will, at some point and to some degree, be sedentism. This is not because permanent economic, ideological, and political institutions are bound to evolve from any kind of synoecism. Nor, in any case, is sedentism an all-or-nothing matter. Hunting and foraging bands can be virtually sedentary for significant periods and thereby make and acknowledge claims to territoriality (Cashdan 1980) without year-round occupation of caves, huts, or houses. Even where permanent stone-built structures have been uncovered, this does not necessarily indicate sedentism, and even intensive harvesting of wild cereals need not imply more than a seasonal mobility

pattern (Bar-Yosef & Meadow 1995). But once climatic conditions favoured continuous plant cultivation, as they evidently did in the early Holocene (Bar-Yosef, this volume; Richerson & Boyd, this volume), sedentism and intensive exploitation of annual crops are likely to have reinforced one another (Henry 1989; McCorrison & Hole 1991), and communities where both plants and animals had been domesticated will have started to experience a joint expansion of food surpluses and population (Hole 1984).

Whatever time it may have taken, a combination of storage, sedentism, and residential aggregation could not but have had a significant effect on social behaviour-patterns, if only because of the need for co-operation within and between groups whose increased size made increasingly difficult if not impossible the detection of free-riders and restraint of aggrandizers. Human beings as a species appear to have evolved adaptive social networks limited to about 150 people (Dunbar 1993, 1998), and increasing group size is well known to give rise to problems of collective decision-making which need to be alleviated either by prescriptive rituals or by diffusion of decision-making among clans, moieties, sodalities, or age-grades (Johnson 1982; Reynolds 1984). But large aggregations and absorption of population from other groups also give rise to problems of social control (Kaufman 1992) and conflicts of loyalty (Myers 1988: 59) which are compounded to the extent that there are rival claimants to increasingly contested resources, including access to, and control of, physical space. The same co-operative norms may be transmitted by imitation and learning from parents and elders to successive generations of children, but how are they to be made effective in cases of inter-familial dispute? There do not need to be central, permanent, specialized roles to which there attaches monopoly control of the means of coercion. But some formal procedure is now called for whereby disputes can be resolved by mediators or arbitrators designated as such, in contrast to the purely personal interventions in fights among foragers like the !Kung San, where a man with a reputation for being strong and competent and himself very mild-mannered can successfully interpose himself, but women or old men who interpose themselves are often 'hit in the bargain' for their pains (Lee 1979: 308, 381). The formal roles of mediator or arbitrator pose the difficulty that the practices defining them could emerge without leaving any trace whatever in the archaeological record. But it is surely legitimate to conjecture that, for example, the small Natufian building in Ain Mallaha with a plaster-covered rounded bench 'could have been used by the leader or shaman of the group' (Bar-Yosef 1998: 163). This is not a ruler's throne, or a magistrate's judgement-seat, or an official's dais, or a chief's stool, any more than the caves with the paintings are churches or temples. But nor is it just the camp-fire or water-hole round which debate is conducted by the men and women of the hunting and foraging bands.

From such preliminary indications of emergent practices and roles, one

possible trajectory leading to a stable equilibrium is what may be called the 'Deioces model'. According to Herodotus (I.96–100), Deioces, having acquired a reputation as a mediator, refused to continue until granted his own armed retainers and palace, and thus became the first king of the Medes. Although the particular story is mythical, many 'aggrandizers' in the historical record have succeeded in usurping, or being granted, a monopoly of the means of coercion, and from there it can be a short step to religious legitimation of rulership, honorific modes of address, slavery or forced labour, a military and perhaps land-holding elite, and a hierarchical structure of designated roles whose incumbence is hereditary. But co-operation does not have to be imposed in this way even in large, settled communities with distributable surplus resources. The contrasting solution, in game-theoretic terms, is to add to the players' decision-tree a parameter representing a cost for self-financing monitoring and a strategy for negotiating a co-operative agreement (Ostrom 1990: 16). As Ostrom emphasizes (1990: 14), 'New institutional arrangements do not work in the field as they do in abstract models unless the models are well specified and the participants in a field setting understand how to make the new rules work.' But examples exist, and have been studied in the field, where, for example, fishermen agree to rotate potentially productive locations in such a way that access to the best opportunities is equalized and monitoring is carried out by mutual observation at sufficiently low individual cost for it not to be a rational strategy to defect. This is not to say that all such arrangements are successful, or that there are not sub-optimal polymorphic equilibrium traps into which the relevant population can fall (Skyrms 1996). But as one of the early contributors to the literature on common-pool resource problems remarked, 'stable primitive cultures appear to have discovered the dangers of common-property tenure and to have developed measures to protect their resources. Or, if a more Darwinian explanation be preferred, we may say that only those primitive cultures have evolved which succeeded in developing such institutions' (Gordon 1954: 134–5).

These two alternative models are close to being ideal types of the alternative 'Hobbesian' and 'Rousseauesque' versions of how control is exercised within and between groups whose members owe no familial or personal allegiance to people whose interests conflict with their own. But the ethnographic record discloses a whole range of intermediate arrangements in hunter-gatherer, as well as horticultural or agricultural or pastoral, societies by which the continuity of distinctive and consistent social behaviour-patterns can be sustained. It is a commonplace that no social system is based entirely on consent or entirely on compulsion. But in the diverse combinations of practices and roles which make up the institutions of relatively simple but none the less very different societies, there is a universal tendency for the phenotypic effects of economic, ideological, and political practices to function in such a way as to enhance the probability of replication of one

another, often through recombination in a single composite role. It is not only in the formation of states that 'the elaboration of religious institutions, ideology, and the arts' is so frequently involved (Bettinger *et al.* 1996: 159). Even if there is no warrant for assuming that any of the hunter-forager societies in the ethnographic record is a replica of those of the Epi-Palaeolithic (Betzig 1998: 267; Binmore, this volume; Mithen 1994: 170; Shott 1992), the inference which can legitimately be drawn from the ethnography of the more affluent and complex hunter-gatherers is the ease with which environmental pressure and competition between the incumbents of differentiated roles can generate institutional as well as cultural variation once the evolutionary threshold has been crossed between information transfer by imitation and learning only and the encoding of formal rules in the mutant and recombinant practices which define these differentiated roles.

This is what makes the first completion of the transition of such obvious sociological interest and gives the Natufian culture its particular relevance (Bar-Yosef, this volume). I have suggested that even on a generous interpretation of the archaeological evidence, it is difficult to argue that the Upper Palaeolithic 'Revolution' brought the transition about. But even on a sceptical interpretation of the Natufian evidence, it is difficult to question that it has occurred. 'Transition', however, rather than 'revolution', would seem to be the appropriate word. Subsequent social evolution can be very rapid because, among other reasons, the idea of institutional inducements and sanctions has been arrived at already, and the memory or suggestion of formally differentiated roles can be culturally transmitted from one successive or adjacent population to another. But when the first mutant practices brought the first economic, ideological, or political institutions into being, the vernacular terms for the roles defined by those practices will have had to be invented or new meanings attached to existing terms. What is more, not every member of the community in question will necessarily have given their assent. Nor, as the Natufian example also shows, is there any reason to assume that the transition may not go into reverse (Bar-Yosef, this volume; Moore & Hillman 1992).

Successive and continuing excavations have by now yielded a detailed and coherent picture of Natufian settlements which, although significantly smaller than Neolithic sites such as Gilgal or Jericho, were evidently as large as the smaller Neolithic villages. Despite the relative rarity of underground storage pits, there appears to be unmistakable evidence of delayed-return surpluses, albeit not on a scale sufficient for Kwakiutl-style potlatching. Even if cereal crops were not yet fully domesticated (Unger-Hamilton 1989: 101), plant remains, together with sophisticated tools and extensive faunal remains, indicate skilled and productive exploitation of the natural environment. An incipient industry produced decorated pendants and beads as well as tools and

parts of hunting devices such as spear-throwers. Grave goods include belts, bracelets, earrings, and headpieces. Skulls were preserved, perhaps as symbols of deceased family members, or perhaps as trophies of dead enemies (Bienert 1991: 20). Marine shells, basalt implements, and obsidian pieces were acquired from sources distant from the locations where they have been found. Artworks in distinctive styles include decorated bowls, spatulas, and sickles, human and animal figurines, and incised limestone slabs, some of which have what may be notational marks. Could all these activities have been carried out by communities in which there were no acknowledged practices defining specialized formal roles in which different individuals succeeded one another according to pre-existing rules? Must there not have been what have been called in the Mesoamerican context 'central planners of seasonal working performance' (Boehm de Lamenas 1988: 93) who, although they need not have been 'chiefs', let alone 'kings', were still recognized as formally entitled to direct the labour of people other than their own families and households, at least to some degree? Perhaps systems of stably integrated, explicitly designated, formally acknowledged, extra-familial economic, ideological, and political roles emerged only in later, larger, fully sedentary communities with public spaces, communal buildings, monuments, domesticated crops, trading networks, and formal ceremonies. But these communities evolved from the Natufian communities which preceded them: their members were 'the descendants of the local Natufian population which had undergone changes in material culture, social organization, and daily life ways' (Bar-Yosef 1998: 169).

Later autonomous transitions, whether in Mesoamerica or the Yangtze Valley, need not have come about through an evolutionary sequence precisely following that suggested by the archaeological record for south-west Asia. But whenever it happened, aggregation of population beyond a certain critical point created an environment favouring formal inducements and sanctions without which the necessary minimum of co-operation between unrelated individuals would no longer be possible to sustain. Subject to the risk attendant on any categorical statement of this kind, it would, I submit, be a sociological impossibility for the 10-hectare settlements of over 1,000 people of Pre-Pottery Neolithic B to have cohered and reproduced themselves without an institutionalized role-structure of a kind which the hunting and foraging bands of the Upper Palaeolithic did not need to have evolved in order to maintain their coherence over successive generations.

CONCLUSION

It may never be possible to reconstruct from the archaeological record exactly how there first evolved practices defining specific economic, ideological, and

political roles, and still less what the vernacular terms were for them. In the ethnographic literature, there are numerous relatively simple societies with roles whose vernacular terms are suggestive of a possible origin. For example, the Achuan *juunt* (literally, 'great man') 'is invested with a pre-eminent role' because he is 'master of the house' and also because 'everybody relies on his recognized qualities of military leadership' (Descola 1996: 290); he therefore becomes the *mesetan chicharu* (literally, 'war herald') who both organizes defence and negotiates with allies or, if necessary, enemies. By contrast, the Etoro *tafidilo*, although likewise a leader in communal activities including raids against other tribes, is a respected senior man whose status is achieved 'by attaining prestige through generosity in the frequent distribution of growth-inducing game to co-residents' (Kelly 1993: 21), while the Mardujarra *nindibuga* or 'knowledgeable one' has a position 'based on the older men's monopoly of esoteric knowledge, which will be transmitted only if young men conform to the dictates of the Law, and are willing to hunt meat in reciprocal payment for the major secrets that are progressively being revealed to them' (Tonkinson 1988: 157). But any historical reconstruction can only be speculative.

On the other hand, the diversity of hunter-forager cultures (Kelly 1995) gives reason to suppose that there is a range of alternative ways in which the transition can come about, depending on the particular circumstances under which relatively larger populations stay together and settle more or less permanently at sites where they build up delayed-return resources. There is no suggestion that culturally complex but socially pre-institutional human behaviour-patterns were acted out in a pre-lapsarian idyll. The archaeological record discloses ample evidence of harsh climates, hostile predators, short life-spans, dietary deficiencies, incurable ailments, periodic scarcity, and interpersonal violence. But the selective pressures imposed on psychologically modern humans by a difficult, unpredictable, and often threatening environment will have favoured the replication of any of a range of possible mutations which furthered more consistent co-operation between unrelated members of larger groups and more stable relationships with other groups, whether perceived as competitors for scarce resources, sources of potential breeding partners, or links in a chain of long-distance exchange of symbolically valued material goods. To a comparative and historical sociologist it is as puzzling that any anthropologist should ever have questioned that hunters and gatherers 'do not all possess the same "ethos"' (Gibson 1988: 165) as that any archaeologist should ever have questioned that culture 'springs from the active engagement of people in the business of living and interacting' (Gamble 1999: 28; Whittle, this volume). The hunters and gatherers of the Upper Palaeolithic cannot but have consciously and deliberately constructed and negotiated their own particular relationships with the natural world, their

artefacts and monuments (Renfrew, this volume), their deities, and each other, and out of this process some mutations in bundles of instructions affecting phenotype will have been more successfully replicated than others. Only, however, after a threshold had been crossed in sedentism, group size, and storage of surplus resources did they form and sustain institutions which depended for the maintenance of stable social relationships on obedience to rules encoded in established practices and formal roles acknowledged as such. If it took the Upper Palaeolithic 'Revolution' to complete the transition from 'evoked' to 'acquired' social behaviour, then perhaps it took the Neolithic 'Revolution' to complete the transition from 'acquired' social behaviour to 'imposed' (Runciman 1998: 174).

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