The benefits of potential therapies for later-stage Alzheimer's are questioned: "[D]o the drugs simply extend the total period of decline without reducing the overall personal and social burdens the disease imposes?" It is observed that to properly judge the effectiveness of the biological control of invading species, the trade-offs associated with alternatives such as chemical control agents, or doing nothing, need to be carefully evaluated. Highlights of an online discussion on evolution and creationism in science education in the United States are presented. And, the "vogue word/bandwagon phenomenon" inspires a model poem.

Weighing the Benefits of New Alzheimer's Treatments

The results of a clinical trial of the drug memantine raise ethical and policy issues unmentioned in "Drug shows promise for advanced disease" (News of the Week, 21 Jul., p. 375). Decline in cognitive and behavioral functioning was slower in trial participants with moderately severe Alzheimer's disease receiving memantine than in those receiving placebo.

The benefits produced by this and other potential therapies for later-stage Alzheimer's must be carefully evaluated. Do patients receiving investigational drugs exhibit less personal distress or improved well-being during their last months? Is their care over time easier and less costly? Or do the drugs simply extend the total period of decline without reducing the overall personal and social burdens the disease imposes?

These are hard questions with controversial moral dimensions. But they must be addressed if research is to offer meaningful help to patients and families coping with the effects of this terrible illness.

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Biological Control of Invading Species

We agree with Donald R. Strong and Robert W. Pemberton (*Science*'s Compass, Policy Forum, "Ecology: Biological control of invading species—risk and reform," 16 June, p. 1969) (*1*) that invasive species pose major problems to managed and natural ecosystems in the United States. The fact that more than 50,000 species of nonnative plants, animals, and microbes have invaded the United States, where they cause more than $137 billion per year in damages, highlights a major ecological and conservation problem (*2*).

Strong and Pemberton (*1*) recommend that policies for the introduction of biological control agents be strengthened to prevent future ecological problems, and we generally support their recommendations. The weevil *Rhinocyllus conicus,* introduced for the biological control of exotic thistles, is a problem because it also attacks native thistle species (*1, 3*). This indicates that a more thorough screening of biocontrol agents for the exotic thistles and concern for feeding on native thistles should have preceded the release of the weevil.

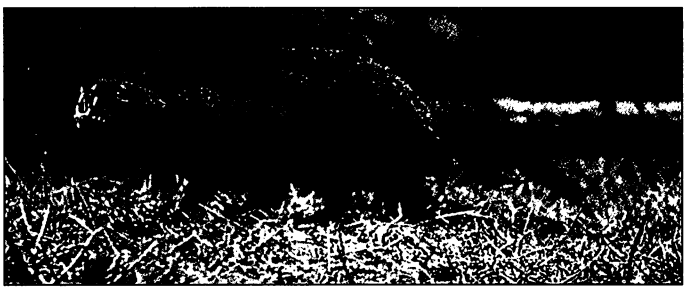
However, Strong and Pemberton do not make the essential ecological assessment of alternative strategies and trade-offs. This would involve comparing the effectiveness of the weevil for the control of exotic thistles with doing nothing and/or spraying with an herbicide for exotic thistle control. Both alternatives may result in significant ecological and conservation problems for the natural ecosystems.

In the United States, nonindigenous weeds, including exotic thistles, are spreading and invading approximately 700,000 hectare of wildlife habitat each year (*4*). Sometimes, one nonnative plant species competitively overruns an entire ecosystem. For example, in California, the exotic yellow-star thistle (*Centaurea solstitalis*) now dominates more than 4 million hectares of northern California grassland, resulting in major changes in biodiversity and species populations (*5*). Similarly, European cheatgrass (*Bromus tectorum*) is dramatically changing the vegetation and fauna of many natural ecosystems (*2*). These examples confirm the need for the protection and conservation of natural ecosystems.

Not to be ignored are many native organisms that are major pests to U.S. crops. Approximately 60% of the major arthropod pests of U.S. crops are native species that moved from feeding on native vegetation to feeding on introduced crops (about 98% of U.S. crops are introduced species) (*2*). For example, the Colorado potato beetle (*Leptinotarsa decemlineata*) moved from feeding on native vegetation to feeding on the introduced potato.

Native pests as well as exotic pests can be controlled by employing biocontrol methods, which have been successfully utilized against major pests with minimal risk (*6*). Indeed, biological controls of some insect and weed pests employing invertebrates and microbes have proven highly effective and have helped reduce pesticide use and the serious environmental problems associated with pesticides (*7*).

As Strong and Pemberton (*1*) emphasize, we must be cautious in introducing biological control agents to ensure that the introductions improve the target ecosystems. The trade-off of biocontrol introductions or doing nothing must be carefully assessed. Biological controls, when carefully implemented, should continue to play a valuable role in future pest control.



The Indian mongoose, introduced for the biological control of rats in Puerto Rico and Hawaii, has become a pest itself, typical of many vertebrate species used for biocontrol.

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Educators Have Hard Choices; Nationally, Not Just in Kansas

Editors' Note: We have received many dEbates responses (see www.sciencemag.org/cgi/content/full/288/5467/813) to Eugenie C. Scotts's Science and Society Essay on

concerns regarding evolution and creationism in science education ("Not (just) in Kansas anymore," 5 May, p. 813). Here are highlights from a representative sample. Dr. Scott's response appears both in this section and in dEbates online.

Anthony White, salesman
People are talking about evolution and creationism because none of the other scientific issues is as vulnerable. Gravity, the first and second laws of thermodynamics, or general and special relativity are not constantly on the "hot seat."...[The theory of evolution] is no closer to being incontrovertibly proven in the hearts and minds of the American public than when it was first introduced. This speaks volumes.

Walt Meier, scientist (response to White)
[T]he validity of a scientific theory is not dependent on polls, but on facts...The fact that many Americans do not accept evolution indicates that science education is sorely lacking in America, not that evolution is an invalid scientific theory.

Frank Lovell, manager (response to White)
If evolution is indeed a flawed scientific theory, it will take scientists with evidence to undo it, not rhetoric waged by a public that remains largely ignorant about the facts and theory of evolution.

Anthony White (response to responses)
What arrogance to assume that the American public is unable to grasp a theory that everyone has been instructed in since grade school.

Wes McCoy, high school science chairman
My genetics students have passed Biology I. They should understand evolution (particularly if I was their teacher). Here is why they usually don't: (i) What they learn about evolution outside the classroom is fundamentally more powerful than what they learn in it... (ii) By and large, students believe that evolution can be equated with atheism. This view comes from the false duality of an "evolution vs. creationism" debate.

Charles J. Robinove, geologist
The creationism view is that of one religion, Christianity. Judaism, Buddhism, Islam, Shintoism, Hinduism, and many other religions have no trouble reconciling evolution with their religious teachings...The fervor of the creationists to force their views on schools amounts to an attempt to establish a religion (or a portion of it) in the governmental system of the United States.

Tyler F. Creelan, undergraduate student
It is...unclear why a...suggested alternative to teaching evolution, the avoidance of all lessons relating to this matter, is to be preferred over current practice. I would rather learn about something I do not wholly agree with than learn nothing at all.

Rudolf Brun, developmental biologist
[W]hat science learns about nature must become integrated into a world view in which faith finds its reasonable place.

Ian Gordon, librarian
We should give more credit to students and their abilities to think through and debate matters of social, scientific, religious, and philosophical origin than we currently allow.

Robert Mac West, paleontologist
In a nation where dollars produce political results—and this is a political discussion as much as it is a scientific and religious one—it is little wonder that the voice of science is not heard as well as the voice of creationism.

Ivan E. Collier, molecular biologist
To present a scientific explanation, whether it be quantum electrodynamics or evolution, without the context of skepticism invites contempt and risks establishing scientific literalism.

Duane T. Gish, executive
As Richard Lewontin has rightly stated, evolution and creationism are irreconcilable world views. When each is stripped down to the bare bones, each is intrinsically religious. Although they constitute inferences

based on circumstantial evidence, the evidence supporting each is by nature scientific and should be made available to students in the tax-supported public schools of our pluralistic democratic society.

William K. Hartmann, senior scientist

The complaint against the fascinating evidence for a Big Bang event is particularly ironic and illuminating. If any piece of modern astronomy could be welcomed by creationists, it should be the Big Bang theory. The fact that it is under attack is evidence, in my opinion, that fundamentalists are not interested in content or ideas, but are simply against science and scientists.

Michael J. Behe, biology professor

[I]ntelligent design in biology is not invisible, it is empirically detectable. The biological literature is replete with statements like David DeRosier's in the journal *Cell*: "More so than other motors, the flagellum resembles a machine designed by a human."...Exactly why is it a thought-crime to make the case that such observations may be on to something objectively correct?

Response

White is correct to say that evolution is not "in the hearts and minds of the public," but he errs in thinking that evolution is taught from grade school up. A smattering of evolution is taught in high school biology, but by then, as McCoy illustrates, students have already acquired a lot of misinformation. The "big three" antievolution arguments students pick up (also illustrated in these dEbates excerpts) are that (i) evolution is scientifically weak—a "theory in crisis," (ii) evolution is incompatible with religion, and (iii) it is "only fair" to teach "both." These three arguments were also used by William Jennings Bryan during the Scopes trial of 1925, so we haven't gotten very far in 75 years. Scientists and teachers need to counter each of the "big three."

Ultimately, existential issues fuel antievolutionism: people are told that if evolution happened, they can't believe in God and their lives are meaningless. A high percentage of the public believes this, which suggests that the faith community has a major role to play in informing religious people of the many ways in which religion is compatible with evolution (see www.natcenscied.org/voicont.htm and www.natcenscied.org/continuum.htm). But scientists and science teachers need to teach more evolution and teach it better, and "better" includes keeping nonscientific ideas such as creation science, intelligent design, and philosophical materialism out of the science class.

Behe claims that intelligent design is empirically detectable, but gives as an example only a statement asserting the similarity of a natural structure to a designed one. Indeed, a structure that functions to get something done can be said to be "designed" for that purpose, but this casual usage should not imply a designing agent, much less an intelligent one, and still less a supernatural one. Natural selection, a nonrandom but unintelligent mechanism, can also produce structures that function for a purpose, and as a natural mechanism, for scientific purposes, it is preferable over untestable supernatural ones.

I thank all those who took time to comment, and apologize for not responding personally to all.

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This Year's ...

The Random Samples item "Cosmic powerhouses" (7 Apr., p. 43) referred to Bohdari Paczyński and Li-Xin Li's explanation of how black holes use energy very efficiently as "a better model." This