

# Art as a biological adaptation, or: why modern humans replaced the Neanderthals

*Kunst als Anpassung, oder:  
Warum moderne Menschen die Neanderthaler ersetzen*

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**ABSTRACT** - Newer biological theories attribute important adaptive functions to human art and thus provide an important, so far mostly overlooked factor that may explain the survival of modern humans and the disappearance of the Neanderthals. The oldest known objects unambiguously identifiable as art were found in Central and Western Europe and date from around 36 000 years ago. According to all that we know, they were created solely by modern humans who had migrated from Africa to Europe just a few thousand years before. Thus art seems to be the only fundamentally new characteristic that the ancestors of today's humans possessed compared to earlier and other hominids (e.g. Neanderthals or *Homo erectus*) and that can be proven on the basis of archaeological finds. Although this historical reconstruction is widely accepted no causal connection is seen between the ability of modern humans to produce art and their stunning evolutionary success. How would a Darwinian explanation of art look like? Does it help to understand the origins of art and its enormous significance for individuals and social groups?

**ZUSAMMENFASSUNG** - Neuere biologische Theorien sprechen der Kunst wichtige adaptive Funktionen zu und stellen so einen möglicherweise entscheidenden, aber meist übersehenen Faktor bereit, der das Überleben der modernen Menschen und das Verschwinden der Neanderthaler erklären könnte. Die ältesten bekannten, eindeutig als Kunstwerke identifizierbaren Gegenstände wurden in Mittel- und Westeuropa gefunden und auf ein Alter von rund 36 000 Jahren datiert. Nach allem, was wir wissen, stammen sie ausschließlich von den wenige tausend Jahre zuvor aus Afrika nach Europa eingewanderten sogenannten modernen Menschen, während sich bei den Neanderthalern nur vereinzelte Andeutungen finden. Damit ist Kunst die einzige grundlegend neue, an archäologischen Funden ablesbare Eigenschaft, die die Vorfahren heutiger Menschen gegenüber früheren und anderen Menschenformen (z.B. Neanderthalern oder *Homo erectus*) auszeichnet. Obwohl diese historische Rekonstruktion weithin akzeptiert wird, wird kein kausaler Zusammenhang zwischen dieser Fähigkeit der modernen Menschen und ihrem erstaunlichen evolutionären Erfolg gesehen. Wie kann eine Darwinische Erklärung der Kunst aussehen? Kann sie helfen, die Ursprünge der Kunst und ihre enorme Bedeutung für Individuen und soziale Gruppen zu erklären?

**KEYWORDS** - art, behavioural modernity, Neanderthals, evolutionary psychology, superorganism  
*Kunst, Verhaltensmodernität, Neanderthaler, evolutionäre Psychologie, Superorganismus*

## Introduction

It is notoriously difficult to identify the causes for the disappearance of the Neanderthals around 30 000 to 25 000 years B.P. Two major explanations have been put forward: Climatic stress and the immigration of modern humans at the beginning of the Aurignacien (40 000 years B.P.). The two factors have been proposed as alternatives and in combination. Among those who emphasize the competitive aspects it remains controversial if the outcome of the encounter was due to chance events or to the advanced capabilities of modern humans (Stringer 2001; Klein 2003; Conard et al. 2005; Schrenk & Müller 2005; Bolus & Schmitz 2006; Finlayson 2009; Junker & Paul 2009).

To overcome the limitations of the sketchy empirical evidence I want to suggest a broader, comparative perspective. If the disappearance of the Neanderthals is not seen as an isolated, singular event, but as one of many similar instances occurring as a result of the evolutionary success of modern humans on all continents, the explanation can be based on broader and more reliable evidence.

Most experts agree that modern humans arose in Africa around 200 000 years B.P. and that they migrated to the other continents after 65 000 years B.P. And there is a clear statistical correlation between their arrival on the continents and subsequent mass extinctions of the megafauna (Barnosky et al. 2004). The extinctions were particularly severe when the arrival of modern humans occurred together with climatic changes, but they also took place when no climatic stress can be identified. If the Neanderthals,

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the descendants of *Homo erectus* in Asia and many species of large mammals shared the same fate and were driven into extinction after the arrival of modern humans it seems reasonable to assume that this general outcome was not due to chance but points to some kind of selective advantage. This also holds true if interbreeding and a modest amount of gene flow between Neanderthals and modern humans occurred. As recent genetic evidence suggests, the interbreeding seems to have taken place before 100 000 years ago and was rather limited. It is estimated that the Neanderthals have contributed only 1 to 4% of the genome of present-day (non-African) humans (Green et al. 2010; see also Templeton 2002). I.e. the evolutionary success (the genetic fitness) of the Neanderthals was comparatively small compared to that of modern humans.

What made modern humans so successful? Various possibilities have been suggested: Broader diet, better division of labour, more efficient use of energy, cognitive superiority („behavioural modernity“) and others. Behavioural modernity in turn is characterized by various special features: advanced cognition and language, symbolic thinking; complex technologies (blade and microlithic technology, bone tools); increased geographic range and long distance trade; specialized hunting and the use of aquatic resources; abstract and representational depiction; burials and grave goods; use of pigments, decoration, personal ornaments and finally art (Haidle 2000; Wadley 2001; Hauser et al. 2002; Klein & Edgar 2002; Conard 2006; Krause et al. 2007; Klein 2008; Froehle & Churchill 2009; Powell et al. 2009).

To sum up: There are good reasons to assume that modern humans replaced the Neanderthals because of their superior cognitive abilities. In this context art is consistently mentioned as one of the typical elements of behavioural modernity, but at the same time it is seen as a peripheral side effect and not as a causal factor for the evolutionary success of modern humans. In my paper I will argue that from a Darwinian perspective this neglect is not warranted and that art almost certainly has played a decisive role in human evolution. Art may well have been one of the single most important inventions of modern humans.

### When did art originate?

The oldest known objects unambiguously identifiable as art were found in Central and Western Europe and date from around 36 000 years ago. According to all that we know, they were created solely by modern humans who had migrated from Africa to Europe just a few thousand years before, whereas only scattered indications have been found for the Neanderthals who inhabited this land at the same time (Anati 1995; Appenzeller 1998; Lorblanchet 2000; Holdermann et al. 2001; Curtis 2006; Guthrie 2006; Pastoors & Weniger 2002; Floss & Rouquerol 2007; Conard

2009; *Eiszeit* 2009). Art is thus the only fundamentally new characteristic that the ancestors of today's humans possessed compared to earlier and other hominids (e.g. Neanderthals or *Homo erectus*) that can be proven on the basis of archaeological finds.

What does this seemingly sudden emergence of art mean? Are we seeing only the final step in a much older and more or less continuous development of art? Or was this the actual beginning, while earlier hominids – Neanderthals or *Homo erectus* – were essentially without art? The answers to these questions depend on how art is defined. Is a general striving for beauty or is symbolic thinking as such sufficient to constitute art? In this paper I will argue that a definition of art that comprehends more than aesthetics or symbolism should be adopted. Since the production of aesthetically refined objects is an important element of human artistic behaviour I will briefly review its historical origins.

If we consider the earliest discovered human artifacts (stone tools) from this perspective, we can see a clear break. It is indeed difficult to discover indications of an aesthetic sense in the oldest known stone tools (Oldowan), which were fabricated more than 2 million years ago. The Acheulean hand axes, up to 1.5 million years old, are another matter entirely. The fine workmanship, the symmetrical form and the material used make them truly beautiful artifacts. And there is clear evidence that coloured minerals have been used to paint bodies and objects for around 100 000 years (Bouzouggar et al. 2007; Balter 2009). Recently, perforated and pigment-stained marine shells have been described that stem from approximately 50 000 years old sites in Iberia that are associated with Neanderthals (Zilhão et al. 2010). If we look for a sense of aesthetics, the first examples were hand axes, perhaps also woodcarvings, body paintings and songs, of which we know nothing because they left no trace. These early aesthetic objects and body decorations are fascinating, but they are clearly different from the statuettes and cave paintings of modern humans. How can we distinguish the latter pieces of art from aesthetic objects of utility (e.g. tools) and individual adornments?

### What is art?

In general, a work of art is expected to meet four criteria:

- 1) A form that is attractive and demonstrates ingenuity.
- 2) The explicit rejection of immediate practical utility.
- 3) A (symbolic) meaning.
- 4) An element of fantasy.

Whether and how these features must come together to constitute a work of art is a highly controversial topic. Nevertheless there is a general consent that art is more than aesthetics and is sometimes even deliberately non-aesthetical. As we

shall see, it is indeed necessary to specify these criteria. However, as an expression of a widespread, traditional understanding of art, they can serve as an initial orientation and starting point for further discussion: Many people accept objects or behaviors as artistic only when they are aesthetic, have no direct practical utility but possess a recognizable meaning and go beyond the representation of material objects (HWP 1976; Davies 1991; Carroll 2000; Ullrich 2001; Junker in press b).

As a matter of fact the Neanderthals (and other early hominids) created aesthetically shaped tools and body decorations but apparently no objects with a (symbolic) meaning. That is, they did not produce art in our sense. It has been suggested that material from the 400 000-year-old site in Bilzingsleben shows signs of symbolic thinking insofar as three of the bones are systematically engraved with parallel lines (Steguweit 2003; Wagner et al. 2007). These findings are extremely interesting, but their singularity makes them hard to interpret and consequently I will not take them into account in the following argument. On the other hand, all human populations living today produce and appreciate art. Artistic capacity thus seems to have arisen only in the ancestors of modern humans *after* the divergence from the Neanderthals (around 600 000 years ago) but *before* the migration to the continents (around 65 000 years ago). On the basis of further paleontological and genetic considerations, it is possible to narrow the window for the emergence of art even further: it originated 200 000 to 100 000 years ago. But why?

### The Darwinian imperative

In 1859, Charles Darwin ventured a bold prophesy in the closing pages of his landmark work *On the origin of the species*: "Psychology will be based on a new foundation, that of the necessary acquirement of each mental power and capacity by gradation. Light will be thrown on the origin of man and his history" (Darwin 1859: 488). If the theory of evolution really does explain "each mental power and capacity" in humans and other animals, this should apply not only for such traits as intelligence, morality or language, but for art as well.

From a biological perspective not the various languages, moral codes or artistic forms, which vary in time and place are of interest, because they are based on personal experiences and the knowledge systematically imparted by a community (its 'culture'), but the fundamental ability to produce and appreciate works of art. It is assumed that the sense for art is a part of human nature and that basic aesthetic preferences are a biological, genetically inherent trait, which was 'acquired by gradation' during the course of evolution. For Darwin (and modern evolutionary biology), the most important causes driving evolutionary change are natural and sexual selection, i.e. random genetic

differences between individuals, their struggle for survival, sexual competition and the choice of mates.

This evolutionary scenario has two implications: First, there must have been a historical *beginning of art*. Second, the ability to create a work of art and to perceive it as such must have entailed *significant advantages for the individuals*. It is theoretically conceivable that art emerged as a byproduct of another important trait, and at first glance there seems little to suggest that art might confer a selective advantage (Pinker 1997: 535-36). A piece of jewellery, a mural, music, song or dance is designed to explicitly demonstrate that they have no immediate practical utility.

From the perspective of evolutionary biology, however, it is highly likely that this is a misapprehension. Interest in art and the ability to create art are complex mental processes that are only achievable on the basis of a highly developed brain anatomy and function. Chimpanzees or autistic children, for example, have only an extremely limited capacity in this regard because they lack the biological prerequisites (Morris 1962; Baron-Cohen 1999; Whiten 1999). When one considers the amounts of money spent on museums and works of art, on opera houses and theatres, the importance art can hold for the life of an individual, the fact that for many people a life without art is not worth living, then it is scarcely possible to deny that there is some kind of utility to art.

Charles Darwin's book *The descent of man, and selection in relation to sex* (1871) contains detailed examinations of questions that are of paramount, but indirect significance for the understanding of art. Over a span of 150 pages, Darwin discusses the various "mental powers" of human beings and compares them to the capabilities of other animals. He addresses emotions, curiosity, imitation, attention, memory, imagination, reason, the use of tools, abstraction, self-consciousness, language, the sense of beauty, the belief in god and spirits, superstition, and morality. Darwin was particularly fascinated by the origin and function of beauty as well as the relationship between language and song. Only one major topic is not touched on: art.

Thus, Darwin himself did not try to explain the general artistic capacity of humans. However, such an explanation ought to be possible, and so there have been, and continue to be, attempts to interpret art in Darwinian terms (Aiken 1998; Dissanayake 1992, 2008; Brown 2000; Miller 2000: 258-91; Tooby & Cosmides 2001; Menninghaus 2003; Voland & Grammer 2003; Boyd 2005; Spivey 2005; Eibl-Eibesfeldt & Sütterlin 2007; Sitte 2008; Junker & Paul 2009; Junker in press a). These attempts have not led to a consensus as yet. Controversy centres less on the question of whether the artistic capacity as such is a biological trait than on what caused it to emerge and what its concrete function is. Essentially, there are two conflicting models: on one side the attempt to explain

art through natural selection and attribute an important function for the *survival* or the *well-being* of individuals (and social groups) to it. The other approach conceives of art as a *signal* for the choosing a mate, and thus sees it as originating in sexual selection. As I will show in the following, these two explanatory models are not mutually exclusive: although the precursors of art originated as sexual signals, it was not until they acquired further community-promoting functions that proved useful within the context of natural selection that art as we know it emerged.

### Art: A demonstration of ingenuity and luxury

In his famous theory of natural selection, Darwin asserted that in the course of evolution, only those traits that promote survival will prevail in the long run. Thus, in principle only physical traits and behaviors should exist that are useful, i.e. promote survival and/or reproduction. And thus it was initially a mystery why some marked biological traits are not only useless but convey the impression that their whole purpose is to endanger the survival of the individuals or to waste scarce resources. The most famous examples are the long feathers of peacocks and birds of paradise, but other species also show comparable traits or behaviors.

Darwin explained these features through *sexual selection*, his term for the fact that animals must not only survive but find and woo mates (Darwin 1871, 1: 256; 2: 398). When sexual competition is decided by physical combat, genes that endow their bearers with traits as strength, agility and aggressiveness will be passed on. But what happens in the case of species in which one sex, generally, but not always the female, can choose its mate for reproduction? What traits do they prefer to ensure that their progeny will have an optimal genotype? They will initially look for direct indications of survival-promoting traits such as strength, intelligence or health and prefer corresponding mates. But they are confronted with the problem that the signals with which an individual advertises his qualities can be fraudulent.

Because signals without a cost are subject to abuse, those that are difficult to produce will consequently become more common. In other words, women will prefer men who *really* take risks, survive unhealthy behaviors or stage elaborate demonstrations. By the same token, men will prefer women who show traits that are difficult to produce – such as smooth skin, a symmetric physical form or full hair. To explain why not only survival-promoting traits such as health, strength, risk avoidance or energy efficiency of potential mates are perceived as attractive in sexual selection, but sometimes the very opposite, Amotz Zahavi proposed the *handicap principle* as a corollary

to Darwin's principle of sexual selection in the 1970s (Zahavi 1975). It explains why in selecting mates some features are preferred that are costly and risky – i.e. handicaps: because this serves as a guarantee for the honesty of the signal.

In humans a surprising number of wasteful and/or risky traits and behaviors can be observed that have no direct utility but serve to verify the authenticity of a quality signal. Danger for example is an essential element of a variety of sports. Humans perceive luxury and lavishness as pleasurable, create objects made of expensive, rare or hard-to-work materials or ornament objects even when this impairs or even negates their usefulness.

Darwin's theory of sexual selection, together with the handicap principle, thus explains the first two elements of art that relate to its form: ingenuity and luxury signal the genetic qualities of their maker or owner. Numerous observations of humans and other animals in support of this proposition have been described, and it has since become a generally accepted component of the theoretical structure of evolutionary biology. But what about the other two elements of art: its symbolic significance and its fantastic character? How can these be explained and why are they so closely bound to elaborateness and luxury in art?

### The extended phenotype

The genetic qualities of a potential mate can initially be deduced from all perceptible traits on the surface of the body, from hair, eyes, teeth, but also from the voice and the elegance or power expressed through movements. Furthermore, the striving for beauty comprises everything that can be associated with a person, i.e. objects such as tools, musical instruments, weapons, clothing and dwellings. These things too must not only be effective, but attractive as well. The reason is that the quality of a genotype is revealed not only in the physical traits of an organism, but also in how it shapes its environment. Scientists refer to this as the "extended phenotype" of an organism (Dawkins 1982).

In principle, the same biological principles apply for works of art as for other objects created by humans – as part of the extended phenotype, they permit conclusions about the genes of their fabricators. They do so in two respects, as they represent both the craftsmanship and creative skill of the artist as well as his or her life goals and feelings. According to the handicap theory, the fact that a work of art eschews immediate practical utility and instead aspires to be costly, lavish and luxurious is to be understood as evidence of the authenticity of the signal. To achieve this end, a work of art need not necessarily be beautiful; it can also demonstrate a different form of creative expenditure and be e.g. innovative, surprising or provocative. However, as some modern

works of art require little expense to make and are easily duplicated, it can be difficult to determine whether the signal in question is intended seriously, and many people are hesitant to recognize such signals as art. Here as well, inexpensive signals are subject to abuse, and thus in the long term only those that are difficult to produce, elaborate or costly will become common.

When a carpenter makes a beautiful table, an artist paints an interesting picture or a lawyer drafts an elegant legal document, these products are expressions of their creators' traits and thus of their genes. To a lesser extent, this also applies for the things one owns or with which one surrounds oneself. And even those objects in our environment for which our genes are only indirectly responsible are experienced as part of the extended phenotype. For example, when individuals are proud of the history and unique characteristics of their cities, when they, on the other side, feel embarrassed by its unattractive features, this means nothing less than that they perceive their neighbourhood as an expression of their own extended phenotype.

### Art: The language of emotions

In our discussion we have excluded one area so far even though it is just as important as physical traits – the character-related and mental features of humans and their thoughts. To the extent that other persons perceive them, they are subject to the same imperative of aesthetic working that we have described for the body and the things that surround it.

If necessary, we will accept an ugly tool or a cheaply made book if it fulfils its function or if its content is interesting. In another area, on the other hand, the lack of aesthetic working is harder to bear: the realm of fantasies, feelings and desires. Interestingly, humans have not been content merely to make these prettier, but have created special types of representations to give form to their feelings and fantasies in a particularly elaborate, beautiful and interesting manner, and to enjoy these in the community – for this is what art is.

What is the effect when one is confronted with the aesthetically worked feelings and fantasies of another person or another culture? If one does not share these, the response is rejection and disgust. But when one discovers one's own desires and feelings in a novel, a picture or an opera, the result is an intense feeling of pleasure, as the elaborate and skilled working also enhances the value of one's own feelings and thoughts. When an artist succeeds in aesthetically enhancing the value of his audience's often unconscious desires, he or she may be sure of its deepest gratitude and greatest adulation. The effect is greatly amplified when this experience takes place in a community, at a concert, in the theatre or at a public art exhibition.

Thus, art is not only a signal from the artist to his audience, but also serves as a medium of communication between the observers or listeners. We have thus arrived at the two elements of art not touched upon as yet: the (symbolic) meaning is an expression of the fact that it promotes the exchange of concepts within a social group. It is thus a sort of language. Unlike science, art does not claim to be an accurate representation of the real world, but instead depicts what could be, a world suspended between reality and desire. It is the language of emotions. But why is it necessary to embellish the communication about feelings and desires in such a costly manner, why does art exist?

The elaborate way in which art presents the imaginary world permits only one conclusion, namely that the communication about feelings and desires is extremely important, but also extremely liable to counterfeiting. Humans are by nature social animals and, like most primates, can only survive in a group. For social animals, the competition within the group for food, mates and social status becomes the primary selection factor, and the diverging interests necessarily generate conflicts, betrayal and parasitism. In spite of all that, the members of a group must mutually assure each other of their benevolence and trust. Among primates, this is primarily achieved through grooming; sexual intercourse serves a similar function among bonobos. Humans have further methods for establishing community. One of these is language, which enables communication with multiple persons at once; another is community rituals – dances, contests, plays, festivals – and common fantasies (myths).

The commonality of aims, without which no human community could exist, is both vital and fragile. This is where art plays a role: it coordinates and synchronizes the feelings, fantasies and desires of the individuals by investing them with a special value and celebrating them. They are represented in a beautiful, lavish and elaborate manner, i.e. in a manner which had previously been devoted only to perfecting the human body to signal sexual attractiveness. As part of the extended phenotype of many individuals, the common aims thus benefit from the strongest force that emerged in evolution – the desire to reproduce – and for higher animals this means sexuality.

### The new superorganism

By facilitating and reinforcing the identification of individuals with the common fantasies and aims, art transforms a group of humans into a 'superorganism'. This is the term biologists use to refer to higher units created through the close cooperation of many individuals. Under what environmental conditions does a superorganism offer individuals advantages over looser-knit cooperation forms or a solitary life? Among social insects, competition between colonies (of the same or different biological species) is the most

important factor that compels closer cooperation (Reeve & Hölldobler 2007). Does this mean that close cooperation within hunter-gatherer groups (and thus the origin of art) ultimately arose due to conflicts between groups and competition with other predator species?

Darwin thought so: "All that we know about savages, or may infer [...] shew that from the remotest times successful tribes have supplanted other tribes. [...] It is, therefore, highly probable that with mankind the intellectual faculties have been mainly and gradually perfected through natural selection." He characterized superior social morality as the most important prerequisite for success: "A tribe including many members who, from possessing in a high degree the spirit of patriotism, fidelity, obedience, courage, and sympathy, were always ready to aid one another, and to sacrifice themselves for the common good, would be victorious over most other tribes; and this would be natural selection" (Darwin 1871, 1: 160, 167; Bowles 2009). Social feelings and altruistic behaviors are certainly an important bond among groups of humans. But there are no indications that, say, Neanderthals were at all deficient in this regard.

However, if the archaeological record presents an accurate picture, it was only modern humans who discovered 200 000 years ago that they could bundle their divergent aims and impart an enormous intensity to their social cohesion by investing them with a special value using signals for attractiveness that originally arose through sexual selection. The difference then was not, as Darwin suspected, based directly on the strength of altruistic behaviors, but on the amplification of feelings and bundling of aims achieved with the aid of art.

One problem remains: How can we explain the considerable lapse of time between the assumed biological origin of the ability to produce art around 200 000 years ago and the appearance of sophisticated, symbolic art around 36 000 years ago? A second look reveals that this interval does not contradict the above account, but is to be expected.

**1)** From a biological perspective it is very unlikely that a complex behaviour like art arises through a single mutation. We rather have to assume that it evolved over an extended period of time through subsequent mutations and the perfecting action of natural and / or sexual selection (McBrearty & Brooks 2000). The evolution of human artistic abilities may have reached its current level not much earlier than 65 000 yr B.P., when modern humans started to migrate to other continents from Africa and became geographically isolated.

**2)** New findings suggest that the timeline for the start of human art may have to be revised. In particular, recent discoveries of pieces of red ochre engraved with crosshatched patterns at Blombos Cave in South

Africa dated to 100 000 yr B.P. are interpreted as evidence for symbolic and / or artistic behaviour (Henshilwood et al. 2009).

**3)** Human cultural activities in general are cumulative, i.e. they are improved through individual inventions, the dissemination within a population and the passing on to the next generations. In this respect art does not differ from other crafts that depend on extensive experiences with the material properties of objects and the development of skills to manipulate them (Tomasello 1999). Consequently we have to assume that the remarkable finesse and maturity of the cave paintings of the Grotte Chauvet or the mammoth-ivory horse from Vogelherd required the efforts of many generations.

We have explained the origin of artistic capacity through sexual competition between individuals within hunter-gatherer groups; and it has never lost this function – to attract the attention of and thus to woo sexual partners through the aesthetic presentation of one's own genetic qualities. But it is only to the extent that humans began to identify with the products or behaviors of other individuals (i.e. to accept them as part of their extended phenotype) that art as we know it today originated: as elaborately worked collective thoughts, feelings and desires. If this is true, then through art, humans achieve and celebrate nothing less than the (partial) solution of one of the greatest problems facing any community of individuals with diverging interests: the coordination and synchronization of their diverging aims as the prerequisite for successful cooperation.

The evidence for the evolutionary importance of art is circumstantial, but it stems from a wide range of independent sources, from the philosophy and history of art, the theory of evolution, sociobiology, evolutionary psychology, archaeology, palaeoanthropology and genetics. What kind of direct evidence will corroborate its significance for the disappearance of the Neanderthals? If my account is correct, the following predictions can be made: 1) No Neanderthal art will be found. 2) Further genetic evidence will show that between 100 and 200 000 years B.P. genetic changes took place that allowed modern humans to coordinate their (unconscious) feelings.

Interestingly enough the recently published draft sequence of the Neanderthal genome points in this direction: "It may thus be that multiple genes involved in cognitive development were positively selected during the early history of modern humans." In particular the authors mention genes that are important for the capability to participate in a social group: "Mutations in *CADPS2* have been implicated in autism, as have mutations in *AUTS2*. Autism is a developmental disorder of brain function in which social interactions, communication, activity, and interest patterns are affected, as well as cognitive

aspects crucial for human sociality and culture" (Green et al. 2010: 717; see also Dorus et al. 2004; Fisher 2006).

The scenario presented here, emphasizing the evolutionary importance of art for the survival, well-being and success of modern humans, could be the solution to one of the greatest mysteries of human history, the explanation for their uniqueness and evolutionary success. It provides not only a long-sought Darwinian explanation of art as an adaptation, but also enables us to understand why art retains such an important role for the survival of an individual and a group, and why conquerors of all times destroyed not only the fortifications but also the works of art of a conquered people.

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# Quartär

Internationales Jahrbuch zur Eiszeitalter- und Steinzeitforschung

*International Yearbook for Ice Age and Stone Age Research*

Band – Volume  
57

Edited by

Miriam Noël HAIDLE, Werner MÜLLER,  
Martin STREET, Gerd-Christian WENIGER



Verlag Marie Leidorf GmbH · Rahden/Westf.  
2010

187 Seiten mit 118 Abbildungen

Manuskript-Richtlinien und weitere Informationen unter <http://www.quartaer.eu>  
Instructions for authors and supplementary information at <http://www.quartaer.eu>

Bibliographische Information der Deutschen Nationalbibliothek

**Haidle, Miriam Noël / Müller, Werner / Street, Martin / Weniger, Gerd-Christian (Eds.):**

Quartär: Internationales Jahrbuch zur Eiszeitalter- und Steinzeitforschung; Band 57

International Yearbook for Ice Age and Stone Age Research; Volume 57

Rahden/Westf.: Leidorf, 2010

ISBN: 978-3-86757-923-0

Die Deutsche Nationalbibliothek verzeichnet diese Publikation in der Deutschen Nationalbibliographie.  
Detaillierte bibliographische Daten sind im Internet über <http://dnb.ddb.de> abrufbar.

Gedruckt auf alterungsbeständigem Papier

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Verlag Marie Leidorf GmbH

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Internet: <http://www.vml.de>

ISBN : 978-3-86757-923-0

ISSN 0375-7471

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Umschlagentwurf: Werner Müller, CH-Neuchâtel, unter Mitwirkung der Herausgeber

Redaktion: Miriam Noël Haidle, D-Tübingen, Werner Müller, CH-Neuchâtel,

Martin Street, D-Neuwied und Gerd-Christian Weniger, D-Mettmann

Satz, Layout und Bildnachbearbeitung: Werner Müller, CH-Neuchâtel

Druck und Produktion: druckhaus köthen GmbH, Köthen

## Inhalt - Contents

<b>New information on the Havelte Group site Ahrenshöft LA 58 D (Nordfriesland, Germany) - Preliminary results of the 2008 fieldwork</b> <i>Neue Informationen zum Fundplatz der Havelte-Gruppe Ahrenshöft LA 58 D (Nordfriesland, Deutschland) - Vorläufige Ergebnisse der Ausgrabungen 2008</i>	
Mara-Julia WEBER, Ingo CLAUSEN, Rupert A. HOUSLEY, Christopher E. MILLER, Felix RIEDE With the collaboration of Hartmut USINGER .....	7-24
<b>Bladelet production, core reduction strategies, and efficiency of core configuration at the Middle Palaeolithic site Balver Höhle (North Rhine Westphalia, Germany)</b> <i>Lamellenproduktion, Strategien der Kernzerlegung und Effizienz der Kerngestaltung an der mittelpaläolithischen Fundstelle Balver Höhle (Nordrhein Westfalen, Deutschland)</i>	
Andreas PASTOORS & Yvonne TAFELMAIER In cooperation with Alexandra KUNISCH & Jacqueline RULAND.....	25-41
<b>Recurrent occupations of the Late Middle Palaeolithic Station Kabazi II, Unit II, Level 8 (Crimea, Ukraine) – Seasonal adaptation, procurement and processing of resources</b> <i>Wiederholte Belegungen der spät-mittelpaläolithischen Station Kabazi II, Unit II, Level 8 (Krim, Ukraine) – Saisonale Adaptation, Beschaffung und Verarbeitung von Ressourcen</i>	
Guido BATAILLE.....	43-77
<b>Geißenklösterle. The Swabian Gravettian in its European context</b> <i>Geißenklösterle. Das schwäbische Gravettien im europäischen Kontext</i>	
Luc MOREAU.....	79-93
<b>Palaeoenvironment at Gravettian Sites in Central Europe with emphasis on Moravia (Czech Republic)</b> <i>Die Paläoumwelt mitteleuropäischer Gravettien-Fundstellen mit Schwerpunkt in Mähren (Tschechische Republik)</i>	
Rudolf MUSIL.....	95-123
<b>The Late Upper Palaeolithic in the catchment area of the River Saale – facts and considerations</b> <i>Die späte Altsteinzeit im Einzugsgebiet der Saale – Fakten und Überlegungen</i>	
Mario KÜSSNER.....	125-137
<b>Between East and West – a new site of the Federmessergruppen in Poland</b> <i>Zwischen Ost und West – eine neue Fundstelle der Federmessergruppen in Polen</i>	
Jacek KABACIŃSKI & Iwona SOBKOWIAK-TABAKA.....	139-154
<b>New AMS-dates for the Upper Volga Mesolithic and the origin of microblade technology in Europe</b> <i>Neue AMS-Daten zum Mesolithikum der oberen Wolga und das Aufkommen der Mikroklingentechnik in Europa</i>	
Sönke HARTZ, Thomas TERBERGER & Mikhail ZHILIN.....	155-169
<b>Art as a biological adaptation, or: why modern humans replaced the Neanderthals</b> <i>Kunst als Anpassung, oder: Warum moderne Menschen die Neanderthaler ersetzten</i>	
Thomas JUNKER.....	171-178

**Surface scanning of anthropological specimens: nominal-actual comparison with low cost laser scanner and high end fringe light projection surface scanning systems**

*Oberflächenscannen anthropologischer Objekte: Soll-Ist Vergleiche mit einem niedrigpreisigen Laserscanner und hochpreisigen Streifenlicht Scanner Systemen*

**Astrid SLIZEWSKI, Martin FRIESS & Patrick SEMAL.....179-187**