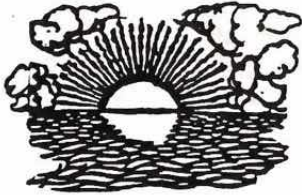


Q. Do sociobiologists have an explanation for the aesthetic impulse in humans? Why the apparently universal human urge to simply admire—whether a sunset, a cathedral, or a poem?



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A. Richard Alexander, Donald Ward Tinkle Professor of Evolutionary Biology, and Curator of Insects in the Museum of Zoology, responds: This question reminds me of Charles Darwin's tests of his theory of evolution by natural selection. Darwin realized that, if correct, his theory should explain everything observable but not everything imaginable. This led him to enumerate possibilities that, if anyone could show them to be true, would falsify his theory, and, as well, to preoccupy himself with known phenomena that seemed to threaten his theory. Perhaps the outstanding example of the latter was the social insects, in which the vast majority of individuals are sterile, using their lives solely to help their mother rear siblings, some of which will be reproductive. Because natural selection is a process of differential reproduction, Darwin described the workers of the social insects as "the one special difficulty, which at first appeared to me insuperable, and actually fatal to my whole theory." Then he showed that the trait of sterility could evolve if the trait could be carried without being expressed, and if those who expressed it helped sufficiently those who carried it without expressing it. This hypothesis has developed into an increasingly firm explanation during the ensuing 129 years of scientific criticism. (Darwin thus used Karl Popper's method on an actual scientific problem of the greatest magnitude long before Popper was born, which is ironic, since Popper seems always to have regarded evolution as metaphysical and untestable.)

The astute person who asked the question about the aesthetic sense has identified what might be called a 1989 parallel to Darwin's "one special difficulty. . . ." My dictionary defines "aesthetic" as "Of or pertaining to the beautiful, as distinguished from. . . especially, the useful. . . ." In other words, the questioner is suggesting that if evolution by natural selection saves only reproductively useful changes, how could it possibly produce a trait (the aesthetic sense) that literally is defined as useless? It is significant that the supposedly difficult trait is human, because humans represent for many people the last possibility of denying that organic evolution is the only scientifically acceptable explanation for the traits of living creatures.

Some of my colleagues would argue

that evolutionary biologists should not be expected to concern themselves with seeking evolutionary explanations for every last human trait. This attitude I identify as reflecting cowardice. Scientists in general must seek the truth, knowing they can only approach it and never finally achieve it, and evolutionary biologists concerned with how humans have evolved must seek the *raison d'être* (and that means the reproductive significance, direct or indirect) of every human trait and tendency, no matter how difficult the task or how vile the insults thrown at them.

Stephen Jay Gould (or someone else) might at this point call me a card-carrying "ardent adaptationist." I am delighted to accept this appellation, so long as it does not also include nonsensical accusations, such as that, as a consequence, I am not aware of the existence and significance of homologies; or of the significance of differences in developmental, physiological, morphological, and historical backgrounds or origins; or that many traits and tendencies do not have directly (only indirectly) selective reasons for existence. Evolutionary biologists—even those sometimes called sociobiologists—know that natural selection is only the principal guiding force of evolution and not the sole source of change, and they understand as well that selection can only operate on last year's model—on those physiologies, morphologies, and ontogenies that evolution has produced by its own cumulative history.

Regarding the aesthetic sense, it might be possible to argue that it is not a trait at all but some kind of fiction generated out of humans' views of themselves; or, that it must be merely an incidental effect of something else favored by selection. Such things exist, but I am unwilling to pass off aesthetics so easily. Richard Dawkins, in *The Blind Watchmaker*, quotes William Paley from 1802 as comparing a stone found in the roadway to a watch also found there. Of the stone he said it is easy to imagine that it had always lain there, but he could not think the same of the watch, because of its remarkable appearance of design. Darwin obviously felt that way about sterility in worker bees, and I feel that way about the aesthetic sense. It appears to me too complex and ^{genetic} insuperable to be an accident or an incidental effect of something else.

For one part of the aesthetic sense there is no difficulty in hypothesizing a selective explanation. Indeed, the notion

*editor's error

is frequently expressed that the aesthetic sense represents our ability and tendency to relate form and function. A cathedral that stimulates what we call aesthetic appreciation may do so because its form inspires thoughts about function (religious as well as architectural), and the two sets of thoughts blend together into some more generalized feeling or effect that we call "appreciation of beauty." Similar ideas are possible about appreciation of form and function in tools, mates, landscapes, and other (useful) aspects of our environment. I find this idea appealing, for example, when I consider how I personally apply the idea of aesthetic, beautiful, lovely, or pleasing, whether it be in choosing a mate, a horse, a painting, a shirt, a place to live, or an idea to put me to sleep (or keep me awake). So have others, such as G.K. Chesterton, when he said that art for art's sake is fine if it means that the earth is where the tree extends its roots and the sky is where it extends its branches. He went on to say that the notion loses its significance if the tree might as well have its roots in the sky. Similarly, Podhajsky, in *The Art of Dressage*, remarked that ". . . nature can exist without art, but not art without nature."

But there is something else involved here, as we all know. This second part is not so intuitive, and it is almost surely the aspect that casts doubt on the entire notion of aesthetics as form and function, and denies usefulness as its goal. Using the questioner's examples, what about sunsets and poems? They are not tools, mates, or landscapes—nor do they seem (initially, at least) to be items for which a "form-function" argument is easy. Even if a form-function argument could be mustered for them, everyone knows that appreciation is often expressed for forms for which any attribution of function other than their appeal would be exceedingly difficult if not impossible. There certainly are people who would appreciate the idea of a tree's roots now and then being in the sky. What about such kinds of art or literature or beauty, which we humans sometimes seem to produce quite deliberately (I am not speaking here of cultural differences in appreciation of beauty, which obviously exist and sometimes entail difficulties in communication, but need not confuse the general issue I am discussing)? And what about the implications of individuality in taste? We also have sayings such as "Beauty is

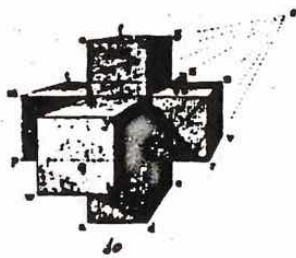
in the eye of the beholder," and "There is no accounting for [differences in] taste." Can each person have a different idea about what is beautiful, concepts of beauty have reproductive significance, and everyone still be right?

To the extent that appreciation of the relationship between form and function becomes an important ability, we can expect that humans will look for it, or its absence, in others and judge them accordingly. The nature of our "aesthetic sense," as a result, becomes a significant part of our personal reputation, which correlates with how well we are viewed—or treated by others, and in the end our access to the resources of life (and reproduction—or in the modern, novel world its multifarious surrogates). Typically, not everyone has equal access to resources that are limited, and beauty in all its expressions obviously is limited.

Reputation is a many-sided phenomenon, and I am aware that sometimes I invest part of mine in the proposition that, in some of the situations in which I am forced to make the best of something less than what I might have considered optimal if there hadn't been any competitors, what I accepted as my share or prize is actually better than what my competitors got (or at least better than they think). Rather than being content to be regarded as someone who simply lost, in other words, I work to convince the world that I actually won (or didn't lose as profoundly as it may have seemed). In the process, I may convince them that my aesthetic sense—my view of form and function—is intact, and maybe even superior. Rather than taking a loss in reputation, I may thereby either maintain or improve my status. I think we all make this kind of effort repeatedly. Sometimes some of us may even be lucky enough or powerful enough to start fads or trends.

Other organisms also compete for limited resources, but unlike us modern humans (at least), they don't live in societies in which the principal binding cement is social reciprocity, and therefore in which everyone is constantly inspecting all his associates with an eye to whether or not they would be good partners in reciprocity. That's one reason reputation is special among humans.

Perhaps we have begun to derive an hypothesis not only for attention to "beauty" that seems not to fit the form-function arguments, but for tendencies to label as useless something that in fact may be quite useful: If I contend that I





know little about art but I know what I like, then I am putting off all those who would argue that value in art can be identified and that they know what it is (and I do not). I am doing my best to convince others that value in art is not as easy to judge as those people seem to think, and simultaneously injecting a question about whether or not I might know more about it than they, or than they or others might think. Again, I am protecting—perhaps enhancing—my reputation. Here, I think, we are talking about the tip of the iceberg that represents the border between science and the humanities: Science has as its centerpiece striving toward identifying the undeniable; the humanities deal primarily in values. Undeniability becomes a necessity as evidence approaches factuality, but values remain diverse because interests remain divergent. Science prides itself primarily on the cumulative growth of knowledge, but the humanities progress primarily through changes in sophistication with regard to meaning, in arenas not accessible to the methods of science. The aesthetic sense involves meaning, and meaning is often individual and perhaps never universal.

Darwin's hypothesis about the evolution of sterility showed that the existence of evolved sterility could not be used to falsify his theory quite as easily as might have been imagined. He did not show, in 1859, that it was the only hypothesis, or even the best one. He showed only that at least one plausible hypothesis existed that might ultimately prove to be

the correct explanation, and he related it to things like how to select for long horns in castrated bovines and how to select for tastiness in vegetables although the test plant has already been eaten. Thereby he showed that he knew that genetic relatedness would have to be high between the sterile worker and those for whom it worked. That requirement was in turn a potential falsifier of his hypothesis. One might say that he started the scientific process working, even though the next large step in testing his hypothesis did not take place until 1964, when William D. Hamilton showed that workers of most social insects can be 50 percent more closely related than siblings in other forms, and that beneficence between almost any kinds of relatives can, in different social situations, be favored by natural selection. It will likely not take 105 years for hypotheses being ventured today to be subjected to a parallel scrutiny.

“Who can confidently say what ignites a certain combination of words, causing them to explode in the mind? Who knows why certain notes in music are capable of stirring the listener deeply, though the same notes slightly rearranged are impotent? These are high mysteries . . . ” (E.B. White, *Elements of Style*).

Professor Alexander is the author of Darwinism and Human Affairs. He presented the University's Russel Lecture in March.

Anthropology

1. Charles Darwin's major contribution was proposing a mechanism—natural selection—whereby evolution takes place, rather than the concept of evolution itself, as is popularly thought.

2. The first members of the human family lived in subSaharan Africa some 3–4 million years ago (as *Australopithecus afarensis*), of which the famous fossil “Lucy” was a member.

Asian Languages and Cultures

3. Buddhism is the religion that influ-

enced the greatest number of Asian cultures.

4. Indo-Aryan languages, India, are close relatives of the main languages of Western-Europe.

Astronomy

5. The age of the Universe is about 10–20 billion years. The size of the *observable* Universe is limited by its age and the finite speed of light to a size of 10 billion light years in any direction. We do not know whether or not it extends infinitely beyond that.

6. Thermonuclear fusion is the energy

source that powers stars.

Biology

7. Useful discoveries developed as a result of experiments involving animals include vaccines (polio and rabies, for example); anesthesia; knowledge of blood circulation and the nervous system; discovery of insulin; development of chemotherapy; development of new surgical techniques.

8. Darwin: theory of evolution; Mendel: genetic inheritance; Watson/Crick: structure of DNA; Calvin: