

To date, ecosystem service projects have occurred primarily in terrestrial environments, and most have been led by governments or large environmental organizations. We likely will see a greater diversity of ecosystems and institutions involved in the next wave of ecosystem service assessment and management. For example, ecosystem services are a centerpiece of the new U.S. National Ocean Policy, and some companies (such as Dow Chemical, in partnership with the Nature Conservancy) are embracing ecosystem services as a means to assess potential business strategies. By providing a roadmap for how to move from well-grounded theory to real-world practice, *Natural Capital* offers an excellent resource for these and many other emerging ecosystem service projects. Yet in order for these efforts—and this volume—to fulfill their promise, scholars and practitioners will need to continue to work together to assess how ecosystem services are likely to change in an uncertain future, particularly in the face of humanity's adaptation to our changing environment.

References and Notes

1. G. Daily, Ed., *Nature's Services: Societal Dependence on Natural Ecosystems* (Island, Washington, DC, 1997).
2. www.un.org/millenniumgoals/.
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NEUROSCIENCE

Why We Laugh

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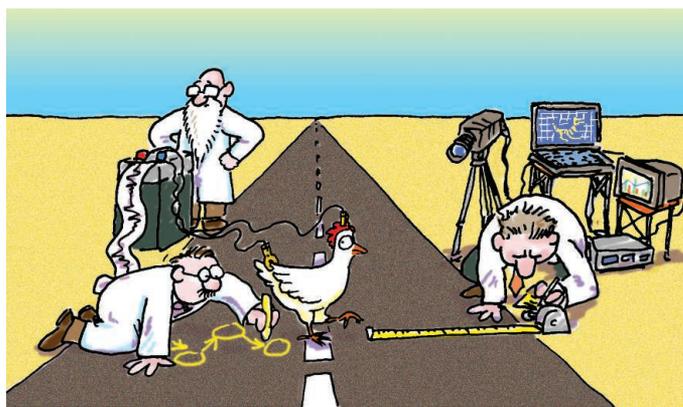
Inside Jokes is funny in two ways. It is funny ha-ha, because it includes hilarious jokes. (Question: "How do you tell the sex of a chromosome?" Answer: "Pull down its genes.") It is not funny huh, because it is clear and accessible rather than confusing or disturbing. Yet it is funny peculiar. Like a funny-looking tree, it holds your interest and raises new questions.

Science advances by asking new questions, and in the book, Matthew Hurley, Daniel Dennett, and Reginald Adams raise a lot of them: Why is humor enjoyable? Why do we laugh out loud? Why do we tell jokes? Why do we go to such great lengths to hear jokes? Why are some jokes funny and others not? Among funny jokes, what makes some funnier than others? Why does humor depend

on knowledge and culture? Why do some old jokes (and movies) still make us die laughing, whereas other jokes (and puns) die when repeated? Why are timing and order so important when telling jokes? Why is humor always about humans and never about rocks or roses unless they are anthropomorphized? What makes caricatures, nonsense, and incongruity funny? Why are our own failings and foibles funny? How does first-person humor differ from third-person humor? Why are practical jokes funny? Why is it funny to disparage certain groups of people but not others? How do sexual innuendo and bathroom references enhance humor? Why do men get more laughs and women give more laughs? Why do we laugh—and laugh so long—when tickled? Why don't other animals have a sense of humor? Why is the sense of humor so widespread in humans? Some of these questions have been asked before, but no previous attempt succeeds in answering so many so well.

The key to the authors' success is that they locate humor within recent cognitive science and evolutionary theory. To aid survival, our brains constantly and covertly use heuristics to generate expectations about what we will experience next, but we would be too inventive for our own good if we did not regularly search for and remove discrepancies between our expectations and our experiences. The immediate incentive to look for such discrepancies and thereby to reduce error comes from the pleasure of discovering a mistake in a currently harmless active belief that was introduced covertly. That pleasure is mirth, and humor is what produces it. Thus, humor is "a cognitive cleanup mechanism" that stains with mistaken belief before washing out the error (as in "I wondered why the Frisbee was getting bigger, and then it hit me."). Laughter is then a public signal of our ability to clean up our minds. Because such cognitive prowess is useful, it attracts mates—both friends and sexual partners—and spreads throughout the world.

Hurley, Dennett, and Adams apply their theory to well over a hundred examples



(including stupid jokes, dark humor, musical jokes, and witty remarks that are not humorous), to many apparent counterexamples (such as surprises, forgetting, riddles, and lies), and to related phenomena (such as magicians and garden-path sentences). They also use their theory to answer or refine the questions above, as when they explain why jokes can be ruined by taking too little time (for an active expectation to form) or too much time (so that the active belief is given up before the punch line) even though theatrical comedies can last for hours. Analysis is said to ruin jokes, but I still found myself laughing while the authors carefully dissected joke after joke. Perhaps my reaction could be taken to support their theory.

Their account also suggests several larger lessons. Humor is related to the scientific method of testing hypotheses, although it operates more quickly and covertly. Humor also illustrates how epistemic emotions motivate and control cognition. Reason is the slave of the funny bone. And humor exemplifies the human tendency to project our emotions onto the world, since humor is a feature of our thought processes rather than of jokes or any other external stimuli in themselves. Because humor is central to and distinctive of human life, understanding it can help us understand much more about ourselves.

Many parts of the authors' theory are, of course, not new. Hurley, Dennett, and Adams laugh on the shoulders of giants. In addition, much work remains to be done, especially regarding the neural mechanisms of humor. And critics will surely propose counterexamples and refinements. Whether or not the details of this theory survive, it is a very promising leap forward. Everyone who reads *Inside Jokes* will be enlightened as well as amused.

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Inside Jokes

Using Humor to Reverse-Engineer the Mind

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and Reginald B. Adams Jr.
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