

Some thoughts on social versus cultural complexity

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ABSTRACT – *Socially complex hunter-gatherers are characterised by (1) inherited, permanent leadership and (2) sustained control over non-kin labour. Archaeologists have tended to infer social complexity through evidence of cultural complexity (i.e., artistic elaboration, composite tool technology, religion, etc). Complexity theory, however, indicates that patterns suggestive of social complexity can be produced through simple behavioural rules that do not necessitate social hierarchies. Therefore, evidence of cultural complexity cannot be used to infer social complexity in archaeological societies, nor should social complexity be emphasized in discussions of hunter-gatherer achievement or evolution of food production.*

IZVLEČEK – *Socialno kompleksne skupnosti lovcev in nabiralcev označuje (1) dedno, trajno vodstvo in (2) nepretrgan nadzor nad ne-sorodstvenim delom. Arheologi so se s pomočjo dokazov o kulturni kompleksnosti (i.e., umetniškem delovanju, tehnologiji sestavljenih orodij, religiji, itd.) nagibali k oceni o socialni kompleksnosti. Vendar teorija kompleksnosti kaže, da so vzorci, ki kažejo na socialno kompleksnost, lahko produkt enostavnih pravil obnašanja, ki ne zahtevajo socialne hierarhije. Zato dokazov o kulturni kompleksnosti ne moremo uporabiti za sklepe o socialni kompleksnosti arheoloških skupnosti, niti ne bi smeli poudarjati socialne kompleksnosti v razpravah o lovsko-nabiralskih dosežkih ali razvoju pridelovanja hrane.*

KEY WORDS – *complex hunter-gatherers; complexity theory; Mesolithic; sociocultural evolution*

[In] literature as a whole, successful farmers have social relations with one another, while hunter-gatherers have ecological relations with hazelnuts.
(Bradley 1984.11)

This paper examines recent attempts to consider social relations in the European Mesolithic that led to the portrayal of the Mesolithic as a social evolutionary stage characterised by socially complex hunter-gatherers. Social complexity consists of (1) hereditary social differentiation and (2) control over non-kin labour. Increasing cultural complexity, on the other hand, refers not only to socio-economic organisation, but to all aspects of culture, including art, technology, and religion. The paper begins by reviewing debates about complex hunter-gatherers and about Mesolithic hunter-gatherers. This is followed by a consideration of archaeological applications of complexity theory. I critique the use of complexity

theory in the creation of a new social evolutionism. We should consider culture in its entirety, rather than just socio-economic organisation, as the non-linear adaptive system whose evolution we want to study. Essentially, this is the same adaptationist argument that Peter Rowley-Conwy (2001) and many others before him have made, although as archaeologists we cannot hear it often enough. The final sections of this paper review recent debates about the social organisation of the Levantine Natufian and the Lepenski Vir culture of the Iron Gates Gorges; both regions appear to be characterised by culturally rather than socially complex hunter-gatherers.

Complex hunter-gatherers

The dominant discourse in the West has traditionally portrayed hunter-gatherers as radically alter Others, highly mobile in their day-to-day food quest and living a simple life without social differentiation. They are thought of as closer to nature than to culture (*i.e.*, civilisation), and their situation has often been clearly juxtaposed, for better or for worse, to that of our modern selves (*Pluciennik 1999; Tringham 2000; Hernando 2002; Kotsakis 2003; Borić 2005*). Thus, Thomas Hobbes famously described this supposedly natural state of humankind as having “no Culture of the Earth [*i.e.*, no cultivation]; [...] no Knowledge of the face of the Earth; no account of Time; no Arts; no Letters; no Society; and which is worst of all, continuall feare, and danger of violent death; And the life of man, solitary, poore, nasty, brutish, and short.” (*Hobbes 2003[1651].102*).

Although Marshall Sahlins’ concept of the original affluent society (*Sahlins 1968; 1972*; see also *Lee and DeVore 1968*) allowed for a more positive view of hunter-gatherers, the belief remained that they had a comparatively simple social organisation (*Solway 2006*). The explanation for this lack of social complexity hinged on the fact that hunter-gatherer communities were relatively small, while social complexity was understood to generally increase with a rise in population (*e.g.*, *Carneiro 1967*). Moreover, the criteria for measuring complexity were set with Western capitalist states always at the top of the ladder (*Rowlands 1988*).

Socially complex non-agricultural societies, like those of the Northwest Coast of North America and to a lesser extent Siberia (*e.g.*, *Suttles 1968; Donald and Mitchell 1975*; sources cited in *Shnirelman 1992. 15–16*) tended to be explained away as rare anomalies (starting with *Grosse 1896*). Archaeologically, they did not fit the evolutionary scheme that associated any form of transegalitarian¹ social organisation with agriculture. Bakhta (*1986*) sums up this stance by specifically differentiating early farmers from hunter-gatherers based on (1) sedentism, (2) storage, (3) delayed return economy (*cf. Woodburn 1980*), (4) socially differentiated relations of production, (5) intensification of productivity, and (6)

specialisation of labour. This view is still very much alive in the Western political and popular imagination (*e.g.*, *Horst Köhler and Günther Oettinger in Licher 2007.8,10*). Rowley-Conwy (*2001*) pointed out that the highly mobile, egalitarian hunter-gatherers came to be (wrongfully) seen as the baseline from which all subsequent human evolution took place. This criticism of presupposing a directional evolutionary trajectory towards greater complexity applies not merely to Victorian social evolutionists, but to Marxist, processual and ecological archaeologists (*Trigger 1998.10*) as well as to pre-Darwinian Enlightenment thinkers (*Chapman 2003.5*). Complex societies are consistently valued more highly (*sensu Shanks and Tilley 1987.164*) than their simple counterparts.

Carneiro (*1967*) perceived population growth as a sufficient cause for more complex social organisation, with sufficient population growth in turn only made possible by the greater productivity allowed for by agriculture. From the social evolutionist viewpoint, this increase in social complexity was defined as the development of social structure (*Spencer 1873*), predicated on growth in the units of society (namely, population growth). Evolution implied both the growth of structural units and the development of new structural units at a higher level of organisation (*Spencer 1866*). Carneiro created a yardstick (*cf. Naroll 1956*) for measuring social complexity based on the presence or absence of 205 traits in 46 societies, concluding that “the more traits a society had, [and, thus, the more socially complex it was,] the higher its culture level” (*Carneiro 1967.235*). While presumably devising a measure of social complexity, Carneiro went on to make a value judgment about cultural complexity.² The interchangeable use of social and cultural complexity (*e.g.*, *Carneiro 1967.235; Matson 1983.125–126; Maschner 1991; Price 1995b. 423–424; Tainter 1996a.4–8*; and to a lesser extent *Arnold 1996.80*) has caused considerable confusion about what scholars are actually referring to, although they have generally agreed that both types of complexity tend to be associated with agriculturalists.

Since the 1960s, Richard Lee (*1968; 1992; Solway and Lee 1990*), and others, saw the unifying characteristic of all hunter-gatherer ‘band societies’ in their egalitarian ideology of sharing. This is what Ingold

¹ Transegalitarian refers to a degree or level of social complexity intermediate between egalitarian bands and stratified chiefdoms (*Hayden 1993; cf. Johnson and Earle 1987*).

² See Newell and Constandse-Westermann (*1984*) for a more nuanced argument for the interconnectedness of population growth and density, social complexity, and archaeologically visible complex technology.

(1988) calls the hunter-gatherer 'mode of production', a social type implying not only a hunter-gatherer mode of subsistence, but also egalitarian social relations (*sensu Ingold*) and ideology (*sensu Lee*). In Marxist approaches, dialectical materialism specifies a straightforward relationship where the subsistence base determines social relations, which are further reinforced through ideology. Tainter (1996b) indicated that hunter-gatherers thus doomed to simplicity, were reckoned to demand little respect from archaeologists more concerned with societies closer in complexity to their own. Sir Mortimer Wheeler even compared a bad archaeological fieldworker to a hunter-gatherer, "master of a skill, perhaps, but not creative in the wider terms of constructive science" (Wheeler 1954:152). Hunter-gatherers were thus summarily dismissed.

It is in this context that a discourse on 'complex hunter-gatherers' (CHG) emerged in archaeology during the early 1980s (Koyama and Thomas 1981; Price and Brown 1985a). At least some hunter-gatherers, as was known, were complex in all the characteristics identified by Bakhta (1986) as indicators of a food producing economy. Archaeological correlates of complex hunter-gatherers that have often been proposed include: sedentism (Matson 1985); higher overall population, population density, and population growth; storage (Testart 1982); delayed return economy (Woodburn 1980); logistical collector subsistence-settlement pattern (Binford 1980); property rights and territoriality (Coupland 1985b); elaboration of ceremony and art (Soffer 1985); trade and inter-group networking; technological and labour specialisation; and a division of labour that goes beyond close kin, sex, and age (Arnold 1996).

Considering the previous emphasis on agriculture as the enabling precondition of complex social organisation and cultural elaboration, it is perhaps little wonder that early CHG studies focused on the ecological conditions necessary for increasing complexity. Resource intensification (Dyson-Hudson and Smith 1978; Matson 1983) was seen as the most crucial variable in the transition from simple to complex hunter-gatherers (e.g., Price and Brown 1985b; Henry 1989) and more generally in the transition from the Late Pleistocene to the Holocene (Hayden 1981).³ Zvelebil (1998) elaborated on Ingold's (1988) scheme of the hunter-gatherer mode of production: some 'hunter-gatherers' existed without the

ideology (and social relations) of egalitarianism and sharing, while other 'hunter-gatherers' did not rely on an exclusively non-agricultural subsistence. It is not merely the mode of production, but rather the relations of production and the efficiency of particular economic adaptations to their specific environments that are important in the appearance of social complexity (Shnirelman 1992). This point, however, had been lost on many researchers. As Warren (2005a) and others pointed out, the CHG discourse made a generalising social evolutionary stage out of complex hunter-gatherers (e.g., Hayden 1993; 2003: 3), rather than enabling analysis of variability in their social organisation (cf. Kelly 1995; Ames 2004). Levantine archaeologists, for example, now saw the Natufian (complex) hunter-gatherers as a pre-agricultural foundation of Western Civilization (Bar-Yosef 1991:394, and less explicitly in 1998:159).

Like the Man the Hunter conference (Lee and DeVore 1968), the CHG debate was originally envisioned to help humanise hunter-gatherer studies. Complexity, as defined by Jeanne Arnold, consists of two things: (1) ascribed and permanent inequality (i.e. hereditary social differentiation) and (2) labour relations characterised by sustained, on-demand control by elites over non-kin labour (Arnold 1996: 78-79). Arnold (1996:94) identifies (social) complexity through mortuary contexts and household architecture and content as evidence for social differentiation, and through production contexts, residential settings and cemeteries as evidence for labour relations. Other aspects of (cultural) complexity – such as art, ritual and symbolism – were previously used by some scholars to infer hunter-gatherer complexity (e.g., Soffer 1985). These aspects of cultural complexity not associated with social organisation are seen as "epiphenomenal" in Arnold's scheme (1996:78); they are merely idiosyncratic features of particular cultures and are thought to be dependent on social organisation. Such a definition sees social complexity as a necessary first step in cultural complexity.

Complex hunter-gatherers have been opposed to 'simple', egalitarian hunter-gatherers (e.g., Price and Brown 1985b; Ames 1995; Arnold 1996) – whom Sahlins (1968; 1972) called the original affluent society, because they are efficient in satisfying their daily subsistence needs (see also Rowley-Conwy 2001; Solway 2006). The distinction between these

³ This has also been described as a switch from *K*-selected to *r*-selected resources (e.g., Hayden 1981; Gamble 1986), terms borrowed from animal ecology (cf. Pianka 1972).

two societal types is found in the direction of within-group material transfers: from those who temporarily have more to those who have less (*i.e.* sharing) in simple societies, and from those who chronically have less to those who have more (*i.e.* exploitation) in complex societies (Cowgill 1996). Complexity was correlated with more people interacting with one another on a daily basis in order to meet everyday needs. Cohen (1985) identified scalar stress within such situations, in which interpersonal conflict is more likely to arise, as the driving force in a shift from egalitarian to ascribed, hierarchical social organisation. In this account, social inequality was understood as functional and beneficial to the community as a whole, since higher-level social units were thought to be necessary for dealing with scalar stress. However, Rathje and McGuire (1982) demonstrated that cross-culturally such complexity is exploitative – those with power gain more from it than those without power. Tainter goes as far as to call complexity an “*abnormal condition of human organization*” (1996b.12, see also Henry 1989.5), while Rowley-Conwy (2001.65) proposes that it is, in fact, egalitarianism that is the “*most remarkable and specialised social form that humans have ever evolved*”.

Many scholars have critiqued the simple-complex dichotomy in hunter-gatherer studies and its social evolutionary heritage (*e.g.*, McGuire 1996; Rowley-Conwy 2001; Ames 2004; Warren 2005a). Variability in hunter-gatherer social organisation lies on a continuum or spectrum (Kelly 1995), and opposing the two ends of this spectrum needlessly simplifies things. This critique has led to revisions of the simple-complex dichotomy. For example, Arnold (2004) now adds an ‘affluent’ stage between egalitarian and complex hunter-gatherers; this ‘affluent’ stage is characterised by cultural complexity, but lacks the hereditary inequality and sustained control of non-kin labour characteristic of her (socially) ‘complex’ hunter-gatherers.⁴ Such approaches, and Rowley-Conwy’s (2001) own four-stage model, have been criticised as still not going beyond the social evolutionary discourse. Warren (2005a.70) contends that while “*it is possible to argue that the discussion of ‘complex hunter-gatherers’ served an archaeological purpose during the 1980’s it is now time to move on*” and look at more humanising aspects of the past (*e.g.*, Warren 2005b). While applauding the call for a more humanising archaeology, I do not entirely agree with Warren’s assessment. Arnold (2004)

argues that for the Northwest Coast and Plateau of North America, a major anthropological goal remains to discern the exact type of social organisation of the prehistoric populations in these areas. I believe that the same applies to the Natufian, Lepenski Vir and other prehistoric hunter-gatherer societies that have been recently described as socially complex. Although social organisation does not determine other aspects of culture, we should not ignore it altogether as an object of study.

Mesolithic hunter-gatherers

Whereas the preceding discussion of complex hunter-gatherers juxtaposed them to simple hunter-gatherers, studies of the European Mesolithic tend to juxtapose hunter-gatherers (regardless of social organisation) to Neolithic farmers (Price 1985; Zvelebil 1998). Wilmsen and Denbow (1990; see also Woodburn 1988) believe that the egalitarian ideology of many modern hunter-gatherers and their social relations based on sharing (*cf.* Lee and DeVore 1968) are a result of encapsulation by pastoralists; they consider ‘simple’ hunter-gatherers as a very recent phenomenon. This helped question the idea that simple hunter-gatherers were a baseline of social evolution (Rowley-Conwy 2001), which had important repercussions for interpretations of the Mesolithic-Neolithic transition in Europe (Radovanović 2006; *cf.* Spielmann and Eder 1994).

When Lubbock (1865) split up the Stone Age, he distinguished the Neolithic from the Palaeolithic on the basis of the presence of (1) polished stone tools, to which others later added the presence of (2) modern fauna (*i.e.*, Holocene epoch), (3) agriculture (in the form of domesticated plants and animals), and (4) pottery. To Victorian social scientists, the Neolithic was simply a chronological stage on an implicit social evolutionary progression from primitive hunter-gatherers to British civilisation (Pluciennik 1998; Zvelebil 1998). It was not until V. Gordon Childe’s (1925) concept of the ‘Neolithic Revolution’ that the Neolithic came to be seen as a societal type, characterised by a specific social organisation determined by an agricultural mode of subsistence. Zvelebil (1996) points out that analogies for the technological and economic aspects of the Neolithic are taken from ethno-historical (and folk studies) accounts of the European peasantry, creating a sense of the Neolithic as an ancestral form of our own societies.

⁴ In the Japanese tradition (*e.g.* Koyama and Thomas 1981), ‘affluent’ hunter-gatherers have more in common with Price and Brown’s (1985a) ‘complex’ hunter-gatherers, than with Sahlins’ (1972) ‘original affluent societies’ (see Koyama and Uchiyama 2006).

Aspects of Neolithic social life, on the other hand, are generally taken from ethnographic analogies from outside Europe (e.g., Papua New Guinea), because the European peasantry is considered to have evolved socially (and morally), making it an inadequate source of analogy for early farmers from several thousand years ago (Zvelebil 1998:12–13). The last two decades have seen an increased interest in providing a more coherent reconstruction of Neolithic mentality (e.g., Hodder 1990; Thomas 1991; Cauvin 2000). Post-processualists have identified a fundamental wild/tame duality as the basis for many other binary oppositions structuring thought during the Neolithic. Although Zvelebil (1998) has shown that Mesolithic hunter-gatherers may already have distinguished the wild from the tame, Cauvin (2000) was unwavering about Natufian hunter-gatherers having a fundamentally different mindset than people in the Neolithic, something akin to Ingold's hunter-gatherer ideology of egalitarianism. When combined with the 'cultural circles' approach (e.g., Kossinna 1911), which assumes a direct correspondence between archaeological cultures and distinct ethnicities and which is still conventional in much of central and eastern Europe (Chapman and Dolukhanov 1993), the definition of regional Neolithic cultures and their Mesolithic 'opponents' takes on both nationalist (Zvelebil 1996) and imperialist overtones (Pluciennik 1998). The Neolithic was variously understood as both the foundation of European civilisation and as a precedent for (as well as justification of) 19th and early 20th century European imperialism.

Meanwhile, the Mesolithic was first defined by Westropp (1872, and later by Reboux 1873 and Brown 1893) and originally referred to what we now know as the Upper Palaeolithic (Ayarzagüena Sanz 2000). The Mesolithic was supposed to have bridged the apparent hiatus between the Old and New Stone Ages proposed by de Mortillet (1872).⁵ Zvelebil (1998) argues that unlike the Neolithic, the Mesolithic never came to be characterised by its own societal type; even Childe (1947) dismissed it as a mere chronological stage because it did not fit preconceived models of social evolution: "*the Mesolithic was regarded as a period of decline, not of progress, whose diminutive stone tools – microliths – neatly*

symbolised the irrelevance of the period" (Zvelebil 1998:2, cf. Clark 1978:3). The 1980s attempts to define the Mesolithic as a unique complex hunter-gatherer societal type based on a largely fishing mode of subsistence (e.g. Price 1985), and moreover representing a progressive stage on the social evolutionary ladder (e.g., Hayden 1993; 2003), were not widely accepted by European scholars (e.g., Price 1995a; Zvelebil 1998:3).⁶ The view that sees the European Mesolithic and the Levantine Natufian as populated by complex hunter-gatherers only became institutionalised in a few North American introductory textbooks (e.g., Fagan 2001; Hayden 1993). Because they are foundational histories (*sensu* Leone 2006), however, these textbooks have shaped the preconceptions of a whole generation of students, myself included, that relied on them.

Beyond the Neolithic and the Mesolithic, a third term – the Epipalaeolithic – has gained currency. The Natufian, originally defined as a Mesolithic industry (Garrod 1957), was later called Epipalaeolithic, based on its re-dating to the Terminal Pleistocene (Belfer-Cohen 1991). In the Levant, then, the distinction between Epipalaeolithic and Mesolithic was based on the Pleistocene-Holocene boundary. In the Iron Gates Gorges and southern Europe generally, on the other hand, the Epipalaeolithic refers to Holocene (rather than Pleistocene) hunter-gatherers, distinguished from the Mesolithic based on the presumed continuity of life-ways with the Upper Palaeolithic (Boroneanţ and Dinu 2006; Radovanović 1996:12–15). In the Levant, however, the Natufian Epipalaeolithic (though usually not the preceding Kebaran and Geometric Kebaran) have come to stand for the same evolutionary threshold between simple hunter-gatherers and farmers as the Mesolithic in some areas of Europe (e.g., Bar-Yosef 1991; 2002; Henry 1985; 1989). Some scholars therefore label the Natufian a Mesolithic entity (Clark 1980; Hayden 1993).

Because they were originally conceived of as chronological markers, the co-existence of Mesolithic and Neolithic was for a long time thought to be impossible. This created problems in areas such as the Iron Gates Gorges, where scholars defined the Lepenski Vir culture as either Neolithic or pre-Neolithic (or

5 De Mortillet (1883) concluded that the Palaeolithic inhabitants of Europe moved out and were replaced by Neolithic populations from the Near East after a period of no occupation. This theory had profound implications for future studies of the Natufian, Lepenski Vir, and the Mesolithic-Neolithic transition in southeast Europe generally (e.g., Childe 1929).

6 What Zvelebil considers the prevailing view of the Mesolithic would best be summed up by Laurent's humorous drawing of Mesolithic hunters chasing landsnails with microlith-tipped spears in rainy weather (Laurent 1965:81, reproduced in Radovanović and Voytek 1997:20).

Mesolithic) based on whether they accepted the contemporaneity of pottery and trapezoidal house floors (e.g., *Srejšović 1969; 1972 contra Jovanović 1969*). The contemporaneity of at least parts of the LV I layer at Lepenski Vir with the Early Neolithic of surrounding regions to the south eventually led to models of Mesolithic-Neolithic contact (e.g., *Chapman 1989; Voytek and Tringham 1989; Radovanović 1996; Roksandić 2000*). These arguments were often based on Zvelebil and Rowley-Conwy's (1986) 'availability model of the moving frontier' of interaction between hunter-gatherers and farmers during the transitions from the Mesolithic to later prehistoric periods in various areas of Europe.⁷ However, Alexander (1977) had introduced the frontier analogy with explicit reference to Frederick Jackson Turner's (1893) 'American Frontier.' He distinguished between an initially 'moving frontier' and four versions of the ensuing 'static frontier' resulting in hunter-gatherers either (1) being 'destroyed', or (2) being absorbed by farmers, or (3) retreating into isolation, or (4) creating a symbiotic relation with farmers. Because of this connection with the manifest destiny of American imperialism, as well as the fact that 'Neolithic farming' eventually predominated over 'Mesolithic hunting and gathering', Pluciennik (1998; 1999; see also *Borić 2005*) felt that Mesolithic-Neolithic frontier models predisposed an eventual static frontier always characterised by the annihilation of the hunter-gatherers. One has to point out, however, that Zvelebil and Rowley-Conwy (1986) were arguing precisely against such a position.

The Mesolithic, as currently conceived, is closely tied to hunter-gatherers, if not necessarily to Ingold's (1988) hunter-gatherer mode of production. Mesolithic social organisation has been variously interpreted as either simple or complex, as has the general 'state of culture'. However, most research on the Mesolithic has taken an ecological approach (*Price 1995b; Zvelebil 1995a*), focusing on hunter-gatherers' relations with their environment rather than with each other (*Bradley 1984*). While Tringham (1991), among others, argued for a focus on ideology, meaning and social relations, Jochim (1998) criticises all such approaches as unscientific in their 'sweeping interpretations' unsupported by archaeological data and in failing to take into account alternate hypotheses. Although this does not mean that we should abandon such innovative research altogether, Jochim (1998:28) is correct in urg-

ing for a clarification of terms and stronger support of arguments by data. In this context, one should point out that Natufian and Lepenski Vir scholars have reconsidered the archaeological evidence for social complexity (see below). A shift in socio-cultural evolutionary theory has accompanied these meticulous reconsiderations of the type of social organisation of temporally and spatially distinct hunter-gatherer groups.

Complexity theory

Complexity theory, as a novel approach to the study of non-linear adaptive systems through computer simulation, was popularised in the 1990s (*Lewin 1992; Waldrop 1992; Gell-Mann 1994*). Essentially, there is feedback in complex adaptive systems between (1) the interaction of constituent parts at the local level and (2) global structures and patterns that emerge from these local interactions (*Mol and Law 2002; Bentley 2003; van Kooten Niekerk and Buhl 2004*). Such an approach is juxtaposed to the reductionist systems theory characteristic of processual archaeology, where the importance of feedback between global- and local-scale phenomena had been understated. Vitalists explained away local phenomena as being determined by some inexplicable global structure, while mechanists explained away global phenomena as being determined by their constituent parts. The insight from complexity theory is that global structures emerge from local interactions, but are more than the arithmetic sum of the system's constituent parts at the local level and, in turn, act back on these constituent parts.

Complexity theory can trace its beginnings to several sources, one of which is the debate on the origins of multicellular life immediately prior to the Cambrian period. Christopher Langton (1986) proposed that such life could emerge from interactions of simple single-celled organisms. Once they come to exist, these more complex multicellular organisms propagate themselves, form diverse and ever more complex life-forms, and oscillate periodically between florescence and collapse (*Lewin 1992:63*). They are said to evolve to the edge of chaos (*Langton 1990*), a state precariously poised between order and chaos, characterised by ever-increasing complexity (i.e., species diversity), with periodic collapses of catastrophic dimensions. Langton (1986) used cellular automata in his computer model to simulate the

⁷ According to Zvelebil and Rowley-Conwy, the hunter-gatherers were conceptualised as having diverse and historically specific social organisation (see also *Zvelebil 1998*).

emergence of multicellular life from the interactions of single-celled, inanimate organisms. However, because they are inanimate, cellular automata work best for simulating spatial phenomena that can be conceptualised as stationary, as opposed to kinetic and dynamic systems such as past human cultural systems (Epstein and Axtell 1996:17–19).

While much early complexity theory dealt with biological phenomena, it is increasingly being applied to the social sciences (e.g., Epstein and Axtell 1996; Mol and Law 2002). Joshua Epstein and Robert Axtell's (1996) Sugarscape was a pioneering effort in this direction. Sugarscape is an example of agent-based modelling of artificial societies. These are computer simulations of complex systems involving artificial agents interacting with each other and with an artificial environment modelled on cellular automata. The Sugarscape environment is modelled as a torus-shaped landscape of cells with differing amounts of a resource (called sugar). Sugarscape agents, on the other hand, are modelled as heterogeneous individuals that move through the artificial landscape in search of the sugar they need to live and prosper. Object-oriented programming languages allow this decoupling of landscape and agents (Epstein and Axtell 1996:179–181; Kohler 2000). While such artificial societies are not perfect replications of the real world, they allow for a 'bottom-up', generative social science that allows for a positivist testing of competing hypotheses of diachronic trajectories (Bentley and Maschner 2003b:4). Agent-based modeling, moreover, (1) allows social scientists to move beyond concepts of equilibrium, linearity and homogeneity, (2) enables a study of emergent phenomena, and (3) is more realistic than deterministic models that fail to account for agents' actions at the local level (Bentley 2003:21).

There are two ways of applying complexity theory in archaeology (Bentley and Maschner 2003b): empirical and theoretical. Empirically, we can juxtapose observed patterns in the archaeological record to those created by bottom-up agent-based modelling or other simulations of complex, adaptive systems (e.g., Banning 1996; Dean et al. 2000; Lake 2000; other contributions to Kohler and Gumerman 2000). Theoretically, we can use concepts such as emergence and the edge of chaos as explanatory mechanisms without relying on specific models or simula-

tions as go-betweens (e.g., Hayden 1993; several contributions in Bentley and Maschner 2003a). On a theoretical level, complexity theory can also support the argument made here that increasing cultural complexity does not necessarily mean increased social complexity.

Agent-based modelling has often served a 'spoiler role' in archaeology (Kohler 2000:12). It has been used to derail theories that postulated a need for global rules and centralized processes to account for complex global patterns, which in reality could have been generated by simple rules of interaction at the local level (Bentley 2003:14). Banning (1996), for example, shows how simple rules of local behaviour can account for patterned village layout in Near Eastern prehistory, a phenomenon Childe (1950) attributed to political complexity and centralized control over 'town planning'. In a similar vein, Banning (2003:8–9) notes that the standardisation of house shape in the Near Eastern Neolithic could have arisen out of simple local rules of what a house should look like, rather than from a centralised monopoly on house construction by architect specialists. The spoiler role, of course, only provides alternative explanations, as it does not disprove the competing interpretation, but merely shows that a simpler explanation can account for whatever phenomenon is being investigated. However, agent-based modeling also appeals to archaeologists because it can be used as a 'dialogic resource' that allows for experimentation with different scenarios (McGlade 2003:117). By specifying different rules for agents, researchers can compare the (hopefully different) outcomes of these rules with patterns observed in archaeological cases, thus narrowing down the possible sets of rules that governed prehistoric behaviour. This allows for a consideration of contingency (Kohler 2000:14), as differences in model outcomes can be matched to differences in initial conditions and/or agent rules.⁸ An example of this second application of agent-based modelling is Dean et al.'s (2000) Artificial Anasazi Project. This project simulated historical trajectories for the 96 km² region of Long House Valley, Arizona. The model outcomes indicated that the archaeological evidence for total abandonment of the region at 1300 CE could not have been due to environmental degradation alone, but must also have been due to 'cultural' factors not yet accounted for by the model (Dean et al. 2000).

⁸ In this context, the 'docking' of different agent-based models (Axtell et al. 1997), that is, the comparison of model outcomes, is an important undertaking because it compares artificial societies that are potentially structured (coded) differently. Because it compares different models, 'docking' is a stronger test than the comparison of outcomes of runs of the same model, in which each run has different initial inputs of agent attributes, but the rules of agent-agent and agent-environment interaction are coded the same way.

On the theoretical level, the application of complexity theory to archaeology has largely resulted in worldviews of an inevitable diachronic trajectory to ever-increasing inequality. Of course, this is not entirely a new idea: social scientists of the Victorian era argued that human evolution is characterised by increasing complexity over time, where only the most complex societies were believed to be ultimately fit to survive (*Chapman 2003*). Some applications of complexity theory have taken a neo-Victorian stance on increasing complexity (though see *Tainter 1996a; 1996b*). They equate increased complexity with increased social complexity; that is, they see an inevitable trajectory towards ever-increasing social inequality. Brian Hayden (*1993.448–466*) provides the most discomfiting example of this, when, in his introductory textbook, he discusses the potential of archaeology to predict the future. He first warns his readers that the “*images may be disconcerting to some people*” and that the archaeology of the future “*requires a total stilling of the self, great objectivity, and complete divorce from the emotional values that structure [one’s] daily profane thought*” (*Hayden 1993.448*). He claims that we are heading for ever greater inequality, where the rich get richer and the poor get poorer. There is no way of stopping this, because “*there is no doubt that evolution will continue; if not now, then later; if not here, then elsewhere; if not on this planet, then on another; if not by our hands, then by others*” (*Hayden 1993.466*). Because introductory textbooks are foundational histories (*sensu Leone 2006.139*), in the sense that they shape the underlying paradigms of whole generations of archaeologists, the ethical consequences of such texts always need to be scrutinized. In Hayden’s case, evolution is provided with a purpose, and the only type of human agency that is seen as adaptationally successful in this case is rugged individualism. This is the adaptation to the edge of chaos applied to human societies, whereby catastrophic collapses of complex systems occur, but the complex systems always re-emerge and are more complex (*i.e.*, characterised by greater inequality) each time. This is a very pessimistic view, and one that serves the interests of certain, well-off sectors of modern society. It is not a value-neutral stance. Moreover, it is not necessarily logically valid.

According to Clifford Geertz (*1973.5*), who in turn traces the idea back to Max Weber, humans are essentially cultural creatures, and they function in cultural systems of meaning. These cultural systems constitute larger-scale phenomena that subsume aspects of social organisation. In this sense, then, a dia-

chronic trajectory to greater complexity can be applied to human ‘evolution’ without implying increasingly differentiated or stratified social organisation. As archaeologists, we observe complex cultural phenomena, such as patterned settlement layouts or monumental architecture, at a ‘global’ level, and social organisation merely provides the local rules of behaviour followed by people in the past. Agent-based modelling and complexity theory, generally, have taught us that simple rules at the local level suffice to create complex patterns, and no centralised structure characteristic of ‘complex’ social organisation is necessary. This brings us to the Natufian and to Lepenski Vir, where social complexity has often been assumed rather than demonstrated.

The Natufian example

The Natufian was first discovered in Shukbah Cave, Wadi en-Natuf, in 1928 (*Garrod 1942*) and more extensively investigated at El-Wad in the Wadi el-Mughara (*Garrod and Bate 1937*). It dates to 14 900/14 600 to 12 000/11 700 calBP in the Terminal Pleistocene (*Byrd 2006*), and has received a lot of attention as the period preceding the first appearance of domesticated plants and animals in the Old World (*Valla 1975; 1995; Bar-Yosef and Belfer-Cohen 1989; 1992; Byrd 1989; Bar-Yosef and Valla 1990; 1991b; Belfer-Cohen 1991; Schyle 1996.175–209; Poyato Holgado 2000*). Based largely on its chipped and ground stone assemblages and its erroneous placement within the Holocene, the Natufian was originally interpreted as a Mesolithic industry by Garrod (*1932; 1957*) and Neuville (*1934*). Though it is now considered the terminal phase of the Epipalaeolithic sequence, some authors (*e.g., Clark 1980; Hayden 1993*) have continued to see it as Mesolithic, while others (*e.g., Gilead 1984*) consider it Upper Palaeolithic. Such terminology is about more than mere lithic industries, as each term implies a reconstructed mode of production and differing levels of continuity with preceding and subsequent phases. Because it is closest in time to the Neolithic, the Natufian has generally been assumed to be more complex than the preceding Kebaran and Geometric Kebaran (*e.g., Henry 1989*; but see *Kaufman 1992* for a different opinion).

Very briefly, the Natufian chipped stone industry is characterised by a predominance of lunate microliths and by the microburin technique. Ground stone tools include mortars and pestles and are thought to occur in greater frequency than in preceding periods. The bone industry includes decorative items, such as

pendants and beads, shaped by grinding. Artistic expression, although present throughout the Epipalaeolithic (e.g., *Hovers 1990*), now includes a few zoomorphic figurines. Stone-built architecture, in the form of small- to medium-sized circular structures, is present on some sites. Burial customs included decorated burials in the Early Natufian, and secondary burial with skull removal during the Late Natufian.

The Natufian material culture extends over much of the (southern) Levant, though there appear to be diachronic changes in its extent. The differently shaped microliths are generally thought to represent stylistic variation and have therefore been used to identify ethnic groups or cultures in the 'culture circles' sense (e.g., *Henry 1989*). Neeley and Barton (1994) have suggested, however, that they might actually represent different stages in reduction sequences. Starting with Henry (1981) and Wright (1978), the Natufians have frequently been considered complex hunter-gatherer chiefdoms with high levels of social complexity (*Bar-Yosef 2002*). This complexity, according to Henry (1981; 1985; 1989) was made possible by intensified wild cereal collection – a type of proto-cultivation that eventually led to domestication in the Pre-Pottery Neolithic. Smith (1987), for example, proposes that reduced robusticity and size of mandibles in the Late Natufian, along with evidence for increased dental disease, indicates increased reliance on cereals in the Late Natufian diet, at least at Nahal Oren. Dubreuil (2004) comes to a similar conclusion on the basis of an increased reliance on, and improvement of, grinding slabs. This intensification, in turn, was said to have been made possible by the expansion of wild cereals from the Last Glacial Maximum refugia to the highlands of the Mediterranean phytogeographic zone, considered the Natufian 'homeland'. Such an interpretation has, however, never been fully accepted (e.g. *Olszewski 1991; 1993; Kaufman 1992; Byrd 2005; Boyd 2006*). Wild cereals may have played a noteworthy role in Epipalaeolithic diet well before Natufian times (e.g., *Nadel and Hershkowitz 1991; Weiss et al. 2004*), and a broad spectrum of other plants may, in fact, have overshadowed the importance of cereals even during the Natufian (*Olszewski 1993*). On the other hand, on the basis of dental microwear, Mahoney (2005) infers an increased reliance on ground plant foods occurring in the Pre-Pottery Neolithic rather than the Natufian.

Natufian settlement patterns include large sites in the core area, for which sedentism is assumed (e.g., *Henry 1985*), medium sites in the hillsides, and small sites in the hillsides and in desert areas. Various explanations of this pattern have been offered, some relying on the socio-economic organisation characteristic of Arnold's (1996) complex hunter-gatherers, while many do not (e.g., *Perlès and Phillips 1991; Kaufman 1992; Lieberman 1993*). Henry (1981) suggested that Natufian adaptation was significantly different from that of mobile hunter-gatherers' during preceding periods. The expansion of wild cereals into the Mediterranean hill zone (which has better soil than the Pleistocene refugia, *Henry 1989*) allowed for sedentism based on intensified reliance on wild cereals as a dietary staple. This caused the population growth and expansion of the Natufians. Later, claims Henry, climatic deterioration meant that Natufians could no longer support themselves by intensive reliance on wild cereals alone. This led to two different responses:

- 1) a change to a food producing economy with the domestication of cereals (Pre-Pottery Neolithic in the 'homeland'), and
- 2) the 'return' to mobile foraging (Harifian in marginal zones).

Byrd (2005) indicates that more reliable palaeoenvironmental data are needed if we want to correlate climatic change with specific cultural changes at the beginning and end of the Natufian; these cultural changes need not have been causally determined by environmental changes.⁹ One aspect of complexity theory that differs from processualist linear systems theory is the possibility for change to occur without stimuli external to the system.

Olszewski (1991) charges Henry relies too much on sedentism as a necessary component of Natufian social complexity. This social complexity has been inferred from burial data, population density, base camps, local group size, storage, and territoriality. Olszewski (1991) debunks all these possible sources of evidence for social stratification and chiefdom organisation. Wright's (1978) conclusion for the existence of social stratification on the basis of an analysis of grave goods from El-Wad, too, has been discredited by several scholars (*Olszewski 1991; Belfer-Cohen 1995; Byrd and Monahan 1995; Kuijt 1996*). Hayden (2004), while also disagreeing with the idea

9 Despite his apparent environmental determinism, Henry acknowledges the contingency of the Near Eastern trajectory that eventually led to agriculture. Were it not for "some Neanderthal driven to grinding pigment for ritual purposes" Henry (1989:236) claims, "it is unlikely that most of the world would be sustained by agriculture today" because mortars and pestles would not have been invented and there would therefore not have been a technology for processing cereals several millennia later.

of Natufian chiefdoms, argues that the burial record still indicates a high degree of social complexity with a heterarchical social organisation; here, inequality would exist between corporate kin groups without an inter-settlement political hierarchy. In a circular argument, Hayden (2004) reasons that transegalitarian societies are characterised by feasting, and if the Natufian were complex it would have evidence of feasting; despite a lack of 'secure' evidence for feasting (2004:274), feasting is then used to reconstruct a complex social organisation for the Natufian (2004:276). Bocquentin and Rouais (2004) conclude that a differentiation of tasks within sequences of production requiring the use of teeth as tools took place at Ain Mallaha, on the basis of intensive tooth wear on two individuals (out of 306!). This could be an indication of labour specialisation and social complexity, although it could be interpreted in a myriad of other ways.

The very concept of Natufian sedentism has been criticized by several scholars (Kaufman 1986; 1992; Boyd 2006). On the one hand, evidence for year-round sedentism during the Natufian is problematic at best (Boyd 2006). On the other hand, even during the Early Epipalaeolithic, evidence for a reoccupation of specific locations exists, for example at Ohalo II (Nadel and Werker 1999). The huts at Ohalo II had up to three superimposed floors, a number that compares favourably with that of the Final Natufian layers at Ain Mallaha (Samuelian et al. 2006). Hardy-Smith and Edwards (2004) argue that garbage disposal patterns indicate that the Natufians had not yet 'gotten used to' sedentary living, assuming they were sedentary in the first place. Zooarchaeological analyses indicate a general increase in mobility (and decrease in sedentism) during the Late Natufian (Munro 2004). Overall, the archaeological data have been interpreted by different scholars as indicating varying degrees of sedentism and social complexity. While social organisation and other aspects of culture appear to have varied throughout the duration of the Natufian, there is little support for the contention that these were socially complex hunter-gatherers.

The Lepenski Vir example

At Lepenski Vir, we see a similar debate. Srejović (1966) initially considered the LV I trapezoidal house floors to be Neolithic, because at the time he subscri-

bed to a Hobbesian worldview that could not imagine attributing such a complex cultural phenomenon to hunter-gatherers. Only when it became stratigraphically apparent that the architecture and art at Lepenski Vir (LV I) clearly predated the overlying layers of Early Neolithic pottery (LV III) did he begin to consider the socio-economic conditions that may have been responsible for this culturally complex hunter-gatherer settlement (Srejović 1967).¹⁰ Srejović eventually came to the conclusion that the planned village layout at Lepenski Vir 'presupposes complex socio-economic relationships' (1969:14; 1972:12), even convincing Sir Mortimer Wheeler that hunter-gatherers are indeed worthy of study (Wheeler in Srejović 1972:8–9). Although this is hardly ever acknowledged, the discoveries at Lepenski Vir paved the way for the complex hunter-gatherer debates of the 1980s and 1990s. Eventually, several scholars came to reassert that Lepenski Vir was a site of socially complex hunter-gatherers (e.g., Voytek and Tringham 1989; Radovanović and Voytek 1997), thus earning the Iron Gates a mention in a North American overview of world prehistory as an example of a European Mesolithic society analogous to the supposed social evolutionary stage that the Natufian occupied in the Levant (e.g., Fagan 2001). As Cvekić (2007, *in prep*) has pointed out, however, Banning's (1996) insights from complexity theory and the Near East bring into question the necessity of relying on complex social organisation to explain the pattern at Lepenski Vir.

Over the years, several scholars have questioned the idea of social complexity at Lepenski Vir. Kulišić (1972), for example, proposed that the large, central houses previously identified as chiefly residences (Srejović 1969) were in fact men's houses for unmarried youth who used stone sculptures in rituals of initiation into manhood. This interpretation, however, does not account for the presence of sculptures in smaller houses throughout the settlement, nor does it account for the standardisation of house layout. A more serious threat was presented by Radovanović's (1996) reinterpretation of LV I sub-phases on the basis of hearth construction, which suggested only 5–10 houses were occupied contemporaneously at any point in time, meaning that the population of the village would have been only 25–50. Radovanović (2006) eventually made explicit that these would therefore have been settlements of egalitarian hunter-gatherers, although her re-phrasing of

10 Some researchers have questioned the validity of stratigraphic interpretation at Lepenski Vir (e.g., Milisauskas 1978; Borić 2002). Perić and Nikolić (2004) point out that these arguments are marred by a rather superficial knowledge of the site, and in any case should not be conflated with debates about the chronometric dating of Lepenski Vir.

LV I has proven faulty on several accounts (*Bonsall et al. 2000*).

My own analyses of variation in house size and content do not indicate the presence of social complexity at Lepenski Vir (*Cvekić 2007, in prep*). Bonsall (2008) also came to argue against social complexity in the Iron Gates on the basis of a lack of evidence for year-round sedentism, storage, internal division of houses (*cf. Kent 1990*), and warfare (*cf. Rokсандić et al. 2004*). Bonsall suggests that the intensified occupation and artistic elaboration of LV I was due to interaction with Neolithic communities in nearby areas. Radiocarbon dates from nearby Vlasac (*Borić et al. 2008*), however, indicate a more intense occupation at this site beginning several centuries prior to the Contact Period of LV I (8250–7950 calBP). Moreover, the continuities in design between LV I art and earlier Mesolithic art have long been emphasized (*e.g., Srejić and Babović 1983*). Although there is wide agreement that Lepenski Vir was not socially complex, there is no need to conceptualise the Mesolithic inhabitants of the Iron Gates as socially inert prior to the appearance of the first farming communities in the Morava Basin to the south. Rather, social organisation and other aspects of culture varied over time, as in the Levantine Natufian.

In lieu of a conclusion

It has become increasingly apparent that the Natufian and Lepenski Vir may not have been characterised by the social complexity posited in a ‘Mesolithic societal type’ connecting simple hunter-gatherers and complex farmers. In fact, social complexity might

not characterise any part of the European Mesolithic (*Spikins 2008.10; Bailey 2008.369*). However, that Natufian and Lepenski Vir hunter-gatherers were not socially complex does not mean they were egalitarian. Their society could have been characterised by inequality, but not necessarily hereditary inequality. I also do not wish to argue that we should confine ourselves to investigations of non-directional, multi-linear, culturally specific social evolution (*cf. Rowley-Conwy 2001*). Studies that have limited themselves to this social aspect of culture have largely failed to move beyond social evolutionism (*Warren 2005a; Cvekić 2006*). Instead, we should consider all aspects of culture taken together as the dynamic, non-linear system that is the object of study in archaeology. When the physical or social environment changes, humans do not need to respond by adapting their social organisation; they can respond equally well by changing technology, religion, artistic expression, or any other aspect of culture. If there is any trend towards greater complexity at all, it is greater complexity in the cultural system as a whole, rather than in its social subsystem. Although I find social organisation a fascinating topic, the other aspects of culture are equally important and equally interesting to study.

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