In response to comments that the term "restoration" does not convey the practice of restoration ecology, a discussion of the field's philosophy and practices are offered in rebuttal. Scientists in an advocacy role "should not dictate what society wants, but rather, interact vigorously with other scholars and the public to achieve ends that both are feasible and make sense scientifically." In the so-called "science wars" between realists and relativists, "it may be time for scientists to worry about Trojan horses in their midst." And, it is discussed whether mice that lack the gene for the dopamine transporter are a suitable model for studying attention-deficit hyperactivity disorder.

Restoration Ecology

In response to the News Focus article "Returning America's forests to their 'natural' roots" (Keith Kloor, 28 Jan., p. 573), Mark A. Davis posed three problems with restoration ecology in his letter (18 Feb., p. 1203): the choice of a "target" time period is arbitrary, the term "restoration" equates with ecological stasis, and "true restoration" is impossible because of such processes as extinction and climate change. But these arguments are too oversimplified.

In contrast to a whimsical choice of some past "target" condition, reference conditions for restoration are based on a thorough study of historical ecosystem structure and processes as well as on knowledge of ecological relationships. Ecologists seek to understand the evolutionary environment of indigenous ecosystems to determine whether and how degradation has occurred and what intervention may be useful in restoring natural processes. Reference conditions are not linked to specific places but to the conditions of climate and disturbance—including long-term human disturbance—that influenced the adaptations of species and their interactions with the environment.

Far from stasis, restoration ecology aims at reversing recent degradation so that dynamic processes such as fire, flood, herbivory, predation, and regeneration can resume their natural flux. The fact that permanent changes such as extinctions have occurred only underscores the importance of restoration to forestall continued declines. As Earth's ecosystems move into an uncertain future of atmospheric change and growing human pressures, the concept of restoring the integrity of indigenous ecosystems as closely as possible to evolutionary habitats is central to the conservation of native biological diversity.

Humans, and indeed all species, practice "ecological architecture" (Davis's proposed substitution for the term "restoration") by modifying their habitats to facilitate their survival. As the ultimate ecosystem engineers, humans have distorted global ecological processes, causing deforestation, desertification, and other damage. Ecological restoration offers practical, realistic strategies for helping nature's architecture reassert itself.

Thomas A. Alcoze
W. Wallace Covington
Peter Z. Fulé
Ecological Restoration Principles Class
Northern Arizona University, Flagstaff, AZ 86011, USA. E-mail addresses: tma@spruce.for.nau.edu; wally.covington@nau.edu; pete.fule@nau.edu

dEbates!
Respond online
http://www.sciencemag.org/cgi/content/summary/287/5461/2159

Evolution of an Advocate

The coverage given to advocacy in the News Focus articles "Ecologists on a mission to save the world" by Jocelyn Kaiser (18 Feb., p. 1188) and "A new breed of scientist-advocate emerges" by Kathryn S. Brown (p. 1192) seems to fall into the journalistic "give the two extremes" trap. Over three decades, my ideas on advocacy have evolved, and I now have a personal file of past mistakes. The idea that science should (or can) be value-free is wrong. Scientists must make value judgments all the time—at the very least in the choice of projects (what is "worthwhile" investigating), in the choice of methods (for example, what level of impact on ecosystems or on individual organisms would be justified by the information gained), and in the interpretation of results ("the most important conclusion is..."). We cannot avoid such judgments: being steeped in values is part of being human.

The success of science comes not from researchers' attempts to be objective, but from its adherence to rules (honesty, disclosure of procedures, attempts to disprove hypotheses) and its adversarial nature (peer review, replication by others, rewards for shifting the paradigm), and from the fact that nature serves as a final arbiter. When predictions are not met, it often points to where a system was misunderstood. Scientists' credibility should rest on openness about uncertainties, being clear if their own views oppose the consensus, readiness to change conclusions in response to new data, and persistence in telling policy-makers what they can reasonably expect from science.

In addition, scientists who wish to be effective in helping change public policy on issues must increasingly participate in interdisciplinary research. In virtually all cases, society will be faced with difficult trade-offs, and scientists must help to clarify them. Scientists should not dictate what society wants, but rather interact vigorously with other scholars and the public to achieve ends that both are feasible and make sense scientifically.

Paul R. Ehrlich
Department of Biological Sciences, Stanford University, Stanford, CA 94305–5020, USA. E-mail: pre@leland.stanford.edu

Trojan Horses

In his Essay "Deconstructing the 'science wars' by reconstructing an old mold" (Pathways of Discovery, 14 Jan., p. 253), Stephen Jay Gould posits that the fashionable issue of "science wars" between those who approach knowledge as realists and those who approach it as relativists is a spurious one. To that effect, he suggests that currently both scientists and humanists are relativists and are fully aware that absolutes in the natural sciences may not be attainable. Yet Gould's stance seems too conciliatory: There is in fact a war. It is the war between the historical tradition of rhetorical humanism and the experimental enlightenment of the last few centuries. Galileo's predicament is not over yet. Scientists and humanists alike may be aware of cognitive interferences, our internal biases exemplified by the Baconian idols that Gould describes. The difference between them, however, is that scientists strive to control these idols, whereas humanists lean on them to proclaim that anything goes and the equal worth of any conjecture, down to Feyerabend's assertion that science is on equal footing with astrology and prostitution (*1*).

The real war hinges on differences of method. Science relies on experimentation. Experimental scientists address hypotheses amenable to testing. Other hypotheses may enter into exploratory theories, some may be shelved and waiting for feasible experi-