

Brian Boyd's Evolutionary Account of Art: Fiction or Future?

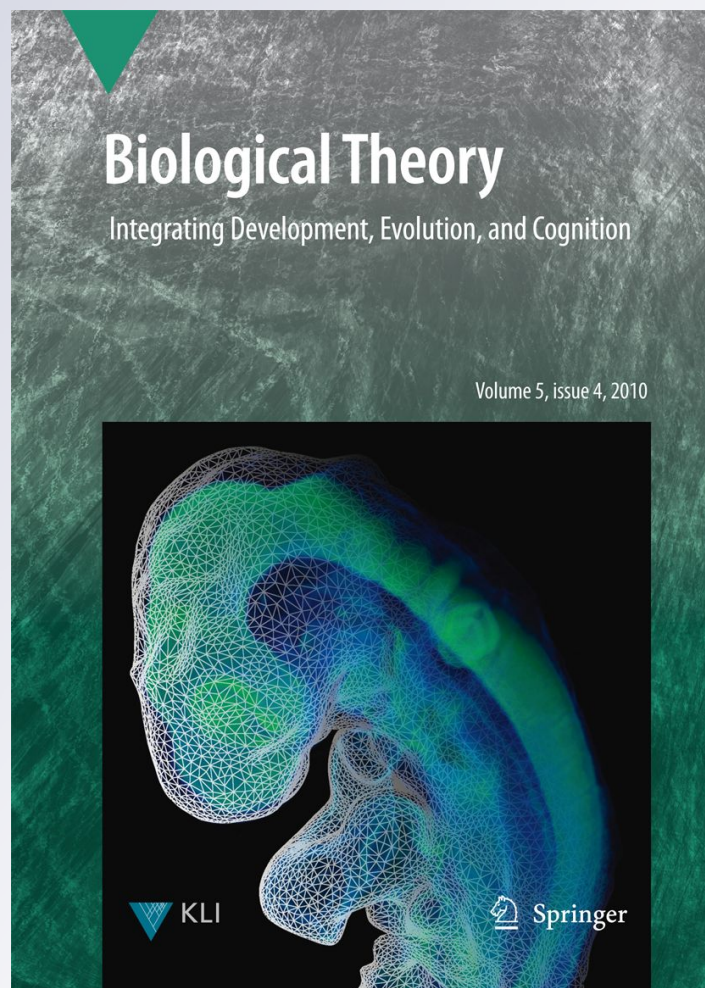
Jan Verpooten

Biological Theory

ISSN 1555-5542

Biol Theory

DOI 10.1007/s13752-012-0023-9



Your article is protected by copyright and all rights are held exclusively by Konrad Lorenz Institute for Evolution and Cognitive Research. This e-offprint is for personal use only and shall not be self-archived in electronic repositories. If you wish to self-archive your work, please use the accepted author's version for posting to your own website or your institution's repository. You may further deposit the accepted author's version on a funder's repository at a funder's request, provided it is not made publicly available until 12 months after publication.

Brian Boyd's Evolutionary Account of Art: Fiction or Future?

Brian Boyd: On the Origin of Stories: Evolution, Cognition, and Fiction. The Belknap Press of Harvard University Press, Cambridge, MA/London, 2009, 540 pp, \$35.00 hbk, ISBN 978-0-6740-3357-3

Jan Verpooten

Received: 27 March 2012 / Accepted: 28 March 2012
© Konrad Lorenz Institute for Evolution and Cognition Research 2012

Abstract There has been a recent surge of evolutionary explanations of art. In this article I evaluate one currently influential example, Brian Boyd's recent book *On the Origin of Stories: Evolution, Cognition, and Fiction* (2009). The book offers a stimulating collection of findings, ideas, and hypotheses borrowed from a wide range of research disciplines (philosophy of art and art criticism, anthropology, evolutionary and developmental psychology, neurobiology, ethology, etc.), brought together under the umbrella of evolution. However, in so doing Boyd lumps together issues that need to be separated, most importantly, organic and cultural evolution. In addition, he fails to consider alternative explanations to art as adaptation such as exaptation and constraint. Moreover, the neurobiological literature suggests current evidence of biological adaptation for most of the arts is weak at best. Given these considerations, I conclude by proposing to regard the arts instead as culturally evolved practices building on pre-existing biological traits.

Introduction

Recently, there has been a surge in evolutionary approaches to art (e.g., Coe 2003; Boyd 2009; Dutton

2009). Here I discuss one such influential account, Brian Boyd's recent book, *On the Origin of Stories: Evolution, Cognition, and Fiction* (2009). The general aim of Boyd's work is to advocate evolutionary biology's relevance in understanding artistic achievements. This aim should be seen against the backdrop that many of Boyd's colleagues from the humanities (Boyd is Distinguished Professor of English at the University of Auckland and the world's foremost authority on the works of Vladimir Nabokov) are of the opinion that biology and evolution have no explanatory value for art whatsoever. Boyd develops his own evolutionary account of art in an attempt to demonstrate that the opposite is true. The essence of his thesis is that *art is an adaptation, biologically part of the human species, which derived—in the phylogenetic sense—from adaptive animal play behavior*.

I agree with Boyd that evolutionary biology can contribute to our understanding of art. Indeed, there is an increasing amount of research that unequivocally demonstrates this. However, I am worried about the specifics of the evolutionary account of art presented in the book. Basically, the arguments Boyd presents in defense of his view and the evidence he cites in support of them do not lead to the conclusion that art is a biological adaptation. Instead, I will argue, the evidence that Boyd provides in the book favors an alternative evolutionary view: *art as a cluster of culturally evolved practices*.

This essay review is structured as follows. In the next section, I briefly survey Boyd's exposition. I then evaluate Boyd's ideas, especially focusing on his arguments for art as a biological adaptation. I will argue why they do not hold in the light of current evidence, and propose instead that most of the arts evolved culturally, building on pre-existing biological traits.

J. Verpooten (✉)
Research Centre for Marketing and Consumer Science,
University of Leuven, Leuven, Belgium
e-mail: jan.verpooten@ua.ac.be

J. Verpooten
Ethology Research Group, Department of Biology,
University of Antwerp, Antwerp, Belgium

Summary of Boyd's Account

A monumental work, at over 500 pages, the book is divided into two sections ("Book I" and "Book II") of virtually equal length. The first part of the first section introduces the reader to some general concepts with regard to (human) evolution: human nature, adaptation, evolution of intelligence and of cooperation; all of which play an important role in Boyd's account. Part 2 offers an evolutionary account of art in general and Part 3 focuses on the evolution of fiction specifically. In the second section Boyd deals with two literary pieces, the *Odyssey* and Dr. Seuss' *Horton Hears a Who!*, which serve as test cases for Boyd's evolutionary literary criticism or "evocriticism" based on the evolutionary analysis from the first half of the book. Boyd's evolutionary analysis of art is presented in Parts 2 and 3, therefore I will mainly focus on those parts.

In Part 2 Boyd presents his idea that art is phylogenetically derived from adaptive animal play behavior. (The idea is not original: it was developed earlier by Steen and Owens 2001, but Boyd does not cite them in his book.) Boyd claims that art has retained characteristics of ancestral nonhuman play but is also characterized by derived aspects that are unique to humans. The following are aspects that art retained from ancestral nonhuman animal play: Art is a practice in a safe context for behaviors that have key functions with regard to (adult) survival and reproduction; by repeatedly engaging in art, useful skills and relevant sensitivities that play a role in these adaptive behaviors are sharpened. This leads to measurable results on the neurological level: strengthened synaptic connections and brain growth (p. 191). Boyd calls this training of skills a "major evolutionary function" of art. In order to fulfill this function, art is highly self-rewarding—even compulsory—just as nonhuman mammalian play is, he argues.

But art also exhibits derived characteristics it does not share with play behavior in other animals, making it uniquely human. First, since "humans gain most of [their] advantages from intelligence" (p. 14), art is significantly more cognitive than non-human play behavior. In art, Boyd reasons, humans play cognitively with patterns of information that are humanly appropriate. Visual, aural, and social information are most relevant to human survival and reproduction, corresponding to visual art, music, and fiction, respectively. By compulsively playing with humanly appropriate patterns in art, humans strengthen the neural pathways that process these patterns. Second, art is also derived in that it acquired a suit of additional evolutionary functions. A first additional or "subsidiary" evolutionary function of art Boyd considers is social attunement: "Art has played a key role in training and motivating us to share our attention in ever more finely-tuned forms" (p. 101).

Social attunement is beneficial because it enhances close cooperation. In music and dance humans may synchronize feeling and movement, and draw strength from this attunement. Visual art traditions such as in architecture, costume, hairstyles, etc., may signal and reinforce shared norms. Also fiction has this function, through stories that embody prosocial values (p. 106). A second subsidiary function Boyd envisions that art has is that it is a means for improving individual status. Boyd considers status enhancement a genuine evolutionary function of art. He suggests that being an artist enhances status and that in socially hierarchical groups, those of higher status have better access to resources and hence usually enjoy greater reproductive success. A final and "major" function Boyd proposes, gradually emerging out of the three previous functions (p. 119), is engendering creativity. Art generates a confidence that helps humans to modify the given in chosen ways, and it supplies them with skills and models that they can refine and recombine to ensure ongoing cumulative creativity. Boyd believes that, in evolutionary terms, "Nature has evolved art to create creativity" (p. 119) and "Art [is] effectively designed for creativity" (p. 121).

Part 3 is entirely devoted to fiction. Since Boyd considers fiction as an art, all aspects of art in general discussed in Part 2 apply to fiction as well and are explored in more detail in relation to fiction. Boyd explicitly distinguishes inventing stories from true narration. That humans are interested in the latter "poses no untoward biological challenge" whereas humans' interest in the pseudo-information of fiction poses an evolutionary puzzle: why do humans not prefer only true information, Boyd asks (p. 188). He suggests the answer lies in the fact that fiction as an art is an adaptation in its own right, that it is adaptive cognitive play with patterns of social information. Also in Part 3 Boyd presents a detailed developmental, cognitive, and comparative analysis of the components that constitute fiction. These components include Theory of Mind (ToM), systems for recalling, inventing and representing events, and so on. Much attention is paid to pretend play which develops early in human childhood and which may also occur in some nonhuman animals. Boyd considers pretend play to be where art "begins" (p. 96) and presents it as evidence for fiction as an innate adaptation. Further, Boyd discusses research that demonstrates that recalling events should be seen as reactivating past experiences and that the flexible recombination of these experiences allows humans to pre-simulate the future. The "prospective brain hypothesis" suggests that recalling the past and imagining the future even rely on the same cognitive mechanism; indeed, neurological research shows both activities involve the same brain regions (Schacter et al. 2007). These activities seem cognitively closely related to engaging in

fiction. This has some interesting implications for explaining fiction (see below). Part 3 concludes with a discussion of fiction's evolutionary functions (echoing the functions for art in general described above) and a discussion of evidence for fiction as adaptation. With respect to the latter, Boyd considers some evidentiary criteria for adaptation including "good design," suggesting there is a tight fit between fiction and its evolutionary function. This and other evidence Boyd brings forward I will describe in more detail and evaluate in the next section.

Evaluating Arguments for Adaptation

Here I evaluate Boyd's exposition, focusing on his argumentation for art as adaptation. I distinguish three main arguments. A first one is a cost-benefit thought experiment. The second argument is based on the view that art derived from adaptive animal play, acquiring additional evolutionary functions. Finally, Boyd applies some evidentiary criteria to art that are sometimes used in evolutionary psychology to demonstrate adaptation. I will argue that none of these arguments demonstrates that art is an adaptation.

A Thought Experiment

Boyd proposes to consider the thought experiment, "Nature selects against a cost without a benefit," as an important piece of evidence for art as adaptation (p. 83). Boyd refers to the secondary loss of sight over evolutionary time in many burrowing or cave-dwelling animals as an example of this general principle. Sight is a costly ability and when redundant will be dispensed of by natural selection.¹ By analogy, Boyd notes, art is generally a costly activity in terms of time, energy, and resources devoted to it. He offers the following examples: Early visual art, such as scarification, tattooing, and body piercing, causes pain and risky injuries. Michelangelo spent years on his back painting the Sistine Chapel ceiling. More than a century of sponsorship has still not brought Gaudi's design for Barcelona's *Sagrada Familia* cathedral to completion. If there were no benefits attached to these costly artistic activities, the propensity to engage in them would have long been weeded out by natural selection. Therefore, Boyd concludes, art is evolutionarily functional and hence by definition an adaptation.

However, the problem is that Boyd has cherry-picked his examples here. First, with regard to costly art, his examples are all from the visual arts. A lot of visual art

may be costly to produce but is the same true for fiction and music? Both these artistic activities do not necessarily require materials, in contrast to visual art. Fictional stories and song, for example, can be quite cheaply produced. Vocal chords and cognitive abilities are part of human biology anyway—i.e., maintained by selection for important functions in non-artistic activities (see below). Second, the comparison with selection for secondary loss of sight is also cherry-picked. The eye is an outlier in adaptations because it is a very specific organ that performs only one specific function. If the function of sight becomes redundant to a species, its eyes become redundant as well, and the selection pressure on functional eyes relaxes. But humans do not have an "art organ" that is specifically designed by natural selection for any biological function art may have. Instead, the ability to produce and experience art relies on a plethora of biological traits (cognitive, emotional, and motor) that all have functions in other contexts. Compare it to other things like ears and hands, which perform multiple functions. If one function of the human hand becomes redundant, it won't just disappear but it will be selectively maintained for the other functions it has. Therefore, for natural selection to weed out the human hand all functions for which it is under strong selection would have to have become redundant. The same is true for art. To weed out art, natural selection would have to select against at least one of the many biological traits art relies on. However, since each of these traits is also maintained by virtue of its vital functions in non-art contexts, this will not happen. Hence, natural selection cannot just weed out art's biological underpinnings because they are "constrained." Therefore, the thought experiment is not a valid adaptationist test for art.

I stated there is no such thing as an art organ and explained why this is a problem for Boyd's account. The neuroscientific literature corroborates this. Boyd tends to treat art as a monolithic whole in his biological account of art, but this seems unwarranted since there is no biological ground to base this position on. There is no cognitive mechanism exclusively devoted to art. But even if the different arts are looked at separately, it becomes clear that humans do not possess a unitary cognitive "module" for any of them specifically. Let's take the three arts Boyd refers to in his thesis: visual art, music, and fiction. The evidence with regard to visual art is compelling. Half a century of neurological and neuropsychological research strongly suggests that visual art is a "multi-process activity," i.e., depends on several brain regions and even on redundancy of art-related functional representation rather than on a single cerebral hemisphere, region, or neural pathway (Zaidel 2010). Boyd himself provides ample evidence that fiction involves both many different brain regions and cognitive mechanisms, and also that none of

¹ Note that selection against the cost of sight is just one possible explanation for the secondary loss of it. Neutral evolution by genetic drift is also considered a plausible explanation.

these mechanisms are exclusively devoted to fiction. Fiction relies on abilities such as a ToM, inventing, storing, and representing events, all of which are under comparably stronger selection for functions unrelated to fiction (see below). For music there seem to be some indications of the existence of music-specific cognitive specialization (Peretz 2006). Therefore, at present, music is an art form that has comparably most chances of eventually qualifying as adaptation. However, note that music also involves brain regions that have other tasks as well. For example, there is considerable overlap between brain regions involved in musical and linguistic tasks. As a result, even if further research would indicate that specific selection for musical abilities has occurred, it is still not justified to speak of a “music faculty” in the sense of a unitary module for music (Fitch 2006). Despite the indications of potential cognitive adaptation for music, the current evidence is not strong enough to refute the hypothesis that music evolved by piggy-backing on linguistic abilities, Fitch warns. Relevant to the problem with Boyd’s thought experiment he notes: “If music results automatically from linguistic mechanisms, then powerful selection for language could swamp weaker selection against music” (Fitch 2006, p. 200).

Multifunctional Playground

Boyd’s second set of arguments for adaptation is based on his view that art is a phylogenetically derived form of adaptive animal play that acquired additional evolutionary functions. Adaptations have, by definition, evolutionary functions. Therefore, demonstrating function is demonstrating adaptation. In the previous section I already summarized the four evolutionary functions Boyd claims art has. Here I will evaluate the evidence for these claims and I will conclude that at present it does not allow us to claim adaptation for any evolutionary function. In addition, Boyd assumes that if art derived from adaptive animal play it must be adaptive itself. However, this is not necessarily the case. I will start off with evaluating this assumption.

The problem with Boyd’s assumption that if non-human animal play is adaptive, human art, a form of play in Boyd’s view, must be adaptive as well is that an adaptive explanation of a behavior does not necessarily explain all instances of that behavior. Take as an example the socially transmitted behavior of the seemingly purposeless stone handling by *Macaca fuscata* (Japanese macaque), which may involve devoting large amounts of time and effort to collecting, rubbing, clacking together, scattering, and regrouping stones, observed in provisioned and captive troops in Japan. Although stone handling may have emerged from an adaptive tendency to play in these animals, it is in itself nonadaptive. Over 30 years of research on this behavior has yielded no evidence of an evolutionary

function of the behavior itself (Huffman 1984; Huffman et al. 2008). It cannot be considered as a practice for useful behaviors (these animals are not tool users). It is rather considered a nonfunctional solitary object-play activity that results from a self-rewarding physiological predisposition probably linked to foraging behavior (Huffman and Quiatt 1986). Interestingly, despite the lack of an ultimate evolutionary function, the proximate mechanism of being self-rewarding drove its rapid spread and persistence over these populations of socially interacting macaques. In the same sense, regardless of the unequivocal importance of play in human development, in so far as art qualifies as adult play, it may just as well be a culturally maintained unselected by-product of the human tendency to play instead of an adaptive practice for human functional behavior. To be sure, Boyd does not deny culture plays a role in art and he devotes quite some attention to “biocultural” aspects of artistic behavior. However, he lumps organic evolution and cultural evolution together: “I ... use ‘biocultural’ and ‘evolutionary’ almost interchangeably” (p. 25). Yet, the above example illustrates that a biologically inherited behavioral predisposition that may be an adaptation for a function can become co-opted in a culturally evolved practice in which it does not serve that function. Moreover, whether the culturally evolved practice is adaptive or not does not depend on whether the biological traits it co-opts are.² Before taking a look at the evidence for the evolutionary functions of art Boyd proposes, it is important to consider the following caution. Demonstrating that a trait is evolutionarily beneficial (i.e., increasing reproductive success) by itself is insufficient to demonstrate adaptation. The notions of adaptation and evolutionary function are inextricably linked. An evolutionary function is a beneficial effect of a biological trait for which that trait underwent selection, for which it was modified or “designed” by natural selection. Therefore, if it can be demonstrated that art has a beneficial effect, it is an indication for art as adaptation. However it cannot by itself be regarded as solid proof because a trait can be beneficial without having been selected for it, a phenomenon called exaptation (Gould and Vrba 1982; Gould 1991).³ For example, most humans today can write and read without ever having been selected for these tasks. Latent abilities like these are also found in other animals. For example, orangutans are skillful tool users in captivity but, notwithstanding an interesting

² Also see the review by Mellmann (2010) who came to similar conclusions with regard to Boyd’s account and the role of culture in the evolution of art.

³ “Beneficial” suggests that reproductive success is positively influenced and as a result the gene frequency for the trait in the population may increase. However, since the trait itself is not modified, it is unwarranted to speak of selection in this context (Andrews et al. 2002).

exception, orangutan populations do not exhibit tool use in the wild (van Schaik 2006). Thus, even if future research were to demonstrate that art has certain beneficial effects to those engaging in it, this is not in itself evidence for art as adaptation. This caveat notwithstanding, finding evidence of beneficial effects of art is a required step to demonstrate adaptation. Since, as discussed above, the biology of art cannot be treated as a monolithic whole, the arts Boyd discusses—fiction, music, and visual art—must be considered separately.

With regard to the first beneficial effect of art Boyd proposes, the training of cognitive skills, Boyd does not supply any evidence that points to such an effect. The reason may be that studies have yet to be conducted testing this hypothesis. It is a research area still in its infancy. Also, Boyd does not distinguish between production of art and consumption of art with respect to this function. However, it seems likely that if art trains skills that are valuable outside the art context it will above all be art production—which is much more intense as a practice than consumption—that will have that effect. For example, there is recent evidence that *intensive* music training may tone the brain for auditory fitness (Kraus and Chandrasekaran 2010). Listening by itself, on the other hand, is not sufficient, research suggests. A well-known example of overhyping the latter effect is the so-called Mozart effect, the hypothesis that listening to classical music enhances spatial intelligence, which even spawned a small industry. However, regardless of the many attempts to show such an effect exists, a meta-analysis of 16 studies demonstrated that there is no such effect (Chabris 1999). With regard to fiction there are some correlational studies that explored possible positive effects of engaging in fiction (reading fiction, acting classes, etc.) on the development of ToM and empathy. Results for empathy are mixed, but for ToM there may be some evidence of a reciprocal relationship (Goldstein and Winner 2012). However, as the authors note, the studies that demonstrated correlation were not designed to conclude anything with respect to causation; it could well be that subjects that were more inclined to read a lot of fiction or motivated to take acting classes possessed a more developed ToM in the first place.

Second, there is the idea that art contributes to social attunement of individuals favoring the beneficial behavior of close cooperation. With regard to music Boyd refers to a recent study that showed that singing lowers men's testosterone levels, indicating, Boyd believes, that music may contribute to cooperation rather than competition. Further Boyd quotes some authors suggesting that human societies use synchronized movement to create harmony and cohesion within groups. Boyd notes that visual art serves to reinforce shared norms, but he does not refer to any studies corroborating this. Similarly he suggests that fiction may

stimulate the adoption of prosocial values but cites no evidence. There is a need for experimental and systematic observational studies to explore whether or not such effects exist.

A third evolutionary function of art Boyd suggests is improvement or maintenance of an individual's social status in a group. However it is not clear from Boyd's account how the function of enhancing status could have exerted a selective pressure on art. Boyd notes that modern hunter-gatherer societies are generally egalitarian; attempts by individuals to enhance their status are thwarted by mechanisms such as ridicule, ostracism, and even expulsion. Only in societies with agriculture can surpluses be hoarded and disparities grow, allowing status enhancement, Boyd notes. This is problematic. Admittedly, the social structure of modern hunter-gatherer societies cannot just be extrapolated to human prehistoric societies. Nonetheless, it is more plausible that prehistoric societies were more similar to modern hunter-gatherer societies than to the relatively recent agricultural societies. Taking this into account, the function of status enhancement must be very recent (and if it occurred, limited to post-agricultural peoples) and therefore unlikely to have exerted any significant selection pressure on art.

Finally there is the proposal that art is a system for engendering creativity. Boyd claims that, "Nature has evolved art to create creativity" (p. 119) and "Art [is] effectively designed for creativity" (p. 121). Thus implied is that creating creativity should be considered as a genuine evolutionary function of art. Yet, elsewhere Boyd proposes that this function gradually emerges out of the three previous functions (p. 119). And indeed Boyd seems to assume creativity is a very recent function of art when he notes that there are "changing functions of art in more modern times, its increasing association with creativity and innovation rather than with conformity and tradition" (p. 114). Be that as it may, Boyd does not discuss any evidence for either general creativity emerging from engaging in art nor studies that show that creativity itself pays off in terms of fitness.

Of course Boyd cannot account for the current lack of evidence of beneficial effects of the arts, and the limited explanatory power with regard to adaptation any evidence that eventually may be found would have. But this brief evaluation of potential beneficial effects of the arts does point out that it is currently unwarranted to claim that any of these arts is adapted to any of these effects. As Williams (1966) warns in his seminal work on natural selection: demonstrating adaptation carries an onerous burden of proof. Moreover, he says, "[adaptation] should be used only as a last resort" (Williams 1966, p. 11). And Boyd's account does not convince that adaptation is the only option left to explain the evolution of art.

Evidentiary Criteria

Boyd discusses three evidentiary criteria that are generally used in evolutionary psychology to demonstrate cognitive adaptation for an evolutionary function: (1) good design or tight fit, (2) universality, and (3) developmental reliability of a trait. However, as I will argue, these criteria do not allow alternatives to art as adaptation to be refuted either.

Throughout his exposition of the evolution of art Boyd regularly refers to the argument of “good design” in order to demonstrate adaptation. The idea of good design is that, as a result of natural selection, the features of an adaptation will often be tightly fit to that adaptation’s function (Cosmides and Tooby 1995). For example, there is a tight fit between the features of the eye and its function of sight. Boyd expands on this evolutionary standard with regard to fiction specifically. In his discussion of fiction as adaptation Boyd claims to “have explained the design for fiction” (p. 190). He refers here to the extensive account he offers of systems of event comprehension, representation and storage, theory of things, kinds, and minds, joint attention, and the reliable emergence of pretend play. Boyd indeed convincingly demonstrates a tight fit between fiction on the one hand and these cognitive capacities on the other hand. But clearly, Boyd wouldn’t argue that these capacities evolved *for* fiction—or more correctly for fiction’s function(s). Yet, the latter is exactly what he would need to demonstrate in defense of his view that fiction is an adaptation. The mere observation that fiction may involve cognitive adaptations is no proof of fiction as adaptation whatsoever. Indeed, good design is not only consistent with adaptation but also with alternative explanations. The tight fit between fiction and its underlying cognitive components can just as well result from fiction—as a culturally evolving practice—adapting to human cognition. Indeed as Boyd (p. 64) himself notes (contradicting his main argument):

Stories arose...out of our intense interest in social monitoring. They succeed by riveting our attention to social information, whether in the form of gossip...or fiction.

But again: that human interest in social monitoring is adaptive by no means demonstrates that fictional stories that appeal to that interest are adaptive as well. This is a frequently recurring misunderstanding in Boyd’s account. With regard to the capacity to invent fictional stories Boyd refers to compelling neuroscientific research. The prospective brain hypothesis suggests that memory and prospect are relying on the same cognitive mechanism (Schacter et al. 2007). Indeed, studies show that imagining the future depends on much of the same neural machinery that is needed for remembering the past: brain regions that have traditionally been associated with memory appear to

be similarly engaged when people imagine future experiences. Instead of passively recording, human memory reactivates, almost simulates, prior experiences. This in turn allows recombining freely past experience so that the individual can imagine or pre-simulate the future. Episodic memory in particular is crucially involved in the ability to simulate future happenings. In addition, the same mechanisms may allow exploring the results of different possible actions (for example: I wonder what will happen if I try to steal their food?). Importantly, from this perspective on imaginative capacity it follows that cognitively there is no distinction between creating fiction, i.e., inventing stories, and predicting the future. Inventing stories relies equally on this neural machinery of the prospective brain as contemplating a prospect does. (An interesting test would be to check, as expected from this view, whether the same brain regions are indeed involved in fiction.) However, when it comes to evolutionary function there has to be quite a significant difference. A capacity for imagining the future or potential actions obviously implies strong, direct benefits. By contrast, even if the art of fiction would prove to be evolutionarily beneficial, the selection pressure resulting from such benefits would be negligibly weak in comparison. Therefore, the hypothesis that fiction is a culturally evolved by-product that piggy-backs on the crucial function of the prospective brain seems favorable.

Universality of a trait is another evidentiary criterion Boyd regularly appeals to. Art occurs virtually universally across human peoples and cultures. Boyd considers this as an indication that art is not purely cultural. However, the ability to read also comes close to being a human universal. Yet, evolutionary psychology wouldn’t state that humans have a “reading instinct” (Changizi 2011). Hence, universality is also consistent with culturally evolved practices. Of course art is much older than reading (at least traditional arts are), but being old is by itself no indication of biological adaptation either.

Finally Boyd discusses the evolutionary criterion called reliability of development. Boyd devotes quite some attention to the argument that fiction develops reliably and spontaneously (without training) in early childhood in the form of pretend play. Boyd notes that infants from a year, a year and a half, start manipulating objects as if they were something else. A classical example is the pretend play with cup and teapot. A cup that has been pretend-filled by a pretend-pour from an actually empty teapot will spill its pretend contents if knocked over, and children will refill only the “spilled” cup, not the others, even if all are in fact empty. Although I agree that pretend play offers a fascinating view on the development of capacities required for fiction, I have two concerns with regard to the statement that pretend play accounts as evidence for fiction as adaptation. A first concern regards the relation between

children's pretend play and the art of fiction. Boyd himself acknowledges that, "We would not call pretend play art" (p. 5); rather Boyd considers pretend play is where art "begins" (p. 96). Therefore even if pretend play were a reliably developing adaptation, it by itself does not mean fiction is an adaptation. The alternative that the art of fiction is a culturally maintained by-product of adaptive pretend play would also be consistent with that finding. A second concern is that pretend play may not even qualify as an adaptation itself. The criterion of reliability of development is similar to the previous one in that it appeals to universality, only this time on the developmental level. With regard to pretend play it may also suffer from the same problem. That is, reliable development of pretense in childhood (or what adults perceive as pretense) may be due to cultural induction instead of innate mechanisms. At least that is what recent studies indicate (Rakoczy et al. 2005). For example Striano et al. (2001) found that before 2 years of age, young children's pretense with objects derived almost exclusively from imitation of adults or from adult verbal instructions sometimes with acting on toys with established pretense functions. This puts the cup and teapot example in a different light: children may be taught to pretend play with the objects. The authors claim that if 2-year-old children were not exposed to other persons pretending, they would not invent pretense for themselves as a solitary activity at this young age. Hence, these studies suggest that pretend play is a culturally learned practice. Of course, this is not to say that the practice of pretend play may not also rely on automatic cognitive tendencies of children, but we would not call pretend play, as a trait, an innate adaptation.

Conclusions

By providing fascinating examples (e.g., elaborate bubble play in dolphins) and a broadly sweeping and very informative discussion of relevant theories and findings from a multitude of research disciplines (i.e., philosophy of art and art criticism, anthropology, evolutionary and developmental psychology, ethology, and neurobiology), Boyd succeeds in making the reader enthusiastic about art and the insights and lines of thinking an evolutionary approach to art can yield. For this Boyd's monumental effort is to be applauded, the more so as to date few books exist devoted specifically to the evolution of art. Unfortunately, however, as I have discussed at length, the book suffers from weak and at times inconsistent evolutionary argumentation, which tempers my enthusiasm. Particularly, Boyd's arguments for art as a biological adaptation are unwarranted.

Reviewing Boyd's evolutionary thesis I have formulated three main concerns. One was on the level of

evolutionary effect. I formulated two reasons why Boyd's claim that art has evolutionary functions is presently unwarranted. First, it cannot be concluded from the evidence Boyd provides that any of the arts discussed evolved because it enhanced reproductive success of its producers or experiencers. Second, even if it were to be demonstrated that some form of art has some beneficial effect, it would not necessarily mean that this effect is an evolutionary function, i.e., that the biology underlying art was selectively altered for it. Art exapted to that beneficial effect, i.e., without undergoing selection for it, would also be consistent with it. Yet, Boyd does not devote any space to discussing this alternative. There is in fact cause to assume that exaptation would be an at least as plausible explanation in such a case as adaptation. This relates to the second concern I expressed with respect to Boyd's account, which is on the level of trait. Boyd claims that there is evidence for cognitive adaptation for art. This is however not supported by neurobiological evidence. With the exception perhaps of music, no biological (i.e., cognitive) adaptation for any of the arts, and definitely not for art in general, seems to have occurred. Each art form involves several cognitive mechanisms and brain regions under selection pressure for crucial non-art functions instead of one devoted "faculty." Therefore, if fiction or visual art prove to be beneficial, the conclusion that they are exapted to that effect, instead of adapted, may be favored at this point. My final concern relates to the fact that Boyd explicitly lumps together organic and cultural evolution without providing a consistent argumentation why this simplification would be justified. Throughout my evaluation of the book I have hinted at a possible alternative evolutionary perspective on the arts that does take into account the distinction between organically and culturally inherited traits: the arts as culturally evolved practices. Perhaps, art thus can be seen as a cluster of culturally evolved practices, rather than a biologically evolved monolithic whole. This is not to say that biology plays no role in art. On the contrary, the point is that art has evolved culturally adapting itself to the pre-existing biological traits on which it relies. Thus, I propose explaining the tight fit between art and cognition the other way around from Boyd: art has been culturally selected to fit human cognition.

My aim was not to argue against an adaptationist approach to the arts. To the contrary, I concur with Boyd that adaptationism, accommodating recent cross-disciplinary findings, can yield interesting research questions and hypotheses about the arts. However, taking cultural transmission as a partly independent process from biological evolution and a comparative evaluation of adaptation and alternatives seriously is paramount for developing a sound evolutionary research program of art.

Acknowledgments Thanks to Brian Boyd for discussion of the book, and Wayne Christensen, Rachael Brown, Brett Calcott, and Eran Shiffman for commenting on an earlier version of this manuscript. This paper was supported by the Research Foundation—Flanders (FWO) and the Konrad Lorenz Institute for Evolution and Cognition Research, Austria.

References

- Andrews P, Gangestad S, Matthews D (2002) Adaptationism: how to carry out an exaptationist program. *Behav Brain Sci* 25:489–553
- Boyd B (2009) On the origin of stories: evolution, cognition and fiction. Belknap Press of Harvard University Press, Cambridge
- Chabris CF (1999) Prelude or requiem for the “Mozart effect”? *Nature* 400:826–827
- Changizi M (2011) *Harnessed: how language and music mimicked nature and transformed ape to man*. Benbella Books, Dallas
- Coe K (2003) *The ancestress hypothesis: visual art as adaptation*. Rutgers University Press, New Brunswick
- Cosmides L, Tooby J (1995) Beyond intuition and instinct blindness: toward an evolutionarily rigorous cognitive science. *Cognition* 50:41–77
- Dutton D (2009) *The art instinct: beauty, pleasure and human evolution*. Oxford University Press, Oxford
- Fitch WT (2006) The biology and evolution of music: a comparative perspective. *Cognition* 100:173–215
- Goldstein T, Winner E (2012) Enhancing empathy and theory of mind. *J Cogn Dev* 13:19–37
- Gould SJ (1991) Exaptation: a crucial tool for an evolutionary psychology. *JSI* 47:43–65
- Gould SJ, Vrba ES (1982) Exaptation: a missing term in the science of form. *Paleobiology* 8:4–15
- Huffman MA (1984) Stone play of *Macaca fuscata* in Arashiyama B troop: transmission of a non-adaptive behavior. *J Hum Evol* 13:725–735
- Huffman MA, Quiatt D (1986) Stone handling by Japanese macaques (*Macaca fuscata*): implications for tool use of stone. *Primates* 27:413–423
- Huffman MA, Nahallage CAD, Leca J (2008) Cultured monkeys: social learning cast in stones. *Curr Dir Psychol Sci* 17:410–414
- Kraus N, Chandrasekaran B (2010) Music training for the development of auditory skills. *Nat Rev Neurosci* 11:599–605
- Mellmann K (2010) The multifunctionality of idle afternoons: art and fiction in Boyd’s vision of evolution [review of Brian Boyd. On the origin of stories: evolution, cognition, and fiction, 2009]. *JLT Online Reviews*. <http://www.jltonline.de/index.php/reviews/article/view/170/530>. Accessed 26 March 2012
- Peretz I (2006) The nature of music from a biological perspective. *Cognition* 100:1–32
- Rakoczy H, Tomasello M, Striano T (2005) On tools and toys: how children learn to act on and pretend with “virgin objects.”. *Dev Sci* 8:57–73
- Schacter DL, Addis DR, Buckner RL (2007) The prospective brain: remembering the past to imagine the future. *Nat Rev Neurosci* 8:657–661
- Steen F, Owens S (2001) Evolution’s pedagogy: an adaptationist model of pretense and entertainment. *J Cogn Cult* 1:289–321
- Striano T, Tomasello M, Rochat P (2001) Social and object support for early symbolic play. *Dev Sci* 4:442–455
- van Schaik C (2006) Why are some animals so smart? *Sci Am* 294(4):64–71
- Williams GC (1966) *Adaptation and natural selection*. Princeton University Press, Princeton
- Zaidel D (2010) Art and brain: insights from neuropsychology, biology and evolution. *J Anat* 216:177–183