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Archaeology, Evolution and Darwinism*

Abstract: This paper presents a short history of the influence evolutionary thinking has had on anthropology and archaeology. The focus is on four major "schools" in evolutionist thought: the classical evolutionism of the 19th century, Neo-evolutionism, social biology (sociobiology) and Neo-Darwinian archaeology. The basic conclusion of this text is that the idea of socio-cultural evolution, understood in the broadest sense, has left a lasting impression on anthropological and archeological theory, and that it still represents a useful theoretical framework for new research.

Key words: socio-cultural evolution, Darwinism, sociobiology, Neo-Darwinian archaeology, anthropological theory, archeological theory

The quandary of whether all has remained unchanged through time (the Earth, plants, animals, people, habitats, ways of life, etc.) or whether it has been changing, is almost as old as mankind. The duality in explaining natural and social phenomena, on the one hand as mutable; prone to change over time and development, or on the other hand as eternal and fixed (unchangeable), has characterized European scientific thought for centuries, and has been reflected through different synchronic and diachronic interpretative and scientific models of the world and nature. Darwin's theory of evolution, as a distinctively diachronic, dynamic model which views and explains phenomena through the lens of time, had , quite reasonably, a decisive influence on prehistoric archaeology, a young science which had – as well as anthropology – developed and distinguished itself throughout the 19th century as an independent scientific discipline (Ruse 2006). The concept of evolution, and predominantly Darwin's works, have had a crucial influence on archeological interpretation. The relationship between archeological interpretative paradigms and evolutionism is very complex and polysemic, and so this paper will only provide basic outlines of those intertwined connections, starting from the idea of unilineal evolution, which was naively believed to be the key to understanding the universal past, then considering the cultural-historic denial of

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general cultural evolution; moving on to theories in which culture is understood as an adaptation in the paradigm of processual archaeology, and finally presenting the most recent Darwinist archaeology.

Naturally, even before Darwin, the idea of progress, enlivened in Europe during the Enlightenment, had significantly influenced various disciplines including archaeology (Peri 2000: 24-27; Sharer and Ashmore 1979: 51). No matter how odd it may sound, biology was among the last domains in which the theory of evolution was accepted. The Kant-Laplace theory of the origin of the Earth, which is essentially evolutionistic, had already been dominant in astronomy. Already at the end of the 18th century, there was a classification in social sciences, between savagery, barbarianism and civilization. For Herbert Spencer, a philosopher and social positivist – who had indeed written after Darwin – society was similar to a living organism which develops from a simple to a complex and specialized, diversified state, in a gradual manner with no sudden leaps. In ethnology, as well, at the beginning of the 19th century, the dominant idea was that of consecutive stages of human development (savagery, cattle breeding, agriculture and civilization). German ethnologist J. J. Bachofen, engaged in examining the gender structure of society classified. primitive societies in stages of promiscuity, matriarchy and patriarchy in 1861. In linguistics the theory of primitive language (*Ursprache*) was being considered as the base language out of which all other languages were supposedly formed through evolution. Some of these evolutionistic ideas were predecessors of Darwins' ideas, while others appeared more or less at the same time, or shortly after Darwin's discovery, and they were mostly inspired by the evolution of the living world (Malina and Vašíček 1990: 41-46).

However, geological studies had the highest influence on the very shaping of Darwin's theory, as well as the development of archaeology, since they contributed to establishing a much greater time perspective. Namely, geology had finally "leaped over the boundary", removing the Biblical dogma concerning the age of the Earth of several thousand years and extended the temporal depth of the past. The archeological findings actually showed that something was wrong with the accepted Biblical chronology. Both Mercati in the 16th and Dugdale in the 17th century had emphasized that tools made of rock were the work of the ancient people, but it was not known from how far back in history. However, it was significant that such tools were occasionally found along with the bones of unknown, extinct animals. Thinking about the geological past of the Earth went in two directions, which had created their expression in the theories of catastrophism and uniformitarianism. While the diluvialists thought that fossils were the remains of animals that lived on earth before the Biblical flood, and that the Biblical chronology is exact and indisputable, the catastrophists believed that the Earth's past is extended and that there were more successive catastrophes which had completely destroyed life

on earth. Scottish geologists J. Hatton and C. Lyell had severely criticized the ideas of catastrophism. Hatton pointed towards gradual geological processes, which can be observed even today in, for example, river valleys and canyons, and that those natural forces and activities which form the geological structures are gradual and incessant (Feder 2000: 16-19). Charles Lyell had published his famous three-volume book *Principles of Geology* in 1830-1833, which had marked a turning point in geology. As a true example of uniformitarianism, Lyell thought that geological structures are the result of gradual changes, such as erosion, forming of deposits, etc.; processes that we can witness in present. It is not accidental that on his important voyage around the world on the ship called "The Beagle" in 1831, Charles Darwin brought with him Lyell's *Principles of Geology*.

The theory of evolution by Charles Darwin had made an indelible mark not only on contemporary scientific thought, but on the overall man's identity and his self-consciousness as well (Darwin's book *On the Origin of Species* was published in 1859). On the one hand, the theory of evolution had, after initial opposition, become a mighty metaphor through which the European middle class perceived the world and the society of liberal capitalism, where competition developed freely and the rule "survival of the fittest" was applied (Ruse 2005: 103-129; Gosden 1999: 27). On the other hand, the actual idea of progress, as well as the obvious unequal development of human communities, had a crucial impact on 20th century archaeology.

Edward Burnett Tylor, an English anthropologist, had tried to make a unique system of cultural development (unilineal evolution), based on the set of all known cultures and numerous cultural similarities and differences all around the world. Tylor thought that all cultures, present and past, had to be studied as a part of a unique history of human thought. He wrote that the past is necessary in order to explain the present, and a whole in order to explain a part. Tylor's most significant work is *Primitive Culture*, for which he was accepted as a member of the Royal Society in 1871, before the age of 40 (Tylor 1920). In that work Tylor had tried to reconstruct the history of entire human culture and encountered an obvious problem: how to reconstruct the earliest stages of human development for which there are no written sources. The problem Tylor faced is actual even today, despite the numerous archeological discoveries, it is the problem which still stands right at the heart of archaeological interpretation. That problem, is enclosed in the question asked many years later by the young Lewis Binford: " How can we dig out the social system?" (Binford 1962). In Tylor's time, archaeological finds were rudimentary, and he did not rely much on them. On the contrary, it seemed to him that there was a much better way to reconstruct the earliest stages of human culture, which he had based on the principles of uniformity and cultural remains (survivals). The principle of uniformity was already well-known from Hat-

ton's and Lyell's work in geology. Since progress, as it was thought, was a natural process, the stages of culture could be followed from the simple stages of primitive savagery to the more complex and advanced, and finally to civilization, whether concerning aspects of technology, gender, beliefs or morals (Pluciennik 2005: 39-51).

Archaeological science gave insight into the oldest stages. The most primitive societies, which illustrated those stages, survived on the margin of the world, doomed to destruction, since civilization is an inexorable process, to which they could not adapt, being biologically and culturally backward (Finley 1983: 11-66). The influence of Darwin's theory of evolution was particularly felt in Paleolithic archaeology, which was close to geology, by its nature and the subject of studies. Lubbock divided the Stone Age into Paleolithic or the Old Stone Age and Neolithic or the New Stone Age. In his classification he relied on the works of the French geologists who had hinted on the chronological difference between the chipped and polished stone tools. Lubbock had thus, actually expanded the three-age classification into a four-degree one (Daniel 1976: 85-86). In France Edouard Lartet had divided the Paleolithic into four periods. Gabriel de Mortillet developed his scheme further, who had also, similar to the geologists, named certain Paleolithic epochs according to their characteristic sites (Chellean, Mousterian, Aurignacian, Solutrean, Magdalenian, etc.). Mortillet and Lubbock were staunch supporters of unilineal evolution. Mortillet envisaged the Paleolithic period as the transitional period between biological evolution as documented by the geological and paleontological evidence and human cultural progress which could be established based on archaeological traces; constituting a unique process of change in one continuous line (Trigger 1989: 94-99). In general, archaeologists who supported unilinear cultural evolution believed that the entire interpretation of the past could be based on ethnographic studies of "primitive" peoples, who were in some way "hindered in their development" and whose way of life was a "living fossil" which reflected the early stages in human development.

Darwin considered that, due to the insufficient amount of paleontological evidence, the primitive human groups are a good example of transitional stages between higher primates and contemporary European man (Gould 2003: 420-422). Darwin's fellow scientist Thomas Huxley tressed the similarities of the Neanderthal skull with the one of the Australian Aborigines. Darwin's neighbor and follower, John Lubbock, later Lord Avebury, an archaeologist and anthropologist and the author of the famous work *Pre-historic times, as illustrated by ancient remains, and the manners and customs of modern savages* (1865), not only believed that "primitive" men were biologically inferior, but that he thought the same about the poorer, lower classes of European society as well. He wrote that human groups and races had become biologically and culturally different as a result of natural selection, and that these differences were their

limiting factor. Social Darwinists of the 19th century protected the values of both the middle and upper classes in European society, through the theory of unilineal cultural evolution (Trigger 1998: 63-77; Pluciennik 2005: 48-52). In the context of Spencer's, Lubbock's and other socio Darwinist works, not all human groups were thought to be able to contribute to progress. Not even the Paleolithic drawings in Europe matched into the established socio cultural scheme, since they were too sophisticated and artistic for the supposed primitive culture of the Paleolithic period, which had just estranged itself from an animalistic nature. Don Marcelino de Sautuola, a Spanish nobleman, responsible for the discovery of the outstanding cave paintings in Altamira, had been declared a charlatan and falsifier at the pre-historian's congress in Lisbon in 1879, because it was thought that prehistoric man could not have produced such paintings (Wendt 1961: 255-259; Williams 2004). The paintings were first incorrectly dated to later epochs, and when, based on the archaeological context, they were understood as the works of Paleolithic men, they were then attributed with the primitive function of "hunter's magic" and totemism, which corresponds to "primitive stages of religion" (Trigger 1998: 74).

The famous English archaeologist (and a retired general), Augustus Pitt-Rivers, was one of the most distinguished archaeological Darwinists. He was responsible for the development of the methodology of archaeological excavations, and he dealt with typological studies as well. Furthermore he was the first to use the term "typology". His typological scheme relied on Darwinism and the paradigm of biological evolution. So, for example, he considered the evolution of types of Australian weapons (boomerang, shield, mace, etc) from a simple stick. However, this extremely evolutionistic typological idea did not hold for long since it was not based on the functional analysis of artifacts – namely, a stick is not a boomerang, nor is a shield a stick (Grin 2003: 29). He arranged his impressive ethnographic and archaeological collection around a quite unique principle. Rather than being guided by chronology, or by the geographic origin of the artifacts, but instead by the degree of their "evolutionary development"; from the simplest to the intricate in his opinion, the collection reflected the evolutionary history of humankind. This collection was the perfect example of the concept of unilineal evolution. It was annexed to the University of Oxford, and after Pitt-Rivers, the position of manager went to Edward Tylor, as the first professor of anthropology. The collection served as the obvious means (tool) in teaching and as a base for Tylor's lectures (Gosden 1999: 25-31).

It is usually thought that the archaeological three-age classification of the prehistoric period (the Stone Age, the Bronze Age and the Iron Age) came as a consequence of Darwin's theory. This is not entirely true. Back in the 18th century Montfaucon spoke of the three-degree (stage) development of humankind, as well as Condorcet in the 18th century, whose first three stages of human development referred to prehistory (Malina and Vašíček 1990: 30). However,

the first connection between artefacts, their classification and their relative chronology, was seen by Christian Jirgensen Thomsen. His collaborator and heir Jens Worsaae believed in the idea of progress, which was reflected in their chronological system of a gradual technological development, from stone, through bronze to iron. They did not take over Darwin's ideas about evolution (which, after all, they chronologically forerun), but their "evolutionary" theory was based on the general ideas of enlightenment, as well as on the detailed archaeological work and classification of the archaeological material, which was, among other things, founded on biological taxonomy, developed by Line, back in the 18th century. It is believed that Tomsen's catalogue and Worsaae's book *The Primeval Antiquities* (1849) are the most significant works of archaeology in the first half of the 19th century, and that what they represent for archaeology is analogous to what Lyell's "Principles" represent for geology (Trigger 1989: 80-86; Daniel 1976: 42; Pluciennik 2005: 48-52).

However, it was another Scandinavian who thoroughly elaborated Thomsen's and Worsaae's model, thus definitively establishing archaeological typology: Oscar Montelius, a Swedish archaeologist. Montelius had based his typological system on the tradition of the Scandinavian school of archaeology, as well as on the bases of Darwin's evolutionary scheme, which he applied to the archaeological material. Although there are opinions that Darwin's influence was negligible and that Montelius's typological system is exclusively the spiritual child of Scandinavian archaeology (Trigger 1989:157), the words of Montelius's student Åberg are quite unequivocal that "the typological method is the direct use of Darwinism on the hand-made human products" (Malina and Vašíček 1990: 47). The artifacts in Montelius's system are seen as they evolve, from simple to complex, as do the living organisms in Darwin's evolutionary scheme (Malina and Vašíček 1990: 47). He started from the simplest functional form as the basic "prototype" which develops into several series of artifacts, that is, into "genetically" similar groups of objects. For example, he followed the development of an axe from a stone axe, to the iron axes which had kept the features of the stone prototypes. Indeed, Pitt-Rivers had written exactly about the development of the axe back in 1875, emphasizing that – as well as in biological evolution – many traces of the earlier functional attributes of an object, remained in the later, more developed types as a redundancy, or were turned into mere decoration (Grin 2003: 194-195). Oscar Montelius, however, was a predecessor of the culture-historical paradigm in archaeology as well, which in many respects represented the interpretative break-up of archaeology and with Darwinian evolutionary ideas (Trigger 1989: 155-161). Nevertheless, it is interesting that the New Darwinian archaeology, in a new key, repeats, up to a certain degree, Montelius's idea of "artifact evolution", as well as some of the basic assumptions of the normative cultural particularism typical of culture-historical archaeology.

At the beginning of the 20th century, the ideas of anthropology's evolutionists regarding a unique cultural development of humanity and its stages (degree) were subjected to severe criticism. Furthermore the very idea of evolution as a natural process, present and crucial in human societies, was fully rejected in the works of influential anthropologists such as Franc Boas in America, or William Rivers in the Britain. The idea of cultures as separate, complete, functional wholes, pervaded with unique spirit, as well as of the superiority of cultural elements over the biological ones (*nature vs. nurture*), influenced Boas' anthropology to a great extent, as well as the cultural-particularistic school and the diffusionistic teachings and the cultural-historical archaeology on both sides of the Atlantic. Instead of seeing the dynamic development of an entire humankind, as was characteristic of unilineal evolutionary theory; individual cultures were being studied and observed as static sets (clusters) of characteristic shapes and manifestations. The focus was transferred from general and universal development to the description of individual and local. The similarities and common denominators were no longer examined, but mutual differences of cultures and human societies. It was believed that progress was not a natural, biological tendency, but on the contrary that natural characteristics of cultures were static and constant (permanent) (Trigger 1998: 95-108; Pluciennik 2005: 61-67) .

The concept of *archaeological culture* was founded in good part as a reaction to the theory of unilineal evolution, but the notion of culture itself was not much different to Taylor's model – it was only significantly narrowed. By the end of the 19th century, growing national consciousnesses and obsessions with the concepts of peoples, nations and the nation-state were reflected in archaeological interpretation as well. The holistic model of culture, as constructed by the evolutionists, was narrowed down to smaller geographically defined wholes, within which there existed certain characteristic forms of archaeological remains. Archaeological culture could be clearly isolated. It was the key archaeological concept (archaeological culture), around which revolved entire archaeological interpretations and theory for more than one hundred years (Johnson 1999: 15-20; Olsen 2002: 29-43). Gordon Childe, the central figure of culture-historical archaeology, realized himself the limitations of the rigidly understood culture-historical method and so he, particularly in his later work, included in his studies of cultures both the functionalistic and evolutionary views. He acknowledged the dependency of culture on the factors of natural environment (geographic, climatic, local resources, food, etc.). Under the influence of Marxism, especially in his later works, he accepted the idea of the evaluative development of culture and the dynamic dialectic conflict of the conservative and progressive tendencies in a society, as well as the relationship of productive forces and relations of production. Under the influence of Morgan and Engels, he classified the Paleolithic cultures as *savagery*, Neolithic as *barbarism,* and

the urban centers of the Middle East as *civilization*, although he believed in multilinear and not unilinear evolution (Trigger 1989: 167-174; McNairn 1980; Olsen 2002: 29-43). His followers in England, like Graham Clark, turned to questions of inner evolution and functioning of culture as a system in a similar fashion (Olsen 2002: 39-43).

In the United States of America, archaeology was developing along with anthropology, even as a basic part of anthropology, which is a consequence of a specific historical situation. Boas' anthropological ideas and assumptions in American archaeology were developed by Alfred Kidder, who built the culture-historical synthesis of Indian cultures in America, similar to Childe's synthesis of European prehistory. Kidder had, as well, improved the excavation techniques, stratigraphic method and chronology. Regarding interpretation, he was a consistent member of the normative, culture-historical school, which was based on typological and chronological analysis and an attentive description of the materials (Lyman et al. 1997; O'Brien and Lyman 1999). His preoccupation with the typological analysis of archaeological material led to the creation of a separate typological course in American archaeology, the "Taxonomy school" whose main representative was Irwin Rouse. Rouse emphasized that the classifications and typologies must be conducted with a predetermined aim and that the historical-chronological types can be interpreted as an expression of norms (standards). He also showed how the popularity of those norms (standards) vary, being replaced by others, or dying out (Willey and Phillips 2001: 30-34, 44-45; Lyman et al. 1997: 105; O'Brien and Lyman 1999). However paradoxical it may sound, Kidder's and Rouse's neat typological studies, and particularly the seriation technique, actually became a firm ground of contemporary Neo-Darwinian archaeology in the 20th century (Shenan 2002: 70-72)

During the 1960s, the theoretical turn to the "new", i.e., processual archaeology, had again brought archaeology and the evolutionistic paradigm closer. At its base New archaeology was founded on logical positivism, a hypothetic-deductive method and a very accurate quantification and analysis of archaeological material. Nomothetic and hypothetic-deductive methods implied searching for general, universal laws and understanding essential cultural processes, regardless of the chronological, geographical or "cultural" affiliation, which meant that a singular, more or less universal, cultural development existed. This implied a special return to the evolutionistic concept of culture. The American archaeologist, Lewis Binford had set up, in his articles "Archaeology as Anthropology" (1962) and "Archaeological systematics and the study of culture process" (1965), two basic postulates of new archaeology – "more anthropology" and "more science", which he later developed in a series of books and articles. (Binford 1962, 1965, 1984). The anthropological basis, necessary for its methodological revolution, that the new archaeology had found was in American neoevolutionistic anthropology, whose major representatives were

Leslie White and Julian Steward (White 1970; Steward 1981). Both of them rejected the principles of Boas' anthropology, which had influenced to a great extent cultural-historical anthropology, and particularly the idea that cultures are individual wholes, as well as that the task of anthropology was to determine their cultural history. Unlike White, who did not pay much attention to the influence of natural environment, Julian Steward believed that ecological conditions have a crucial impact on culture. According to his interpretation, the main characteristic of ecology is adaptation to the natural environment (surroundings). Animals obtain adaptation through their physical characteristics, and humans additionally through culture: "Man comes to the ecologic stage not as just one more organism who is connected to others by his physical characteristics. He brings the super-organic factor to culture as well" (Hach 1979: 156; Steward 1981: 34-52). Binford, as Leslie White's student, believed that there are patterns (regularities) in human behavior which can be scientifically determined, and he also – as did the majority of members of the new archaeology – accepted Stewards view of culture, as a human response to the challenge of the environment, that is as *adaptations.* Culture itself, Binford (similar to L.White) was perceived as a joint action of three subsystems: technology, social organization, and ideology, which mutually overlap and which determine overall human behavior (Binford 1962).

Processual archaeology, following the neoevolutionist anthropological tradition, had mainly rejected ideas about archaeological culture and cultural complexes as an expression of traditions and norms (standards), and it emphasized in the foreground that culture is an adaptation. Cultural change is reflected in various adaptations, not in cultural traditions, difusion of ideas or in migrations. David Clarke's attempts (Clarke being one of the pioneers of this new archaeology) to transform the culture-historical tradition, did not find fertile ground, and, in spite of the significance of his book *Analytical Archaeology* he remained on the fringe of the processual paradigm (Clarke 1968; Shennan 2002: 72). Moreover, Binford criticized Clarke for not breaking radically with the traditional archaeology, but kept the old normative (standardized) concept of culture (Binford 1972: 230; Malina and Vašíček 1990:126-127). Although it had inspired the evolutionary paradigm in archaeology with a new life, processual archaeology – directed at cultural generalities and to adaptation to different environments – did not clear the way for the more recent Darwinist archaeology, which directs itself towards cultural traditions within a population and their transmission.

Processual archaeology was shaken by post-processual archaeology in the 1980s, a powerful paradigm, which imposed itself, on the wings of postmodernism, as one of the main currents of the contemporary archaeological interpretation. Post-processual (or interpretative) archaeologists, in their general rejection of cultural generalizations and directedness towards individuals, as

basic social elements, did not even seriously consider the evolutionistic implications. Even more so because sociobiology, or evolutionary psychology, appeared, as a strong (even ideological) opposition to postmodernist interpretations in anthropology (Wilson 1980, 2003; Polšek 1997; Hrgović and Polšek 2004). In short, sociobiology is the study of the biological foundations of social behaviour in people and animals. Sociobiologists use information from etiology (the study of animal behavior), psychology and anthropology, but they primarily conduct research into social behavior with the help of modern theories of genetics and evolution. Sociobiology is based on the theory, according to which the central life process is the battle of genes for their own reproduction. This has caused severe criticism and disagreements, all of which point out that the explanations for the social behavior of animals cannot be applied to humans. On the other hand, social biologists accept that human behaviour is influenced by culture, as well as by the environment, but also that it cannot be understood whiteout considering the key biological, i.e., genetic factors (Caplan 1989).

Although social biologist's ideas opened up some new debates and research pathways in anthropology and other social sciences concerned with human behavior (Polšek 1997; Hrgović and Polšek 2004), they cannot easily be directly applied to archaeological interpretations. One of the reasons for this is the extensive degree of generality of socio biological research programmes, which are mainly directed at universal, mutual aspects in human behavior (sexual strategies, parenting, signals, cooperation, etc.) and which can hardly explain cultural diversity. The second reason, which is at the heart of great resistances to sociobiology, is that socio biological theories are mainly reductive, because they observe cultural phenomena from genetic and biological evolutionary points of view.

The strikingly rapid development of molecular genetics on the other hand opened up another current of research into the human past and thereby came into direct contact with archaeology. Knowledge about human genetic variations and possibilities to ascertain them in both chronological and spatial dimension with relative accuracy, encouraged geneticists to "interfere" with the job of archaeologists and prehistorians and to map out certain population histories of humankind (Cavali Sforca 2000; Sykes 2002, 2004; Jones 2002). Although it is still a matter for debate and there are disagreements between archaeologists and linguists (who criticize the geneticists' interpretations of cultural changes as reductive, simplified and, somewhat naive) it is beyond doubt that in the future, molecular genetics will be one of the most important archaeological instruments for uncovering humanity's past (Shennan 2002).

Darwinist archaeology, on the contrary, is more narrowly directed at the study of the history of cultural traditions, which are visible in archaeological records, and so it is a kind of renewal of cultural history. However, while the old culture-historical approach had more or less made archaeological culture

equal to its ethnic "carriers", the new Darwinist archaeology shows that the "cultural packages" of information can have different dimensions, so that within one population different cultural practices can be recorded, or different types of artifacts, which can have completely different cultural histories. Some of these cultural traditions could have been passed on together, others separately, and they can be the result of quite different pressures of cultural selection (Shenan 2005: 61-62). Nevertheless, cultural selection is not opposed to natural selection. Rather, culture itself is the subject of natural selection, i.e., and even a part of biology. Naturally, in many aspects cultural adaptation is more rapid than natural or biological selection, because among other things it implies the selection and overtaking of collective knowledge and traditions, i.e. information. Such cumulative cultural evolution, of course, is not possible on the level of an individual adaptation to an environment, but on the levels of interaction of a bigger population with an environment, as well as the interaction of individuals within the population, over time (Richerson and Boyd 2005: 9-15).

It can be observed from the discussion so far that socio-cultural evolution and theories about socio-cultural evolution, as they are outlined in anthropology and archaeology, are similar to Darwinist views of evolution only superficially. Although the same term – evolution – is used, the structure of Darwinist theory, which explains the change in life forms as a consequence of modified heredity, is completely different to the structure and content of almost all theories, which can be labeled as evolutionistic in anthropological sense. In other words, socio-cultural evolutionism does not represent the "use (application)" of Darwinian principles of explanation to anthropological phenomena. On the contrary, it has been noticed that socio-cultural evolutionism resembles Lamarck s ideas to a greater extent than Darwin's (Cullen 2000; Dunnell 1980). For example, according to most evolutionary schemes, cultures directly adapt to changes to the natural and social environment, and those changes are further passed on through time. In other words, adaptation characteristics of culture are gained as a direct response to changes in the natural environment, and then those acquired characteristics are further passed on. However, this criticism was mitigated by Richard Dawkins, emphasizing that during cultural transmission what is directly passed on are not acquired characteristics, a product, genotype or phenotype, (which would be Lamarckian, but the information – the recipe, which is transformed during the transfer, as some word in the game of "Chinese whispers", or in food recipes, which housewives always change a bit (Dawkins 2004: 144-145).

The possibility for culture and cultural change to be observed from the viewpoint of a Neo-Darwinian theory of evolution; without attempting to necessarily reduce them to a genetic base, was presented most impressively by Richard Dawkins in his book *The Selfish Gene* (Dawkins 1976). Dawkins had in mind the generalization of the theory of evolution, in the sense that it can be applied to all the phenomena which at their base have a mechanism of replica-

tion and information transfer. More concretely, Dawkins presented the idea that the phenomena which make up culture (e.g. certain patterns of behavior, myths, rituals, fashion, styles of making and decorating ceramics,...), can be studied from the viewpoint of the theory of evolution, i.e. as models which explain why some cultural attribute is spreading, how it is spreading or why it disappears. He even assumed the existence of a new kind of replicator – *memes* – units of cultural transmission which are analogous to genes. Memes, of course, should be understood only conditionally as an analogy to genes. They are not physical manifestations, but rather "made of (composed)" information which can be transferred by any physical medium. While genes are only written in amino acids, for their existence memes depend on the medium which transfers them by different means, in writing, orally, as a picture, electronically, digitally and by various other "conveyors" (bearers), as a cultural recipe (Dawkins 2004: 137-172; Dennett 2003: 170-181). The analogy with food recipes is not accidental. Daniel Dennett says that for the survival of a meme (for example a recipe for cookies), what matters is its success. Success in what? Well, in replication. For a tasteless cookie no one will ask for the recipe, nor copy it (Dennett 2003: 176-177).

Although the existence of memes is dubious, the idea that culture could be studied in the theoretical framework of Neo-Darwinian theory was taken very seriously. The book entitled *Culture and the Evolutionary Process* (Boyd and Richerson 1985) represents a turning point in a theoretical study which explicitly shows in which ways cultural phenomena can be observed through models derived from Neo-Darwinian theory. Boyd and Richerson did not enter into debate about the existence or non-existence of memes, stressing that the models can be applied even in the absence of one discrete class of replicators, as well as that the scientific research of cultural phenomena with the help of evolutionistic models is possible even without knowing the exact mechanism and the unit of replication; just like genetics was quite possible even before the discovery of DNA molecules.

Appeals for the application of the Neo-Darwinian theory of evolution in archaeology appeared back at the beginning of 1980s (Dunnel 1980), but the first serious studies appeared somewhat later (Lyman and O'Brien 1998; Neiman 1995; O'Brien and Lyman 2000; Shennan 2000; Shennan and Wilkinson 2001).

As is already known, genetics acquired its high scientific sophistication owing to the fact that its theory and models are expressed in a mathematical form. It turned out that many of the mathematical models developed within genetics and the biological theory of evolution are relevant for the studying of cultural phenomena (Boyd and Richerson 1985). At the same time, the complexity of the mathematical apparatus sets high demands before researchers who wish to deal with culture in this way. The general statements about Neo-Darwinian theory and this method of studying culture often contribute more to mystification of this theoretic school, rather than to clarity about its ideas.

Therefore it is necessary to illustrate in a clear example in which way it is possible to apply evolutionistic models to cultural phenomena.

Ironically, one of the most impressive examples of the relevancy of Neo-Darwinian theory for cultural phenomena refers to the *popularity principle* which had a very important role in culture-historical archaeology and anthropology (Lyman et al. 1997). The principle of popularity refers to an observed manifestation that certain cultural elements like fashion or decoration styles in ceramics, act in a certain regular manner from a diachronical perspective. For example, a certain model of shoes may be small in number right after it first appears, whilst their relative frequency (with reference to other types of shoe) increases as time goes by, reaching the peak popularity and then slowly going "out of fashion" (Picture 1). The distribution of frequencies of that certain type, as observed through time, has the shape of a normal distribution. The principle of popularity represents a basic assumption behind which archaeological seriation may be used as a method of relative dating (Lyman et al. 1997; O'Brien and Lyman 1999). If, for example, different single-layer sites are aligned in such an order (sequence) such that the types of ceramics are subjected to the trend of gradual appearance, reaching their peak and subsequently declining in number until they disappear completely, as observed along the sequence, then the resulting order (sequence) can be interpreted as a relative-chronological sequence.

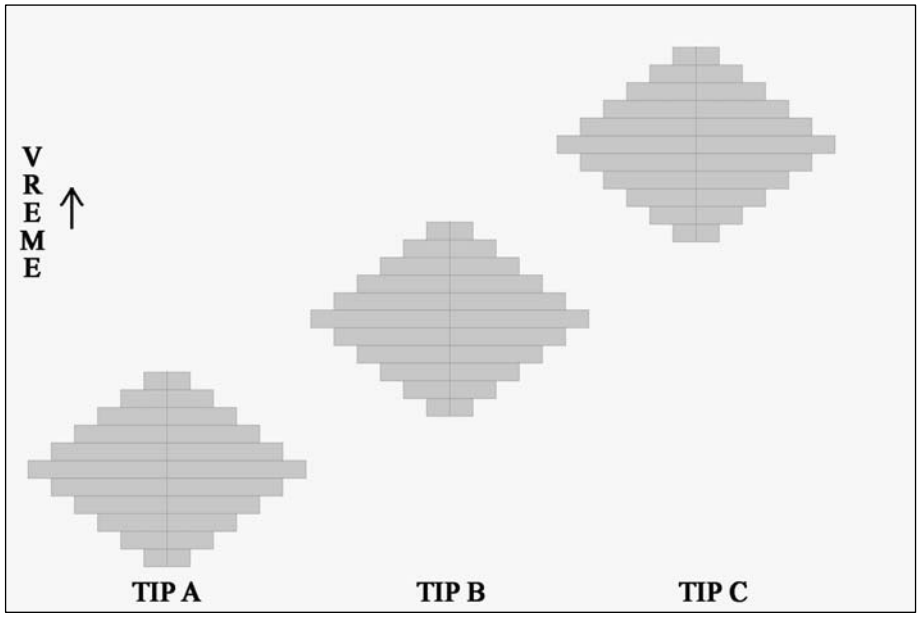

Figure 1: Graphic illustration of the principle of popularity. The horizontal rectangles represent frequency or relative frequency of types in a single time interval.

However, even though the principle of popularity can be empirically verified by an independent set of controls, such as studying the multi-layered sites, the theoretical explanation for these phenomena remains absent. A common sense explanation prevailed – that it is simply the principle of popularity. A. Kroeber, a pioneer in the method of frequency seriation (Lyman et al. 1997; O'Brien and Lyman 1999), dedicated his attention to the studying of the principle of popularity in an anthropological framework. His study about the changes of attributes of female dresses represented another empirical verification of the principle of popularity, although Kroeber went even further in making a specific speculation about the constant alternation of the periods of growth and decline of certain cultural phenomena (from fashion to social systems) as a consequence of slightly mystified forces of culture, which is a standpoint that is in some aspects similar to the ideas of cyclic historic processes (Kroeber 1919).

Although the principle of popularity proved to be a very useful assumption when it came to seriation as a method, the mechanism behind it was not known. However, the principle of popularity can be fully theoretically explained if it is seen through the prism of Neo-Darwinian archaeology.

Frazer Neiman's work represents one of the key theoretical and empirical studies in the Neo-Darwinian vein (Neiman 1995). Neiman had managed to demonstrate how the principle of popularity can be explained by drift, as a model from the theory of evolution. Drift represents the consequences of mistakes in copying errors, which unavoidably occur in cultural transmission within finite populations (Neiman 1995).

The simplest model assumes that each of the N individuals, who make up some finite population, carries one of the existing k variants of an attribute (e.g. ornaments in ceramics), which are uniformly distributed in the population (all variants are in equal proportion). In each time period every individual keeps the variant they already possess or copies a variant from any other member of the population by random selection, with probabilities 1/N and (N-1)/N, respectively. The expected frequency of a certain variant in the next time interval is equal to the frequency in the current interval, but the empiric frequency in the next interval is never equal to the expected one, because owing to stochastic processes some individuals get to be a model more times than some of the others. This process is cumulative, so that from generation to generation the frequency of some variants decreases, whilst the frequency of other variants increases, because with each successive growth in number of one variant the probability that it (that variant) will be copied rises. Following a period of time, we reach a fixation of one of the variants. All other variants disappear, as a result of mere coincidence, which Neiman illustrated well by computer simulation, where the basic algorithm was based on the already mentioned probabilities of the copying of variants in each new generation (Neiman 1995: Figure 1). However, the reader will notice that this is never the case in archaeology; there

never remains *one* type of ceramics, but new types appear all the time, which gradually become popular, reach their peak and slowly disappear.

This inconsistency stems from the simplification of the previous model. Namely, in the previous model the possibility of innovation was excluded, i.e., that an individual rejects the socially taught variant and "produces" a new one. Neiman makes the previous model more complex by introducing the possibility that an individual rejects its socially taught variant and "invents" a new one with probability "μ". A model made more complex like this, when put into effect through a computer simulation, gives the empirical result which is identical to the principle of popularity. The frequency of different variants increases, reaches its maximum and then decreases, whist new variants keep on appearing and going through the aforementioned cycle of rising and disappearing (Neiman 1995: Figure 2). The characteristic shape (form) of the "battle ship curve" is obtained when this alternation is represented in a horizontal histogram, the form being identical to the one expected in the ideal case of seriation (Marquardt 1978).

Thus, the principle of popularity is a predictable consequence of the drift model, which along with selection represents one of the main evolutionary forces (powers). The drift process operates on adaptively neutral attributes (as are often style attributes). In light of this it is expected that style attributes of material culture act diachronically in accordance with the principle of popularity, which actually stands for the consequence of drift's performance.

Yet it does not end here, because explicit mathematical modeling of cultural processes offers the possibility of application in response to anthropologically relevant questions. Based on what we have discussed regarding the nature of the process of copying cultural variants, it is possible to derive a measure of homogeneity or diversity of variants within the observed population. If homogeneity is defined as a probability to choose two individuals which carry a variant (which is a copy of the same model), then it is possible to derive a recursive function which expresses the homogeneity at the given moment as the function of homogeneity in the previous interval t-1 and the probability that the innovation will not occur (Neiman 1995: 14, equation 2):

$Ft = [1/N + (1 – 1/N) * Ft\text{-}1] * (1 – \mu)^2$

Ft – current homogeneity

Ft-1 – homogeneity at the previous moment

N – population size

μ – probability for the appearance of a new variant

The equation has this form because three probabilities are combined. Thus, if two individuals are chosen that carry the same variant, then that means: a) either they have been "taught" it from the same model in the previous iteration, for what the probability is 1/N, b) or they have been taught it from different models in the previous iteration (probability1 – 1/N), but the model of

one of the individuals was the same as the model of the other individual back in the earlier iteration (t-2) for which the total probability equals 1 – 1/N * Ft-1. Multiplication by the term $(1 - \mu)^2$ is necessary, because this term represents the simultaneous probability that neither of the individuals came up with the new variant.

After a certain number of iterations, homogeneity will reach equilibrium, i.e., a stable value. Equilibrium of homogeneity is defined as the value of homogeneity which is equal with the homogeneity from the previous iteration, i.e. when Ft = Ft-1. If the previous equation is modified in this way, with the assumption that μ has a small value, then the next equation is the result, and it gives an equilibrium value of homogeneity. (Neiman 1995: 14, equation 4):

$Fh \approx 1/(2N\mu + 1)$

The homogeneity can be evaluated empirically as well from a sample (without knowing the real values of N and μ) through the following formula (Neiman 1995: 14, equation 5):

$Fh = \sum p^2 i$

i – goes from 1 to k, where k is the number of the existing variants

p – relative frequency of the variant in the sample

The principle behind this formula is simple: the probability for us to choose twice a certain variant is equal to p^2, and the probability to chose twice any of the variants equals the sum of cubes of relative frequencies of all variants.

Things can be seen from a different aspect if homogeneity is replaced by diversity. In this case diversity is nothing but the reciprocal value of homogeneity:

$Dh = 2N\mu + 1$

The diversity of a certain collection of variants can be determined empirically as well (Neiman 1995: 14, equation 7):

$Dh = 1/\sum p^2 i - 1$

This theory states that the diversity of variants will increase when the size of the population (N) grows and/or when the rate of innovation (μ) increases. Neiman further explains how the innovation rate can be seen as the sum of two components $\mu = v + m$, where *v* is the rate of *in situ* innovation, i.e., the probability that an individual will introduce a new variant within its group, while *m* is the probability that the new variant gets "imported" from a different population. If the assumption is that the rate of *in situ* variation is approximately constant for all groups, then the variation in diversity of collection is in correlation with the absolute number of individuals that are "taught" their cultural variants by members of other groups. In other words, by measuring the diversity of the collection, the degree of inter-group cultural transmission is measured directly. Neiman in his case study applies these theoretical results by using a very complex methodology. Even though here the technical details have been generally left out, the reader can appreciate the mathematical demands of the Neo-

Darwinian approach even from this highly simplified example of researching probabilities within Neo-Darwinian archaeology.

Shennan and Wilkinson further elaborate on Neiman's theoretical results, but from another aspect, which allows them to model the expected diversity of the collection under the model of drift and to compare it with empirical diversity, the differences being interpreted in the light of aberration from the drift process and the action of some other factors (Shennan and Wilkinson 2001).

From the above, a conclusion can be drawn that archaeology indeed began to apply Darwinian theory of evolution rather late in its history. It is interesting that many insights within culture-historical archaeology were executed following the Darwinian approach, but culture-historical archaeology never fully went in that direction due to its essentialist interpretation of archaeological cultures in ethnic terms and common sense explanations for phenomena such as the principle of popularity (Lyman et al. 1997). Neo-Darwinism represents another family of evolutionistic ideas that manifest a strong impact on archaeology. Whether that impact will be as strong and productive as was the impact of the classical evolutionism of the 19th century and neoevolutionism of the 20th century (Trigger 1998) remains to be seen.

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Aleksandar Palavestra i Marko Porčić

Arheologija, evolucionizam i darvinizam

U ovom radu predstavljen je kratak istorijat uticaja evolucionističkih ideja na antropologiju i arheologiju. U fokusu su četiri najznačanije "škole" evolucionističke misli: klasični evolucionizam XIX veka, neoevolucionizam, sociobiologija i neodarvinistička arheolologija. Osnovni zaključak ovog teksta jeste da je ideja socio-kulturne evolucije, shvaćena u najširem smislu, ostavila neizbrisivi trag na antropološku i arheološku teoriju, kao i da još uvek predstavlja koristan teorijski okvir za nova istraživanja.

Ključne reči: socio-kulturna evolucija, darvinizam, sociobiologija, neodarvinistička arheologija, antropološka teorija, arheološka teorija

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Archéologie, évolutionnisme et darvinisme

Dans ce travail est présenté un bref historique de l'influence des idées évolutionnistes sur l'anthropologie et l'archéologie. Les idées de quatre "écoles" les plus importantes de la pensée évolutionniste sont ici analysées : celles de l'évolutionnisme classique du XIX siècle, du néo-évolutionnisme, de la sociobiologie et de l'archéologie néo-darviniste. La conclusion principale de ce texte est que l'idée de l'évolution socio-culturelle, comprise dans le sens le plus large, a laissé une marque indélébile sur la théorie anthropologique et archéologique, et qu'elle représente toujours un cadre théorique utile pour de nouvelles recherches.

Mots-clés: évolution socio-culturelle, darvinisme, sociobiologie, archéologie néo-darviniste, théorie anthropologique, théorie archéologique