PART II

The Evolutionary Riddle of Art

The two articles in this section propose different solutions to the evolutionary riddle of art, especially narrative art. (For different perspectives see Carroll, D. S. Wilson, part 1.) The puzzle is roughly this: in ancestral environments characterized by intense competition for survival and reproduction, how could the evolutionary process "allow" any animal to spend (waste?) so much time producing, elaborating, and consuming art—time that could be spent pursuing mates and other quarry? This puzzle is akin to the evolutionary problem of altruism, which has dominated so much of evolutionary thinking over the last several decades. The core problem posed by art and altruism is the same: How do we explain behavior that produces such ostensibly unfavorable cost-benefit ratios? How can self-sacrifice evolve if the sacrificer is, by definition, disadvantaged relative to selfish competitors? How could the artist or aficionado successfully compete with individuals who eschewed cave painting, axe-handle elaboration, and storytelling in favor of hunting, gathering, pursuing mates, lavishing investment on offspring, cultivating allies, and other behaviors that directly augment survival and reproduction?

Evolutionists have been increasingly attracted to this quandary, and debates over the evolutionary role (or lack thereof) of literature and other forms of art will figure still more prominently in coming years. So far, evolutionists have argued that art "behaviors" are the result of direct adaptation (that is, they emerged because they promoted the survival and reproduction of our ancestors) or that they are evolutionary side effects that do not themselves promote survival and reproduction. The articles in this section provide overviews of the existing literature on the subject and propose two different solutions to the problem of

art. While both of these authors may have hit upon part of the correct answer, their answers are quite different and, therefore, cannot both be correct. This is not inappropriate. The thinking on this subject remains at a relatively early stage, where the problems are being defined and potential solutions proposed and weighed. To bring this work fully into the scientific realm, the next wave of research must begin to devise and conduct empirical tests of the competing hypotheses.

Evolutionary Theories of Art

Brian Boyd

The Enigma of Art

Although discussing religion, Daniel Dennett could easily have had art in mind when he wrote: "Any phenomenon that apparently exceeds the functional cries out for an explanation. We don't marvel at a creature doggedly grubbing in the earth with its nose, for we figure it is seeking its food; if, however, it regularly interrupts its rooting with somersaults, we want to know why. What benefits are presumed (rightly or wrongly) to accrue to this excess activity?"[1] Nor do we marvel too much at the bone spear-throwers that helped Paleolithic hunters fell prey at greater distances, but when we see that the handle of a spear-thrower has been exquisitely carved to represent a leaping horse or an ibex turning to watch herself give birth, we want to know why.[2] How can a species as successful as Homo sapiens have evolved to devote so much time and energy to "somersaults" like sculpture, song, and story, rather than stalking steadily after food or mates?

In trying to explain fiction, John Tooby and Leda Cosmides note that the "appetite for the true" that we could expect in any natural data-gathering system like the human mind "fails to predict a large part of the human appetite for information": most people prefer novels to textbooks, fiction film to documentary.[3] In explaining art in general, and our intense pleasure in engaging with art, we need to explain why an "appetite for the useful" fails to predict so much of human activity, from a tribeswoman weaving designs on a basket to a townswoman watching a TV soap opera.

Unless we revert to myths of divine creation, evolution must be part of any complete account of the human, including human art. Many needlessly fear that evolutionary explanations of the human imply "genetic determinism" and the end to hopes of transforming human lives for the better. If evolution can help explain art—human behavior at its freest and most creative—any fears that it implies determinism or denies culture should be dispelled once and for all. No one was ever "genetically determined" to write or read something as unprecedented as *Ulysses*.

Defining Art

But what do we mean by art? What do we include as art? Modern aesthetics argues about what human products count as works of art in response to the challenges to the boundaries and definitions of art posed by modern artists—like Andy Warhol with his Brillo boxes, to cite a much-discussed example. An evolutionary approach tends to see art not primarily in terms of works worth gallery display or literary awards but as a widespread human behavior stretching from ocher body-painting to O'Keeffe.

In this sense, art covers a huge range of activities, from a child making up stories, humming, or drawing in the sand to Tolstoy, Mahler, or Zeng Jing. Let me suggest what they have in common: Art is the attempt to engage attention *by transforming objects and/or actions in order to appeal to species-wide cognitive preferences for the sake of the response this evokes. The more (1) the appeal is purely to these preferences, and the more (2) it operates within some tradition of appealing to (and, hence, elaborating and refining) such preferences, and (3) the more skilled and successful is the attempt to engage attention and evoke a rich response, the more centrally it will be art.*

We engage each other's attention, of course, in casual conversation or in information exchange, but even here there may be elements of artfulness to the degree that we use images, allusions, jokes, mimicked intonations, or ironic deflations as we vivify gossip through selecting, highlighting, animating, reenacting, or stretching the truth toward fiction for the sake of holding an audience. In the metaphors and metonymies and pungent apothegms of Johnson's conversation or the freewheeling amplitude of Coleridge's, or in the dense imagery of Keats's letters or Flaubert's, social exchange shades toward pure art, but not as close as a Keats ode or a Flaubert fiction. For the poem or the fiction has been designed to appeal to still more of our preferences for pattern, situation, character, or story and thereby to catch and hold the attention of any audience, far beyond the naturally shared focus of a moment, a situation, a friendship.

Art, Nature, and Culture

Traditional views of art have tended to see art as reflecting nature, especially human nature, all the way from Plato's discomfort with, or Aristotle's admiration for, mimesis to Shakespeare's or Stendhal's images of art as holding the mirror up to nature. Common-sense traditional views have easily shaded into transcendental views of art, widespread because religious beliefs have been so pervasive and because both artists and their patrons in state or church benefit by nurturing a sense of awe at art's putatively divine origins and power.

The pervasive contemporary critical inclination often known as Theory, but recently labeled more meaningfully Cultural Critique,[4] rightly critiques traditional common-sense and transcendental views, pointing out that the nature, human nature, or supernature that art was supposed to reflect was often merely what was assumed of these things from within a local cultural perspective. Roland Barthes, for example, criticizes "the mystification which transforms petit-bourgeois culture into universal nature."[5] But such critics' critiques also mislead, since they jump to the conclusion that human nature is either nonexistent or is to be explained by culture alone, which they assume detaches human nature from biology. If cultural anthropology has shown that human nature is much more diverse than any one society had assumed, evolutionary biology and anthropology have also begun to discover that culture exists in many animal species (dialects and fashions in bird and whale song, for instance, or in chimpanzee traditions of toolmaking), that there is a universal human nature, and that in humans, too, culture is not *apart from* nature but *a part of* nature. And as many have noted, "explaining" human cultural variation by the power of culture is too circular to be an explanation at all.[6]

In the study of art, stress on cultural difference has even led to the denial that those in other cultures, or in Western culture before, say, the eighteenth century, have such a notion as art. But as Stephen Davies observes, the very concept that there is no non-Western art is a Western one; as Denis Dutton argues, neither the ancient Greeks nor Sepik carvers in Papua New Guinea have a single word to match modern Western "art," but both peoples practice and have concepts of art akin to some of the *many* notions of art currently available in the West.[7] It takes considerable effort to decipher another language, but art can be appreciated and appropriated rapidly across cultures, from Dürer in the 1520s encountering treasures from Mexico and commenting that he had "never seen in all my life anything that has moved my heart so much" or Goethe reading Chinese novels and observing that "These people think and feel much as we do" to Japanese audiences enraptured by Shakespeare and Beethoven.[8] In the nineteenth and twentieth centuries Maori and Sepik carvers picked up Western tools and techniques as keenly as Gauguin or Picasso borrowed from non-Western cultures.

Evolution and Art

Evolutionary theories of art consider art in the light of the first fully scientific attempt to understand human nature. They can ask why art exists at all, how it relates to precursors of art in other species, why it is so prevalent in human behavior. Why *do* we spend so much of our time in sensory somersaults?

There are many evolutionary accounts of art. I will focus on four of the foremost theories of art as possibly a biological adaptation and their most prominent proponents: (1) art is not an adaptation but a *byproduct* of the evolution of human brains by natural selection (Steven Pinker); (2) art is a product not of natural selection but of *sexual selection* (Geoffrey Miller); (3–4) art is an *adaptation,* its chief function *social cohesion* (Ellen Dissanayake) or individual mental *organization* (John Tooby and Leda Cosmides).

In evolutionary theory, an "adaptation" is a biological trait, physiological, psychological or behavioral, shaped by natural selection to enhance the fitness of members of a species.[9] For a trait to constitute an adaptation there must be clear evidence of a fitness-enhancing *function* and of complex *design* toward achieving it.

Many functions of all sorts have been proposed for art over the years by artists, philosophers, and anthropologists puzzled and impressed by the human drive to produce and consume art.[10] But in evolutionary theory, the notion is distinct and strict: "function" means *design* that increases reproductive or survival advantage.

Those who study the human in the light of evolution do so from a wide range of backgrounds. At one end of the spectrum are those close to artificial intelligence and cognitive psychology, who see minds as designed to solve information-processing problems and, hence, in evolutionary psychology, who see aspects of the human mind as having evolved to solve particular problems our forebears had to face in the Pleistocene era. How can we reverse engineer this or that aspect of the mind, they ask, to discover the function it would have served under ancestral conditions?

But others interested in the evolution of the human who come from backgrounds in biology such as animal psychology or primatology often prefer not a single-minded concentration on function but answers to the four questions that ethologist Niko Tinbergen felt necessary to explain an adaptation: Why? (What *function* does it have; how does it help the species survive or reproduce?); How? (What *mechanism* does it operate by?); Whence? (What is its *origin* in the evolutionary history of the species?); and When? (When does it *develop* in the individual?).[11] To be comprehensive on evolutionary grounds, an adaptive explanation of art needs to consider all these criteria.

Evolutionary explanations of art, however, need not claim that art is itself an adaptation. Steven Pinker issues this crisp caveat: "For the same reason it is wrong to write off language, stereo vision, and the emotions as evolutionary accidents—namely their universal, complex, reliably developing, well-engineered, reproduction-promoting design—it is wrong to invent functions for activities that lack design merely because we want to ennoble them with the imprimatur of biological adaptiveness."[12] Art may be explained as a product of the evolved human mind without the further claim that art is itself an adaptation.

Adaptationist or not, a worthwhile evolutionary explanation of art needs not only to account for the biological, psychological, and behavioral evidence but also to add both depth and detail to our engagement with art. It should be able to explain not only how and why art in general exists but also why particular modes, traditions, and works take the form and have the impact that they do.

Art as Adaptation: Attention

"Your brief, should you decide to accept it," my editors wrote me, "is to sum up existing evolutionary theories of art. Because you favor no particular theory, we can trust you to be neutral and objective." After warning them that I was developing my own theory, I accepted the brief. But after trying to present only the theories of others, I found that aspects of my assessments so presupposed my theory that I had no choice but to outline it first. To summarize it as I have the others, it is this: art is an adaptation whose functions are *shaping and sharing attention,* and, arising from that, fostering *social cohesion* and *creativity.*

Although much evolutionary psychology stresses a single function for a single adaptation, there is no reason to exclude multiple functions. An elephant's trunk evolved so that it could sniff, dislodge, grasp, pull, deliver, push, twist, caress, trumpet, siphon, and squirt.[13] Although much evolutionary psychology settles on adaptations at a single level, the individual or the group, there is also no reason not to accept the multilevel selection that David Sloan Wilson has argued so persuasively for.[14] The explanation I propose is both multifunctional and multilevel.

To explain art we have to attend to attention. Art dies without attention, as has often been seen both without and within evolutionary explanation.[15] But except for Ellen Dissanayake's *Art and Intimacy,* even evolutionary studies of art have not investigated the special role shared attention plays in human lives from infancy onward.[16] All organisms must attend to the opportunities and threats that matter to them, as far as their minds and senses allow. But something peculiar happened to attention in humans.

In chimpanzees and bonobos, the color contrast in the eye between sclera and pupil is greater than in other apes and monkeys, and in humans the contrast is still greater, a sign that the ability to monitor the direction of others' attention has mattered more to humans than even to our nearest relatives.[17] Monkey babies lack the stimulus tools to capture and hold their mothers' attention. Chimpanzee mothers rarely gaze at their babies or communicate with them, though they will respond when babies initiate play by biting, and will tickle and laugh in tender reply.[18] But human mothers and infants attend to one another from the first. Infants' eyes after birth can focus only about eight inches away, the distance

between the mother's breast and her face, and unlike infants in other species they maintain eye contact while suckling. Newborns preferentially attend to faces and under laboratory conditions have been shown to be capable of imitating humans, but not animated models, within an hour of birth.[19]

So it continues, in infant and adult. Out of the early features of human attention, especially the capacity for shared attention, humans, uniquely, develop a full theory of mind, a capacity that by the fifth year allows children to appreciate what others can infer from their situation. The unique sharing of precise attention among humans ultimately leads to language and the capacity to pinpoint attention even to the extent of directing others to something absent and perhaps unreal, impossible, or unprecedented and to an ability to understand multiple-order intentionality, to conceive what A thinks of B's thoughts of C's thoughts of D's.[20]

All intelligent animals can focus on the immediate present, expectations of the immediate future, and perhaps some recollections of their personal past. But we alone, because of our special capacity to share and sharpen attention, can focus our minds together on particular events of the past as experienced or witnessed by ourselves or others, living or dead, on possibilities and impossibilities, and on events hypothetical, counterfactual, and fictional. Most animals cannot afford *not* to attend to their immediate environment and cannot easily reason beyond it. But the human capacity to think beyond the immediate allows us an extraordinary power to test ideas and to turn them through the vast space of possibility.

Evolution could not build into even an intelligent animal either an organ of truth, to soak up the discoveries of science, or an organ of useful design, to produce the tools of technology. It has no foresight; it can select only on the basis of current variation, and it can construct cognition only using input from each species' immediate environment. But by slowly expanding the human capacity for sharing attention, and by making it pleasurable for us to explore possibilities *not* limited by the here and now, evolution has gradually lured us into finding ways to search more and more widely for truth and design.

My evolutionary theory of art, then, is this. In humans, social attention, which had been developing in importance in the primate line, especially among the apes, became still more important: earlier, more intense, more interactive, more flexible, more precise, more powerful.[21] Because shared attention had come to matter so much, especially as infants were born less fully developed and remained longer in childhood, the ability to share and shape the attention of others by appeals to common cognitive preferences led to the development of art: to behaviors that focus not on the immediate needs of the here and now but on directing attention and engaging emotion for its own sake, even toward distant realities and new possibilities.

Art therefore has an immediate *individual* function, since keeping up with attention is essential to us (the threat of cutting off attention is a human universal,

and the risks of exclusion severe)[22] and since commanding attention is an advantage (it correlates closely with status).[23] It also has a *social* function, in increasing social attunement and social cohesion. Societies that could coordinate more closely could outcompete those with less coordination or more internal competition, and there is good reason to think that on average societies with shared costume, song, dance, and heroic or admonitory story could coordinate better than those without. And art has a further individual *and* social function in creativity, which leads not only to the triumphs of tribal art or the flourishing of Florence but also to the emergence of religion and, eventually, the invention of science.

But this is not the place to elaborate. What of other evolutionary accounts of art?

Art as By-Product

Even those who accept that evolution has adapted the human mind in highly specific ways can argue that art is no adaptation but only a by-product of the brain's complexity. Steven Pinker has famously explained "how the mind works," how it has been adapted by evolution rather than left a "blank slate." Once on the verge of choosing an engineering career, he sees evolutionary psychology as "reverse engineering" the mind, taking apart its components to determine their function, but he finds no evidence that the mind has any specific design for art. He therefore rates art as not an adaptation but an evolutionary by-product.[24]

For Pinker we have not only, like other species, our own special suite of evolved cognitive preferences but also an evolved capacity to design artifacts to ends we desire. Narrative, he concedes, may serve an adaptive function in enabling us to develop scenarios to test possible courses of action and their consequences without risking real-world harm.[25] Otherwise, he considers art a by-product, in which we deploy our capacity for design to deliver high-energy treats to our cognitive tastes, to concoct "cheesecake" for the mind, or to develop "a useless technology for pressing our pleasure buttons" by "defeat[ing] the locks that safeguard" them.[26]

Pinker rightly stresses the role of our cognitive preferences, which did not evolve *for* but are appealed *to* in art. Here, indeed, lies a rich research program for the new sciences of the mind: just what are the preferences that music, visual art, and literature appeal to, how and why have they evolved, and how are they traded off against one another in art?[27] In his most in-depth examination of a single art, Pinker summarizes the work of other psychologists and offers additional suggestions about the mental mechanisms behind the pleasures of music.[28]

When Pinker calls art "a cheesecake for the mind," he implies that just as we have developed technologies to satisfy our evolved taste preference for

sweetness—valuable at a time when high-calorie foods had to be actively sought out—so in art we have developed technologies to satisfy other cognitive preferences for rich aural or visual or social information. His metaphor becomes a motif throughout his major examination of the arts and is meant to provoke. But as he often does, Pinker rhetorically substitutes a particular preference which evolution could never have selected for, for a general one which it could. A Porsche or a linen suit may help to secure a partner, he remarks elsewhere, but is not an adaptation. No, but capacities to display and assess signs of status have evolved in many species, as in humans.[29] And if we compare our taste for art in general with our taste not for cheesecake but for sweetness in general, art may seem much less improbable as an adaptation.

Pinker's metaphors—cheesecake, pleasure-buttons, or music as "a cocktail of recreational drugs that we ingest through the ear"[30]—foreground art as consumption. But before we respond to art, we first have to generate it. In modern society ready-made art is as available as ready-made cheesecake, but for most of human history and in most societies, art results from the efforts of all, as people weave and carve, sing and dance, tell and reenact stories. The compulsion to engage in art needs to explain the compulsion to *make* art as well as to enjoy it. Art has usually involved intense effort, and the cheesecake metaphor fails to explain why in every society that effort has seemed worthwhile.

Art as cheesecake seems an indulgent extra. But if art were so superfluous, how could it not have been selected against? Why would groups without art, and therefore with much more time and energy for practical purposes, not have outcompeted, outbred, and ultimately outlasted their more self-indulgent neighbors? The fact that all known societies engage in art[31] suggests that it has advantages strong enough for a predisposition to art to have become part of the design of the human mind.

The cheesecake metaphor has a specific evolutionary overtone: that art might even be maladaptive, just as our once adaptive appetite for sweet and fat now threatens us with an epidemic of obesity. Paul Hernadi replies to Pinker's implication by suggesting that it explains only "why too many literary calories may clog our mental arteries" *today*, when we can buy novels and videos a few supermarket aisles past the cheesecakes. But turned around the other way, Hernadi notes, the metaphor might suggest that "well-adapted early humans were pursuing scarce mind-sharpening opportunities for protoliterary experience with almost as much gusto as they pursued meals rich in fats and sugars": the arts *were* adaptive.[32] In fact, they seem to remain so. Despite the increasing abundance of art, despite complaints about the dumbing down of culture, despite children having ever more music, story, and art available in print, on screen, on disc, no epidemic of intellectual obesity threatens us, and as the Flynn effect notes, IQ levels have risen with each decade since they were first measured.[33]

Pinker explains art as our applying our design ability to feed our inbuilt preferences. But why does he assume that our ability to design developed only in purely instrumental modes? The ibex on the spear-thrower found at Mas d'Azil in France required far more design skill than the spear-thrower itself. It seems at least arguable, and in fact highly likely, that art has helped ratchet up our interest in, capacity for, and confidence in design as it has helped us to think beyond the given and to generate the new. A society whose members wove elaborate and superfluous designs because they were pleasing was in a better position to think up a woven eel-trap than a putative society focused exclusively on utilitarian technological solutions could think up decoration for clothing, containers, or coverings.

In *How the Mind Works* Pinker challenged those who might argue that art is an adaptation. Five years later, in *The Blank Slate,* he reaffirmed his position but stressed that "Whether art is an adaptation or a by-product or a mixture of the two, it is deeply rooted in our mental faculties."[34] The limitation of Pinker's treatment of art lies not in his treating art as a by-product but in an insouciance that results from his ignoring the link between artist and audience, his overlooking the role of shared attention in human life. By detaching seemingly pointless design from seemingly indulgent delight, he fails to explain why anyone should have ever wanted to make prodigious efforts to move others, or why we should all care so much about being so moved.

Art as Sexually Selected

Art can seem as showy and superfluous as a peacock's tail. That amazing appendage costs its bearer energy to produce and maintain and makes the peacock both more conspicuous to enemies and less able to elude them. How could ornaments like that have evolved in a competitive world? Charles Darwin realized that such extravagant caprices, such somatic "somersaults," appeared to challenge his theory of natural selection, but he explained them through his additional theory of *sexual selection*.[35] Males can fight each other for access to females, developing in size (like a bull elephant seal) or armaments (like the horns of a stag or a stag beetle), or they can compete to attract females. In the latter case the mere *sensory biases* of the female could, over many generations, shape the appearance or actions of the male, producing striking colors or forms (like the peacock's tail) or behaviors like song (in many songbirds), dance (in lekking birds) and bower-making (in bowerbirds).

Sexual selection theory has been extended and clarified in the twentieth century.[36] The theory of *runaway sexual selection* explains that if peahens, say, preferred to mate with peacocks with showier tails, the male tendency to produce

and the female tendency to prefer elaborate tails would both be passed on and would compound one another until survival pressures set a limit. The concept of *fitness indicators* suggests that sexual selection might often reflect not arbitrary biases but factors that outwardly manifest some inner advantage. As recent findings suggest, only the healthiest of animals, such as those freest of parasites or commanding the richest territories, can display the brightest colors or sing the loudest songs.

Robert Trivers's theory of *parental investment* further explains why it is usually the female, not the male, which is the choosier sex. Whichever sex invests more time and energy in producing offspring (usually the female, since by definition the female is the sex with the larger gamete) has more to lose in producing offspring with a partner with poor genes; whichever sex has the lesser investment (usually the male) has more to gain by being chosen by as many partners as possible. Males chosen by many females can have huge reproductive success, since their investment in any partner can be brief and they can move on to others; but males chosen by none may fail to produce offspring at all. Because of the great variance in male success, there is intense pressure on males for access to females, whether by fighting other males or by attracting females.[37]

Darwin himself had little to say about the origins of human art, but he thought that in humans as in other species "high cost, apparent uselessness, and manifest beauty usually indicated that a behavior had a hidden courtship function."[38] He ventured ("not too plausibly," comments Pinker) that music developed "for the sake of charming the opposite sex" and that body adornments formed a beginning of human visual art.[39] Although others have suggested in passing that art may owe something to sexual selection,[40] Geoffrey Miller is the first to propose on a major scale that sexual selection has been the driving force behind the expansion of the human mind and higher human behavior: intelligence, inventiveness, art, humor, kindness.

Miller presents himself as an evolutionary hard man: "Adaptation can arise through natural selection for survival advantage, or sexual selection for reproductive advantage. Basically, that's it."[41] He notes that evolutionary psychology has almost always searched for the former and overlooked the latter, and he seeks to redress the balance. He rejects other approaches as being insufficiently rigorous. Identifying a plausible origin of, say, music, is insufficient to explain an adaptation: "Evolution just does not work like that. Instead of speculating about precursors, the adaptationist approach puts music in a functional, cost-benefit framework and asks theories for just one thing: *show me the fitness!*"[42]

Hard on others, Miller proves soft on the sexual selection he so favors. So convinced is he of its power that he thinks it can explain almost anything about us: "any feature one is even capable of noticing about somebody else . . . could have been sexually selected."[43] *Could* have been. But to demonstrate that this or

that feature actually *has* been sexually selected requires more than quickly dismissing other alternatives such as natural or social selection.

Miller suggests that among the higher apes, one species could have been sexually selected for muscle mass, becoming gorillas, another for constant sex, becoming bonobos, a third for creative intelligence, becoming humans.[44] He does not note that ecology and diet can explain the large size and the harem-guarding sexual system of gorillas or the open sexual and social system of bonobos.[45] When he claims that human minds "are entertaining, intelligent, creative, and articulate far beyond the demands of surviving on the plains of Pleistocene Africa" and that psychology has been wrong to view them as computers that learn to solve problems rather than "entertainment system[s] that evolved to attract sexual partners," he neither explains why creatures in the plains of Pleistocene Africa would suddenly develop such odd preferences nor considers the huge energy costs of a larger brain.[46] Intelligence would help *any* species respond to its environment more flexibly, but few lineages have evolved it to an advanced degree because of the steep cost and the lack of intense selection pressure—which is exactly what hominids were under on the African plains, being so much slower on two legs than the four-legged prey that speedy predators could already catch. *Preference* for intelligence would come only when intelligence had already become central to a species' mode of existence.

Miller impatiently dismisses the power of *social* as compared to sexual selection in human evolution. Sexual selection indeed has an immediate bearing on whose genes are recombined with whose; but in a species as highly social as humans, social selection affects us throughout life, impacting on our survival to reproductive age, our chances during sexual selection (on average a male achieving higher status through social selection by other males has better sexual prospects than one with lower status), and our chances of supporting children to *their* reproductive success. Miller can write almost as if we did not engage with one another except to mate. After arguing, not implausibly, that the size and shape of the human penis and breasts are sexually selected, he observes that we stare at faces instead of the penis or breasts because these are the most complex and richest indicators of possible mutations: "We pick the one part of the body where fitness differences are most manifest, and regard that as the seat of personhood"[47]—as if we did not have to watch the faces of others to predict their intentions, moment by moment, from infancy to old age, to select whom to engage with and on what terms.

As parental investment theory explains, males can compete over anything: even, as Dissanayake notes, who can pee the highest.[48] With so many potential means of display at hand, males' capacity for competitive display explains little about behavior as biologically improbable as carving likenesses or composing epics.

Miller notes that "male pigeons harass female pigeons with relentless cooing and strutting. If the females go away, the male displays stop. If the female comes back, the males start again."[49] The very difference between pigeon pouting and human art should give him pause. If art were sexually selected, this would predict that it is overwhelmingly male and directed to females, it begins only with puberty, it peaks just before mate selection, and it diminishes drastically afterward. Miller does adduce statistics to show that rock and jazz musicians produce most records in early maturity,[50] but mothers of all cultures sing to infants; infants prefer their mother's singing to their father's; infants of both sexes engage in cooing and singing, clapping, and dancing as soon as they can; adolescent girls go wild over all-female bands like the Spice Girls or Destiny's Child; Hokusai, who in his seventies and eighties adopted the nom de plume Gakyô-rôjin, Old Man Mad with Painting, was still producing masterpieces in his ninetieth year and pleaded on his deathbed for more time: "With even five more years . . . I could become a true artist."[51]

While males strut, females select. If they select according to sensory biases on the basis of caprice and chance initial conditions, as sexual selection theory allows, this would offer little opportunity to *explain* the particular features of forms and works of art except to record a succession of arbitrary inclinations. If, on the other hand (Miller hesitates to choose between alternatives, so long as they support sexual selection), females select according to fitness indicators, can *this* explain art? Miller hopefully proposes that artistic talent might be a reliable fitness indicator. Blind Homer, castrated Farinelli, deaf Beethoven, syphilitic Schubert, manic Schumann, epileptic Dostoyevsky, neurotic Proust, psychotic Woolf?[52] "Imagine a tribe of hominids," writes Miller, "half of them male and half female, all single, all just reaching sexual maturity at the same time. Some males have higher fitness than other males, and they advertise their fitness using fitness indicators such as vigorous dancing, intelligent conversing, or realistic cave-painting."[53] Miller here shows little sense of either hominid social life or of art—of what it might actually take for a species to develop the capacity, taste, traditions, means, and occasions for realistic cave painting.

In insisting on fitness, Miller rejects questions of origins. In fact the identification of a pathway is a necessary part of any complete evolutionary explanation, and in the case of music, Steven Brown shows that the most complex song outside humans, both in songbirds and in other primates, arises not from courtship but in the maintenance of territory and relationships by several species of monogamous duetting tropical songbirds and by gibbons. He notes that duetting resembles human music in several ways that "cannot be accounted for by a courtship hypothesis of music": first, "responsorial, antiphonal, polyphonic and homophonic singing. . . . [which] greatly increases the potential complexity of acoustic signals"; second, both sexes are singers and "make more or less equivalent contri-

butions to the song"; third, "duetting is cooperative and coordinated, rather than competitive or disjoint. Gibbon couples place a high premium on maintaining tight coordination and restart a duet if the appropriate level of coordination is not achieved. . . . Duetting is not a contest but a display of cooperative strength"; fourth, duetting "is involved in defending year-round territories . . . , just as in many human tribes and bands," and serves as "a highly ritualized 'keep out' signal accompanied by exaggerated physical displays"; and fifth, it plays "a significant role not only in defending territories but in maintaining social bonds." Brown adds that "none of the known primate calls is thought to be directly involved in courtship. Primates do not seem to exploit vocalization for courtship purposes, but instead rely on visual, olfactory and kinetic cues. Courtship calls are rare to nonexistent in hominoids, whereas territorial calls are ancestral to the entire group of species."[54]

Brown's examination of analogies (functional equivalents in other taxa) and homologies (structural similarities in closely related taxa) offers a very different approach from the strict adaptationist line that Miller advocates. Not only does Brown's ethological approach respect biological detail and analogues to precursors of human behaviors in other animals, it also respects the peculiarities of a human art.[55] Brown can show that qualities like pitch blending and isometric rhythms, central to music, can be explained by the need to coordinate sound between more than one participant but not by individual display.[56] Recent evidence even suggests that music *reduces* sexual inclination: singing *lowers* men's and *raises* women's testosterone levels, a result compatible with a cooperative but not a competitive account of music's origins.[57]

Miller's search for evidence in support of his hypothesis, and the search for counter-evidence his statistical work has inspired in Brown and others, are both welcome ongoing research programs. There is no doubt that sexual selection does operate in *some* ways among humans. Wodaabe men in Nigeria and Niger are chosen by their women in the human equivalent of a lek dance and are unusually tall with strikingly big eyes, white teeth, and straight noses.[58] Such a stark example stands out by its difference from the human norm, but over thousands of generations sexual selection no doubt *has* played an important part in human life, especially, as Darwin and Richard Dawkins suggest, in the differentiation of superficial racial characteristics like face and hair,[59] and it may also serve as one factor in human art, especially visual art.

Ocher appears to have been sought for body decoration from as early as 120,000 years ago, and other body modifications, such as hairstyling, tattooing, scarification, and body piercing and the like have been practiced around the world for tens of thousands of years.[60] As the recent fashion for body piercing in Western countries highlights, such activity peaks at the ages of maximum reproductive opportunity. It makes biological sense that the visual arts should have

started with the kind of display of the body most likely to have a sexual payoff. But notice here the difference from sexual selection in other species. In prehistoric times, before mirrors, and even now in the case of tattooing and other modifications, body and facial adornment often had to be not an individual practice but a social one. Songbirds do not chorus in support of their rivals, and bowerbirds do not help other males to construct their bowers. But from an early time, even at the closest to sexual selection we find in the arts, cooperation seems also to have been present in our highly social species. And as Kathryn Coe notes, elaborate body decoration in most societies serves primarily as a mark of affiliation and group identification.[61]

Marek Kohn and Steven Mithen have proposed that the knapping of Acheulian hand axes may be an even earlier, and sexually selected, precursor of visual art. The sheer number of hand axes found in some sites, the proportion that under microscopic examination show little or no sign of use, the high and perhaps excessive degree of symmetry and finish, and the existence of forms too large or small for apparent use, all suggest strongly that hand axes may have been refined to a degree far beyond need, in a way best explained in terms of sexual or social selection: as a display to others of prowess and judgment. Notice that this proposal, which Miller naturally endorses, has a detail absent in Miller's own arguments and reveals an awareness of the slow increments by which the first impulse of the visual arts may have developed.[62]

Art as sexual display does not explain *nothing* about art. But the very flexibility of human behavior suggests that sexual selection has been an extra gear for art, not the engine itself. In our species, unlike in peacocks or bowerbirds, there are scores of different criteria, many uncorrelated and some contradictory, by which females can choose male partners: muscularity or intelligence, competitiveness or cooperativeness, liveliness or calmness, zealousness or circumspection, practicality or imaginativeness, adventurousness or steadiness. In such circumstances sexual selection can have far less force than in creatures with much narrower criteria.

But there is one reason young men and women might especially want to look for a social entertainment system in each other: because of the playful interaction between infants and mothers or others at the start of all human lives that arises from, and ingrains more deeply in us, the unique importance of human shared attention (see the following section). With that disposition to sharing attention taken into account and admitted as the impetus for art, *then* sexual selection may explain an escalation of adaptations for sociality and for art.

Differential parental investment—higher male competitiveness, higher female choosiness—can then hint at part of the reason for the preponderance of males over females in art for public display, although women seem always to have participated in song, dance, weaving, and storytelling, especially near the home,

as much as or more than men. Even if sexual selection for male artistic display has played a role in the arts, it should be stressed that this would not necessarily entail that males are more artistically capable. The genes necessary for good male performance would pass to both male and female descendants unless they happen to be located on the Y chromosome (1 chance in 23)—although they might then be activated only by sex-differentiated hormones, such as testosterone—while the genes necessary for female appreciation *cannot* be located on the Y chromosome and would therefore descend to offspring of both sexes. In *The Tale of Genji,* Genji wins a painting contest against his friend To no Chujo and, as a result, the adulation of many women.[63] But this novel, the world's first, and the pearl of Japanese literature, was written by a woman—and a mother.

Art as Adaptation 1: Communion and Community

Ellen Dissanayake has made the most persistent and extensive of all attempts to explain art in evolutionary terms. In *What Is Art For?* (1988) and *Homo Aestheticus*[64] she begins with an intuition, based on her wide knowledge of both Western and non-Western societies, that art matters to all people and therefore requires a biological explanation. Art should be recognized as a specieswide adaptation, she argues, for the following reasons:

1. It is universal in human societies. (She adduces a mass of cross-cultural evidence.)
2. It involves high commitments of time, resources, and energy. (Ditto.)
3. It produces strong pleasure and other intense emotions. (She notes in some detail that pleasure is the brain's sign of what has on average offered evolutionary benefit and that emotion is evolution's way of indicating importance.)
4. It is associated with biologically significant activities.
5. It develops reliably in all normal humans without special training.

Dissanayake also begins with another intuition, that modern Western art is a poor place to start thinking about art in biological terms. She argues that the rise of an art-for-art's-sake aesthetics in the late-eighteenth-century West makes it hard to understand art as an adaptation because it stresses the *non*functional, whereas in non-Western societies whole communities invest heavily in artistic activities that they feel to be not optional and peripheral but obligatory and central. The rise of the artistic avant-garde in the West in the last century and a half further obscures an understanding of art as a human universal because it involves an unprecedented degree of specialization, innovation, mechanical reproduction, and,

therefore, exposure to examples of specialized artistic innovation. This saturation in turn drives some artists to still more radical innovation, even or perhaps especially if it runs counter to the cognitive preferences from which art arose.

In stressing both art as an adaptation and the remoteness of modern Western high art from the conditions in which art emerged, Dissanayake is surely correct. She is also correct to insist that art should be seen not so much in terms of *works* of art but as a behavior. But if art is an adaptive behavior, what is its function? Dissanayake knows, as she lists some of the functions proposed by anthropologists, ethologists, psychologists, and aestheticians, that there is no shortage of suggestions and no sign of convergence: art as direct, immediate experience or as mimesis, as the imitation of experience; as training for the unfamiliar or as defamiliarization; as a source of individual "mastery, security, and relief from anxiety," as a mode of individual display, or an assertion of individual prestige; as communication with others or a means of group identification; as providing a sense of meaning or order to the world or access to a supramundane world.[65]

In her own attempt to find art's highest common factor and its importance as part of the lives of all peoples, Dissanayake proposes describing art as "making special," as a behavior that she shrewdly observes has close affinities with two categories of biological activity (of "doing special," as it were) common in other species as well as our own: play and ritual. Play involves behavior outside the immediately functional, marked as such through particular forms of movement and expression, is pleasurable in itself and is therefore pursued for its own sake. Ritual, a key concept in animal behavior, as in the courtship rituals of many birds, involves behavior fixed and formalized, elaborated, exaggerated, and repeated for the sake of communicative clarity.

Because art in the Western art-for-art's-sake sense could never have directly become a biological adaptation, and because art nevertheless shows all the signs of being central enough to human lives to be adaptive, art therefore, Dissanayake proposes, *must* be "making special," it *must* have been associated with, and have enhanced, activities that mattered. But this does not follow. All animals engage in activities that matter to them, or they will fail to survive and reproduce. But they do not need art to make those activities matter: nature has ensured, through the motivation system of the emotions, that they perform what they must for their survival. And in the human case, art may embellish things of little importance and not those that matter most: ploughs have been crucial to agriculture and therefore to culture itself for millennia, yet they are almost never "artified," whereas in traditional cultures baubles or toys like stilts can be elaborately carved.

Dissanayake's repeated claim—that a society that treated as special any activities of prime importance to it would survive better than a society that did not—seems implausible. If the activities matter, the society already performs them; if it does not, it is already in danger. She writes: "making life-serving imple-

ments (tools, weapons) special both expressed and reinforced their importance to individuals and would have assured their more careful manufacture and use."[66] But hand axes already mattered among our hominid precursors, and they appear to have become essential to the way of life of *Homo erectus*. Overrefining their symmetry or toying with their scale, in the way Kohn and Mithen discuss, may have been early precursors of art and could be classed as "making special," but while this extra skill and effort may have earned the respect of others, it would not have clarified the importance of hand axes to groups that already relied on them.

"Making special" alone seems unable either to encompass all art or to explain its origins or adaptive force. But in her most recent book, *Art and Intimacy: How the Arts Began* (2000), Dissanayake has developed a much more cogent argument. Where Miller sees art as sexually selected, as something humans engage in so as to attract mates, Dissanayake here sees art as arising from the uniquely intimate contact of human parents, especially mothers, with their children. Dissanayake's "attunement" is close to my "attention" (which however allows more room for individual as well as shared attention).

For the first six months, infants have a love affair with human faces, voices, and touch. By about eight months, parent-infant "protoconversations" set the scene for the special nature of human sociality and for art. Aptly described by Dissanayake as multimedia performances, since they use eyes and faces, hands and feet, voice and movement, these protoconversations consist of rhythmic, finely attuned turn-taking and mutual imitation involving elaboration, exaggeration, repetition, and surprise, with each partner anticipating the other's response so as to coordinate their emotions in patterned sequence. From about nine to twelve months, infants tune into the attention and behavior of adults in new ways and try to have adults tune into theirs. By the end of their first year, they engage in joint attention (following another's hand or eyes or checking to see that the other follows its own) and in protodeclarative pointing (indicating an object or event simply for the sake of sharing attention toward it).[67] Human mothers and others provide a social entertainment system for infants, evolution apparently having selected for both adults and children who can turn the uniquely protracted dependency of human childhood into mutual delight.

With this crucial new addition, we can now return to the problem Dissanayake addresses in "making special." Her aim in proposing the term has been to distinguish art as practiced around the world, in mother-and-infant song-and-dance and a myriad other forms, from the Western elevation of art above life through the Kantian distinction between impractical art and the practical aspects of life.

Dissanayake is right to stress that this distinction is unhelpful, since to many peoples—even in the West (the icons in the Russian Orthodox tradition, for instance), let alone in tribal societies—art involves practices considered central and necessary to their lives. But rather than replacing the distinction between

nonutilitarian art and the utilitarian with a distinction between "making special" and, implicitly, "leaving ordinary," I would suggest, we can understand art better by focusing on a distinction that has always been central to human understanding: the distinction between the physical and the nonphysical (the psychological, in modern terms; the spiritual, in older ones).

In one sense, this distinction is crumbling as science investigates the intricate connection between mind and brain. In another sense, cognitive anthropologists and developmental psychologists are exploring it in new ways as a fundamental dichotomy in human understanding of the world, even before language. New techniques make it possible to study how infant minds distinguish the ontological domains of inanimate and animate, bringing different expectations to and drawing different inferences from the two different domains (called "folk physics" and "folk psychology" in one set of terms; "theory of things" and "theory of mind" in another).[68]

From this and other recent findings, significant implications follow for understanding art and its relation to religion and ritual. Art has no immediate physical function but only an immediate psychical one: to appeal to attention and emotion. A decoration on a bowl does not change the bowl's physical capacity but does change its psychological appeal; a harvest song does not by itself gather crops but alters the attitude of the harvesters; a story does not bring about its own outcome but causes an audience to feel and respond as if they had witnessed the events. In each case, the effect is on those who encounter the artwork, whether design, music, or story.

In the initial and default case, across the world, art affects human beings, both active "artists" and reactive audiences. But many peoples believe that it will also have an effect on other kinds of beings in the spiritual world, beings presumed to respond in ways similar enough to *human* spirits that they too will be moved—and moved, perhaps, to intervene for, or not intervene against, those who have made the artwork or accord it respect.

Two points need to be stressed here. First, the impact on human beings is there from the first: the songs, shapes, or stories are, after all, designed to secure human attention. Second, the impact on—and indeed the very supposition of—imagined other beings also depends on art, on the power of story.

We crave one another's attention, but no one wishes to pay attention to a story that discloses only the banal and expected: one would be better off attending to the real world. To merit attention, stories select the striking: unusual characters or events or both. Recent research shows we remember best stories with characters who violate our categorial expectations, who cross one animal kind with another, who combine human and animal, or who separate the psychological from its usual physical embodiment.[69] Even now we attract attention in stories by crossing categories, by introducing aliens, mutants, and robots. And creatures with psychologi-

cal powers but not limited to consistent physical embodiment or causation—spirits or gods—have been central to story from as far back as we can see.

We see our own agency as our prototype of cause: we want to move something, and we do. We make an early and lasting distinction between agents and nonagents, between the animate and the inanimate, and we are prone to overattribute agency: it is safer to err in that direction than in the other, to suppose a bush is a bear rather than the other way around.[70] And because we pay such extraordinarily close attention to one kind of agent, to others of our kind, we humans have uniquely evolved an understanding of false belief—a capacity to see that others, or ourselves, may conceive a situation differently from what it really is.[71] Because we understand false belief, because we can appreciate that we might not know the full situation, we crave the whole story; we seek an explanation that goes behind what we can see.

Spiritual agents as unseen causes are therefore not only memorable figures in story but offer us an apparent and eagerly sought completeness of explanation. Because *we* are moved by song, by images, by stories, because these things have been *designed* to move us, we suppose that these unseen forces may also be moved in similar ways. And because we can envisage the future in a vivid enough fashion to become anxious about uncertain possibilities, we are ready to move the unseen spirits to act more in our favor, or less in our disfavor, with the help of the art that so catches *our* attention and stirs *our* response.[72]

Because unseen spirits can be supposed to monitor what we do even when no one appears to be watching, a society-wide belief in such spiritual powers can help solve the problems of cooperation inherent in any individualized society—any society, that is, whose members are not genetically identical (like slime molds), very closely related (like ants or termites), or in loose aggregates (like mackerel or wildebeest). A human society unified by religion will usually be able to solve problems of cooperation more easily than another without.[73]

But if a society is bound by a common religion and indeed other common values that facilitate cooperation, a further problem emerges: that of ensuring that members of the society are genuinely committed to these shared beliefs. One way of doing this is through what biologists have studied in the animal world as "costly signaling."

Costly signals, although they can be used in the competition of sexual selection, have also been shown to have a powerful effect within many species in reinforcing group cooperation.[74] If a signal has low cost (as in the case of a mere display, promise, or claim), it can be easy to fake. High cost in terms of time, effort, or resources can serve as a guarantee of commitment (only those genuinely committed to the group will be prepared to make the commitment), and biological and historical human case studies show that groups that cement their cohesion by costly ritual can outcompete groups without such ritual.[75]

Costly signaling theory alone does not explain why such a costly activity as religious ritual should take an artistic form in humans. After all, ritualization of practices with high cost but little sensory appeal—prostration, prayer, recitation, offerings, tithes, fasting, sacrifice, mutilation, pilgrimage—can also serve as cohesive social signals. But ritual *with* art has several advantages over ritual without. Art may increase the time and energy costs in ritual preparation and, therefore, the signal value of the commitment, as in the striking example of the *mbari* houses of the Owerri Igbo which Dissanayake describes.[76] Art promises pleasure, engages the attention, stirs the emotions, and arouses pride and awe at the effects produced and the mastery exhibited. The very improbability of any artistic practice makes it a distinct marker, a contrast to the natural and to other rival groups, and hence in both respects a source of pride.

Art, therefore, though it begins in engaging the attention of other humans, can readily be commandeered both to engage the attention of putative spiritual beings and to ensure social cooperation at the human level, whether in the service of the gods or not. Dissanayake places a powerful stress on art as ritual, and Kathryn Coe emphasizes even more strongly that art has been traditionally used to solve the social problem of cooperation.[77]

In Dissanayake's or Coe's sense, traditional art is often far from nonutilitarian: it can have what seems the highest practical purpose possible—securing both the good will (or staving off the ill will) of the spiritual world and the focus of the group on these powerful and unseen agents. And as already noted, this "practicality" is not an illusion: case studies confirm that the advantages of social cohesion can easily repay the effort invested in ritual practice and outweigh the disadvantages of belief in nonexistent spiritual forces.

But even amplified by evidence unavailable to Dissanayake in the 1980s and early 1990s—physical versus psychological domains in cognitive anthropology and developmental psychology and multilevel selection and costly signaling in evolutionary biology—the social effects of religion and ritual cannot explain the *origin* of art. Without the art of storytelling, without the human impulse to catch and hold the attention of others through narratives that include agents with expectation-violating, larger-than-life powers, religion could not have arisen; without costume, architecture, and design, without dance and music, without verse and story, ritual could not pass beyond the penitential and sacrificial and engage the community in such awesome affirmations of its identity, values, and connection with forces beyond.

The religion and ritual to which Dissanayake tends to assimilate art in her first two books may not explain the origin of art—though her third book comes close to doing so—but this does not mean that once art began, social cohesion through group artistic traditions, including ritual traditions, could not become a powerful sustainer of art and, indeed, perhaps its main function, even in strict evolutionary terms, in many small-scale societies without specialist artists. The

very power of art to move the spirit—Dissanayake cites a Dogon sculptor who reported he occasionally created something "that made everyone who saw it 'stop breathing' for a moment"[78]—makes art natural to associate with religion and ritual. I would therefore make an even stronger claim than Dissanayake's: that art has played a central function in human lives not only in itself but also in giving rise to religion and *then* reinforcing, through augmenting the impact of ritual, religion's power to cement group cohesion.

Yet if art can seem at its most powerful when tightly linked with religion and social cooperation, this does not mean that even in traditional societies art does not also persist in other ways closer to play or to trade than to ritual. We enjoy the sharing and shaping of attention, and although we may coordinate attention through ritualized art, we also, because we are not genetically identical, compete for attention. Especially as societies expand and diversify, and division of labor becomes widespread, art can become professionalized and secularized as well as communalized and spiritualized. At its highest, even secular art may retain religious art's sense of offering not just intense interest but deep explanation and exaltation and of drawing on a spiritual power somehow linking us through our artistic heritage. Or art may remain closer to a less exalted, less spiritualized, perhaps more playful form of catching the attention in popular and folk arts and crafts. Or it may, under the pressure for attention in a highly specialized world, lead even to avant-garde art, to questioning and debunking the heritage and shared values or to challenging tried and traditional ways of catching attention.

Instead of the mighty creatures of old story, the gods and demigods mingling with humans in the *Epic of Gilgamesh* and the *Mahabharata*, art can secularize itself to focus on outstanding humans like Genji or Hamlet, then on ordinary ones like Leopold Bloom or the Makioka sisters, then on subfunctional characters like Beckett's, or can fracture or altogether undermine character as a component of story, as in Robbe-Grillet or Godard. But art, whether before religion, in the overrefining of Paleolithic hand axes, or in societies held together by religious belief or in secularized modern or postmodern societies, always serves to engage attention. In identifying the source of our uncannily responsive attention to one another, and hence of our art as well as our social attunement, in the initial intimacy between infants and mothers or others, Dissanayake is surely right.

Art as Adaptation 2: Fiction as Mind Organization

Evolutionary psychology announced itself as a research program in the late 1980s and early 1990s in a series of manifestos by John Tooby and Leda Cosmides.[79] Tooby and Cosmides typify the strengths and weaknesses of strict evolutionary psychology: a probing analysis of the mind's information-processing needs, but in

an abstract manner that often pays scant heed to the animals we emerge from or the humans we have become.

For many years Tooby and Cosmides considered art as a prime example of an evolutionary by-product, but they have recently rethought their position and proposed an adaptive explanation for art. Unlike Dissanayake, they work not from engagement with art but from inquiry about the mind; unlike Dissanayake, who encompasses all the arts, they focus especially on fiction, while still aiming (in their subtitle) "toward an evolutionary theory of aesthetics, fiction and the arts."[80]

They offer concrete grounds for supposing that fiction is adaptive:

1. Across cultures humans engage with pleasure in fictional worlds.
2. There is strong evidence of specialized cognitive design for coping with fiction:
   a. Fiction engages "*emotion systems while disengaging action systems*."[81]
   b. We decouple fictional information from factual, so that it cannot corrupt our knowledge stores, with the efficiency and effortlessness that tend to mark all evolved mental subroutines.
   c. The malfunction of a specialized cognitive system can indicate specialized cognitive design. The capacity to engage in pretend play, a forerunner of fiction, breaks down in autism but not in other kinds of mild cognitive dysfunction.
   d. An improbable feature offers better evidence of functional design than an expected consequence. That bone should be white can be predicted from its calcium content, which satisfies structural needs, so that there are no grounds for supposing the whiteness of bone serves some additional adaptive function. That minds should seek out accurate information seems equally predictable, yet this "'appetite for the true' model spectacularly fails" to match the frequent human preference for fiction over fact.[82]
   e. But it is not that our minds cannot or do not care to distinguish true information from false: in communication *intended* to be accepted as truthful, we pay keen attention to its accuracy.

Tooby and Cosmides propose that neurocognitive adaptations can operate in two ways, in ordinary functional modes and in organizational modes, such as play, learning, and perhaps dreaming, that help construct the mind. They nominate art as a fourth organizational mode. All such adaptations, they reason, should be scheduled for off-peak demands: when we are safe and fed, without obvious reproductive opportunities, and are "prevented by darkness or other restrictions from pursuing pressing instrumental goals, or impeded by (real) immaturity from producing useful work"[83]—all features pertinent to fiction.

Drawing on their other recent work, they note that humans operate not just with information true for the species in general but with the contingently true, with "the new worlds of the might-be-true, the true-over-there, the once-was-true, the what-others-believe-is-true, the true-only-if-I-did-that, the not-true-here, the what-they-want-me-to-believe-is-true, the will-someday-be-true, the certainly-is-not-true, the what-he-told-me, the seems-true-on-the-basis of-these-claims, and on and on."[84] Fiction, they propose, helps develop this key capacity of the mind to reason counterfactually.

Through their intense focus on art as an adaptation Tooby and Cosmides highlight markers of specific mental design that others have overlooked. Their consciousness that our minds were shaped by the demands of the past, not the present, also helps them clarify an important aspect of fiction's appeal. Since human minds evolved in a world where the main source of information was direct experience rather than the reformulations now possible through language and learning, we still process information more deeply "when we receive it in a form that resembles individual experience."[85]

Yet there are problems with the adaptive hypothesis they advance. Most obviously, the "organizational mode" would predict that interest in art should taper off beyond childhood, once the mind has been organized. But fiction in one form or another usually remains a passion or a pastime throughout life, and since Tooby and Cosmides attempt to account for all art as "organizational," we can also wonder why septuagenarians still throng classical concert halls and art galleries, and octogenarians and their elders share sing-alongs in old people's homes.

Tooby and Cosmides concentrate strongly on representation, which is only one component of art. Although they aim to elucidate art in general, their hypothesis does not account for music, likely to be the first of human arts. (Does music organize our ears to hear environmental sound? Surely not.) It also ignores the origins of the visual arts, likely to have begun not in representation but in bodily and facial adornment, in applying pigments, scarifying skin, modifying hair, filing teeth, all of which are still widespread behaviors—and reach high artistic refinement in Maori moko and Samoan tatu—and which presumably preceded masks and cave painting, let alone frescoes and canvases.

As for fiction itself, Tooby and Cosmides prove unpersuasive about its "organizational" effect. They assume that if fiction fulfills such a function, we will regularly prepare for common experience through fiction. Just as throwing rocks at pine cones readied our ancestors for throwing rocks at prey, they suggest, apparently seriously, that reading about the psychology of the characters in works like *The Possessed* may be a precursor to figuring out the psychology of members of our own families.[86] But we have to deal with others from infancy; we develop a theory of mind at about four, and we cannot understand key social aspects of fiction until our theory of mind matures. It is far more likely—as, indeed, developmental studies of narrative comprehension show[87]—that children learn to understand

stories as their cognitive capacities develop in life, than that they learn to handle life through fiction. Tooby and Cosmides suggest that we can take from Cordelia the lesson that "overt emotional demonstrativeness is not a reliable cue to devotedness,"[88] but any child knows that a show of loving behavior is likely to increase parental solicitude, and even a fledgling bird knows to make its cries as loud as it can. Tooby and Cosmides seem to ignore actual experience for the sake of their theoretical model of adaptive function.

If their sense of the ultimate function of fiction seems doubtful, their sense of its proximate mechanism, our immediate motivation for fiction, is lost in fog. They propose that we attend to fiction because our minds detect that it will "have a powerfully organizing effect on our neurocognitive adaptations" even though it is not literally true.[89] But untruth per se does not make us attend to stories; indeed, it is a handicap they have to overcome. There are an infinite number of fictions that would interest no one (this tree is the daughter of a leather ball, and walked here overnight from the next hill . . .). The vague formulation of Tooby and Cosmides says nothing about why we want to tell or listen to stories, or how we choose which stories are worth our while.

Had they considered phylogeny and ontogeny as well as function, Tooby and Cosmides might have developed a more promising explanation of art in terms of shared attention. Our skill at decoupling,[90] which they rightly identify as a key to the power of human thought, first emerges as sociality evolves, in the decoupling of such serious behavior as aggression in rough-and-tumble social play, early in both mammalian phylogeny and human ontogeny.[91] Humans evolved into ultrasociality, and the capacity to decouple thought first reaches uniquely human levels in four-year-old children as their theory of mind unfurls and they begin to understand that their own earlier thoughts or those of others can be different from what they think now. This advance arises from the unique suite of human adaptations for shared, precise attention, which can explain why we want to focus so much on what others are doing, why we want to tell and listen to stories, and why we eventually become so adept, at higher levels, at the most rapid and nimble decoupling, at exploring, along with other imaginations, precise regions of possibility space far from the here and now. Tooby and Cosmides help to demonstrate the likelihood that art and fiction are adaptations, but they do not show why. But an explanation of art and fiction in terms of shared attention can account for both origin and function.

Conclusion

Only an evolutionary theory of art can explain why humans are so made that art matters so much to us, and perhaps why art has made such a difference to the success of our species.

Evolutionary analysis of art may or may not, finally, recognize art as an adaptation, but it will almost certainly show that art depends deeply on evolved features of human minds and behavior, and can link those investigating the arts to the rich research programs into human nature and human behavior currently under way in modern biology and psychology.

Evolutionary theories of art should be assessed on their capacity to generate testable predictions and withstand criticism and competition, to account for the evidence, and to explain art itself: its nature and purposes and impact, its kinds and range and content, its capacity to harness both tradition and innovation, the details of its particular canons and works, its interpretation and evaluation, and its relations to other human impulses, activities, and achievements and to other animal behaviors.

There are other evolutionary theories of art than those discussed here,[92] and other ways of relating evolution to art and literature than through an overarching theory of art as an adaptation. Much of the most promising work on literature and evolution, for instance, investigates one aspect of human nature as suggested by evolution (such as mate choice, male violence, or theory of mind) and examines literary works in this light or uses cross-cultural studies of stories to test evolutionary hypotheses about features of human behavior.[93]

But among evolutionary theories of art as a whole, those discussed here are the most influential to date and represent most major positions: adaptation or by-product, natural or sexual selection, or individual or social functions. All may have a role to play in a comprehensive evolutionary theory of art: Pinker's sharp sense of the mind's detailed design and of the value to the mind of the information we attend to and the ways we attend to it, and his stress on art's ingenious appeals to the adapted mind; Miller's arguments for the part sexual selection may have played in intensifying the artistic impulse and explaining the difference between male and female rates of producing public art; Tooby and Cosmides's alertness to art's role in developing the imaginative scope of decoupled human thought and extending the space in which we think, imagine, and feel; and most promising of all, Dissanayake's stress on human shared attention, which we can extend to suggest not only art's phylogenetic and ontogenetic origins but also its multiple functions, from catching and keeping up with attention through to social cohesion and individual and social creativity. And unlike other explanations, a theory of art focused on the sharing of attention can explain art as a whole, from its overall impact down to its fine-grained detail, even to the decisions individual artists make, in this line or that phrase, to maximize the attention, engagement, and response of an audience.

Joseph Carroll argues not only that literature represents the world but also that until recently it was the great repository of information about human nature.[94] That is not quite true: the great repository of information about human nature was the human mind, adapted intricately by evolution to understand other

human minds. Nevertheless, literature was the great *public* repository of insight into human nature. "Trust Shakespeare," Antonio Damasio says, citing lines by the fallen Richard II, "to have been there before," to have made the distinction between emotion and feeling that Damasio himself, as a neuroscientist of the emotions, now wishes to propose.[95]

But if we were to value literature as the repository of shared knowledge of human nature, would this not raise the question: what role would remain for literature in a world where science can now offer considerably more objective explanations even of subjective human nature? Damasio points out that Shakespeare expresses gloriously the standard assumption that psychic feeling precedes somatic emotion, but he then adduces evidence to show that in fact emotion evolves before feeling in the course of evolution and of individual experience and that after neurological damage it is possible to lose feeling and not emotion, but not the other way around.

Science can explain human nature, but art's role is not to explain but to engage and to evoke. Scientists are approaching an evolutionary explanation of why laughter developed in humans and a neurophysiological explanation of how it operates, but they will not make us laugh by doing so or find a formula for being funny or make us laugh less in future because we now understand better why or how we laugh.[96] Similarly we have been shaped to savor art and stories more immediately, more viscerally, more emotionally than we can respond to new scientific explanations. Science can explain why and how art has come to matter, but that will not give science the emotional impact of art, nor allow it to find a formula for art, nor make art matter less. If anything, it will only clarify why and how art matters so much.

Notes

My thanks to Joseph Carroll, Stephen Davies, Ellen Dissanayake, Jonathan Gottschall, and David Sloan Wilson for thoughtful criticism of earlier drafts of this essay.

1. Dennett 2003, 183.
2. Mithen 1996, 172; Lewis-Williams 2002, 27.
3. Tooby and Cosmides 2001, 12.
4. Leitch et al. 2001.
5. Cited in Dutton 1995, 34.
6. D. E. Brown 1991; J. Carroll 1995, 405; see also 150–51 for critique; de Waal 2001.
7. Davies 2000, 200; Dutton 1993, 21; Dutton 1995, 35.
8. Dürer 1971, 24–25, cited in Dutton 1977, 392; Goethe, conversation

with Eckermann, January 31, 1827, cited Wright 2000, 155; Japanese, Pinker 2002, 408.

9. Williams 1966.

10. Cf. George Dickie, cited in Coe 2003, 108: "From ancient times to the present day, the great bulk of the theories of art have been functional."

11. Tinbergen 1963; Bekoff, Allen, et al. 2002, 60.

12. Pinker 1997, 525.

13. Jolly 1999, 186: "David Pilbeam of Harvard has been pointing out to students for years that evolution does not have to have an either-or explanation for every trait. Two good reasons are better than one."

14. Beginning with D. S. Wilson 1975. See Sober and Wilson 1998, D. S. Wilson 2002.

15. Echoes Boyd 2001. Among those who have recently foregrounded attention outside an evolutionary approach are Bordwell 1997; N. Carroll 1998; within such an approach: Aiken 1998; Bedaux and Cooke 1999; Cooke 1995, 1999; Coe 2003.

16. Dissanayake 2000.

17. Bekoff, Allen, et al. 2002, 205.

18. Hauser 2000, 211; Provine 2000, 93.

19. Stern 1977, 35–37; E. Morgan 1995, 104; Meltzoff and Moore 1995; Johnson, Booth, et al. 2001, 639.

20. Theory of Mind: Baron-Cohen 1995; Baron-Cohen, O'Riordan, et al. 1999; Baron-Cohen, Tager-Flusberg, et al. 2000. Multiple-order intentionality: Dennett [1991] 1993.

21. For the primate evolution of attention, see Chance 1988.

22. Eibl-Eibesfeldt 1982, 188; Bloom 2000, 89 comments that acceptance is as important to social animals as oxygen and food.

23. Bloom 2000, 166, 173; Chance and Larsen 1976 passim; Eibl-Eibesfeldt 1982; Moore and Dunham 1995 citing Chance and Jolly 1970; Bekoff, Allen, et al. 2002, 77.

24. Pinker 1997; Pinker 2002.

25. Pinker 1997, 539–42; 2002, 406. Here he develops a point made by Alexander 1989. But as Dissanayake 1992b notes: "I do not see that Alexander's scheme explains why scenarios should be packaged artfully rather than just presented" (100). Given Pinker's strong sense of the human design function, this should be apparent to him too: why do we not simply design schematic scenarios, and imagine consequences?

26. Pinker 1997, 525, 526, 539.

27. See Aiken 1998; in film, J. Anderson 1996; Bordwell and Carroll 1996; N. Carroll 1996. The work of Ernst Gombrich is the most sophisticated to show artistic trade-offs between one kind of psychological appeal and another.

28. Pinker 1997, 528–38.

29. Pinker in Glausiusz 2001, 4. Pinker indeed makes much of status, since he explains "the very uselessness of art" in terms of its value for indicating status: 1997, 522.

30. Pinker 1997, 528.

31. Here I agree with Dissanayake 1988, 1992a, 2000 and D. E. Brown 1991. For the most sophisticated version of the contrary view, see Shiner 2001.

32. Hernadi 2001, 64.

33. Flynn 1999.

34. Pinker 2002, 405.

35. Darwin 1871b.

36. Cronin 1991; Miller 2000b.

37. Trivers 1972; see Miller 2000b, 85–88.

38. Miller 2000b, 260–61.

39. Pinker 1997, 536; Darwin 1871b, 572.

40. Including Karl von Frisch (Griffin [1992] 2001, 99), William Hamilton (Hrdy 1999, 45) and Robin Fox (E. O. Wilson [1975] 2000, 569).

41. Miller 2000b, 7.

42. Miller 2000a, 334.

43. Miller 2000a, 355.

44. Miller 2000b, 77–78.

45. Wrangham and Peterson 1996.

46. Miller 2000b, 4, 29.

47. Miller 2000b, 250.

48. Dissanayake 1992b, 10–11.

49. Miller 2000b, 35.

50. Miller 1999; but see Fukui 2001.

51. Mothers singing: Trehub in Glausiusz 2001; infant preferences: Wallin, Merker, et al. 2000, 440; Hokusai: Lane 1989, 272.

52. Should you object to Homer and his blindness as legend, not history, other writers can take his place: Milton, Joyce, Borges. Miller overlooks the likelihood that many commit to the arts precisely to compensate for a lack of fitness in other areas, as in *The Gift of Stones* (1988), Jim Crace's thoughtful novel of Neolithic Britain, where a cripple takes up the role of storyteller.

53. Miller 2000b, 196.

54. S. Brown 2000a, 245–46.

55. See de Waal 2002; de Waal 2001, 26: "One could define language so narrowly that the babbling of a toddler does not fall under it, but does this mean that babbling has nothing to do with language? Narrow definitions neglect boundary phenomena and precursors, and they often mistake the tip of the iceberg for the whole."

56. S. Brown 2000a; S. Brown 2000b.

57. Fukui in Glausiusz 2001, 3.

58. Dutton 2000, 513.

59. Darwin 1871b, 2003.

60. Jolly 1999, 97–98 observes that human hair appears to have coevolved with preferences for hair styling.

61. Coe 2003.

62. Kohn and Mithen 1999. Kohn and Mithen were not the first to feel that flints were knapped to a point of "virtuoso elegance" (Loren Eisely 1979, in Dissaanyake 2000, 132).

63. Thiessen and Umezawa 1998, 302.

64. Dissanayake 1988, 1992b.

65. Dissanayake 1988, 64 ff; 1992a, 10, 84.

66. Dissanayake 1992a, 52; see also Dissanayake 1988, 103, 151; Dissanayake 2000, 145.

67. Stern 1977, 39; Barrett, Richert, et al. 2001, 51; Tomasello and Call 1997, 405, citing Stern 1985 and Trevarthen 1979; Dissanayake 2000, 7, 29; Povinelli and Preuss 1995, 422–23.

68. Cosmides and Tooby 1994; Spelke 1995; Caramazza and Shelton 1998; Wellman and Gelman 1998. For a review of the large literature on Theory of Mind, see Baron-Cohen 2000.

69. Atran 2002.

70. Atran 2002; Boyer 1994, 1996, 2001; Kinderman, Dunbar, et al. 1998.

71. For false belief, see Dennett 1978; Astington 1990; Perner 1991; Carruthers and Chamberlain 2000, 186.

72. For a discussion of the human capacity to "time-travel," including envisaging the future, see Suddendorf 1999.

73. Atran 2002; Boyer 2001; D. S. Wilson 2002.

74. See Miller 2000b; Zahavi and Zahavi 1997.

75. Sosis and Bressler 2000; D. S. Wilson 2002.

76. These take two years and much manpower to build and decorate but are left to decay immediately after the inauguration celebration: see Dissanayake 2000, 153.

77. Coe 2003. Coe offers an adaptive explanation of visual art in terms of the cooperative effects ancestor-worship can create among the ancestors' descendants, but she does not particularly explain the origins or features of visual art and underplays the amount of individual initiative and innovation even in traditional art.

78. Dissanayake 2000, 216.

79. Cosmides and Tooby 1989; 1992; Tooby and Cosmides 1989; 1990a, 1990b; 1992.

80. Tooby and Cosmides 2001.

81. Tooby and Cosmides 2001, 8.

82. Tooby and Cosmides 2001, 12.

83. Tooby and Cosmides 2001, 16–17.

84. Tooby and Cosmides 2001, 20; recent work: Cosmides and Tooby 2000a.

85. Tooby and Cosmides 2001, 24.

86. Tooby and Cosmides 2001, 21.

87. Berman and Slobin 1994.

88. Tooby and Cosmides 2001, 22.

89. Tooby and Cosmides 2001, 21.

90. Boyer 2001, 129 provides a clear explanation: "Worries about what would happen if the roof caved in and came crashing down on your head do not require the usual input (e.g., seeing the roof coming down) and do not produce the normal output (an attempt to dash off as fast as possible). This is why psychologists say that these thoughts are *decoupled* from their standard inputs and outputs."

91. Stern 1977, 4; Jolly 1999, 287.

92. See Cooke and Aiken 1999 for an annotated bibliography; Coe 2003.

93. See Bordwell and Carroll 1996 for a pertinent and astute discussion of the mid-range theories (cognitive rather than specifically evolutionary) rather than grand theory in film (rather than literature).

94. J. Carroll 1999a, 165.

95. Damasio 2003, 27.

96. Van Hooff and Preuschoft 2003; Damasio 2003; Boyd 2004.