

SCIENTIFIC AMERICAN **MIND**

THOUGHT • IDEAS • BRAIN SCIENCE

PREMIER ISSUE

EXPLAINING THE
KINDNESS OF STRANGERS

WHY WE HELP

**Stress and
Memory**

**The Overlooked Half
of the Brain**

**Multitasking:
It Doesn't Work**

**How Best to
Treat ADHD**

**The Truth about
Conspiracy Theories**

Risky Antidepressants

SCIENTIFIC AMERICAN®

Established 1845

Scientific American Mind is published by the staff of SCIENTIFIC AMERICAN, with project management by:

EDITOR IN CHIEF: John Rennie
EXECUTIVE EDITOR and CO-ISSUE EDITOR: Mariette DiChristina
CO-ISSUE EDITOR: Mark Fischetti

ART DIRECTOR: Edward Bell
ISSUE DESIGNER: Patti Nemoto
PHOTOGRAPHY EDITOR: Bridget Gerety
PRODUCTION EDITOR: Richard Hunt

COPY DIRECTOR: Maria-Christina Keller
ASSISTANT COPY CHIEF: Daniel C. Schlenoff
COPY AND RESEARCH: Michael Battaglia, Smitha Alampur, Sara Beardsley, David Labrador, Kenneth Silber

EDITORIAL ADMINISTRATOR: Jacob Lasky
SENIOR SECRETARY: Maya Harty

Many of the articles in this issue are adapted from articles originally appearing in Gehirn & Geist.

ASSOCIATE PUBLISHER, PRODUCTION: William Sherman
MANUFACTURING MANAGER: Janet Cermak
ADVERTISING PRODUCTION MANAGER: Carl Cherebin
PREPRESS AND QUALITY MANAGER: Silvia Di Placido
PRINT PRODUCTION MANAGER: Georgina Franco
PRODUCTION MANAGER: Christina Hippeli
CUSTOM PUBLISHING MANAGER: Madelyn Keyes-Milch

ASSOCIATE PUBLISHER/VICE PRESIDENT, CIRCULATION: Lorraine Leib Terlecki
CIRCULATION DIRECTOR: Katherine Corvino
FULFILLMENT AND DISTRIBUTION MANAGER: Rosa Davis

VICE PRESIDENT AND PUBLISHER: Bruce Brandfon
WESTERN SALES MANAGER: Debra Silver
SALES DEVELOPMENT MANAGER: David Tirpack
WESTERN SALES DEVELOPMENT MANAGER: Valerie Bantner
SALES REPRESENTATIVES: Stephen Dudley, Hunter Millington, Stan Schmidt

ASSOCIATE PUBLISHER, STRATEGIC PLANNING: Laura Salant
PROMOTION MANAGER: Diane Schube
RESEARCH MANAGER: Aida Dadurian
PROMOTION DESIGN MANAGER: Nancy Mongelli
GENERAL MANAGER: Michael Florek
BUSINESS MANAGER: Marie Maher
MANAGER, ADVERTISING ACCOUNTING AND COORDINATION: Constance Holmes

DIRECTOR, SPECIAL PROJECTS: Barth David Schwartz
MANAGING DIRECTOR, ONLINE: Mina C. Lux
OPERATIONS MANAGER, ONLINE: Vincent Ma
SALES REPRESENTATIVE, ONLINE: Gary Bronson
WEB DESIGN MANAGER: Ryan Reid

DIRECTOR, ANCILLARY PRODUCTS: Diane McGarvey
PERMISSIONS MANAGER: Linda Hertz
MANAGER OF CUSTOM PUBLISHING: Jeremy A. Abbate

CHAIRMAN EMERITUS: John J. Hanley
CHAIRMAN: John Sargent
PRESIDENT AND CHIEF EXECUTIVE OFFICER: Gretchen G. Teichgraber
VICE PRESIDENT AND MANAGING DIRECTOR, INTERNATIONAL: Dean Sanderson
VICE PRESIDENT: Frances Newburg



Human Kind

Last night something happened for the first time in my 17 years of commuting by rail. As the train began rolling north, I concentrated on proofreading pages of the magazine that you now hold in your hands. Slowly, it dawned on me: “I left my purse in my office,” I said to no one in particular. No ticket, no money, no ID—and no one I knew in sight to help me out. The conductor was headed down the aisle, and I wondered if I’d be tossed out at the next stop, leaving me miles from office or home. Then the woman across from me leaned forward. “Can I buy your ticket for you?” she asked. A man sitting two seats over from her added, “Do you need a ride home when we get to the station?”

Researchers have been puzzled about why such altruism, so frequently and generously offered, should exist at all. In a Darwinian world of “survival of the fittest,” why do perfect strangers volunteer to help, even when such aid may come at a cost to themselves? Why purchase a ticket or expend gas and time driving a hapless commuter home? Seeking answers, scientists probe our behavior in experiments designed to reveal the roots of altruism. The cover story of this issue, “The Samaritan Paradox,” by Ernst Fehr and Suzann-Viola Renninger, on page 14, describes how altruism emerges spontaneously even in anonymous exchanges among people, whereas animal altruism starts and ends with kin.

Mulling our surprisingly cooperative nature seems fitting in this, the premier edition of *Scientific American Mind*, a new quarterly publication. Each issue will explore similar mysteries about what makes us humans humane, heartless, helpless, hopeful—in short, why we are the way we are. Issue by issue, we aim to lift the veils, to reveal more about our own shared essence. Because we will be focusing on the workings of the mind and brain, we are naturally keen to hear what you think about the magazine as well.

Mariette DiChristina
Executive Editor
editors@sciam.com

If we live in a dog-eat-dog world, then why are we frequently so good to each other?

The Samaritan Paradox

By Ernst Fehr and Suzann-Viola Renninger

Like many members of the animal kingdom, people will readily lend a hand to immediate family and relatives. But humans alone extend altruism beyond kin, frequently helping perfect strangers for no obvious personal gain. Whether we live in large or small groups, in the global network of the New Economy or in the most isolated Yanomami reservation along the border between Venezuela and Brazil, human cooperation in the absence of family ties is widespread across cultures.

On what is this largehearted behavior built? Does each of us possess an inner samaritan who is selfless and community-minded, as philosophers

have sometimes proposed [*see box on page 17*]? Or—as many sociobiologists have suggested—are actions that are seemingly done for the benefit of others really motivated by veiled economic calculations and selfishness or by egoism, with an eye to the very long term?

Some of the most fundamental questions about our evolutionary beginnings, social relations and the origins of society are centered on such issues of altruism and selfishness. Recent experiments show that current gene-based evolutionary theories cannot adequately explain important patterns of human altruism, pointing toward the importance of theories of both cultural

Whether we live in the New Economy or in an isolated reservation, **human cooperation in the absence of family ties** is widespread.



FAST FACTS

THE ROOTS OF ALTRUISM

1 >> Many animals demonstrate forms of altruism toward kin. But only humans go beyond nepotism or tit-for-tat tactics, such as cooperating only when one can expect future benefits or when such actions improve social standing. In experiments, people will reward cooperators and punish those who defect—even when it is costly to do so.

2 >> Just why this is so has puzzled scientists, because such altruism doesn't provide immediate benefit or personal gain—seemingly reducing the altruist's chances of survival.

3 >> Recent experiments point the way toward a more nuanced theory of societal origins, combining genetic and cultural evolution.

evolution and the coevolution of genes and cultures.

The idea that selfishness can contribute to the rise and maintenance of a cooperative society is a long-standing topic of political philosophy. At the beginning of the 18th century, in an essay called “The Fable of the Bees,” Dutch-born English doctor and philosopher Bernard Mandeville maintained that “private vice” rather than “virtue” was really at the root of all “public benefit.” Morality and the public welfare, he reasoned, were based purely on the egoism of the individual. Further, if each member of society pursued his own best interests consistently, the greatest possible good would result. Mandeville concluded that government would collapse if egoism ceased to motivate our actions.

In an era when ecclesiastical authority imposed religious values, philosophers vociferously rejected Mandeville's ideas. But similar notions were put forth over the subsequent three centuries.

NAJAH FEANNY Corbis Saaba

(Waxing Philosophical about Human Nature)

Why are people altruistic? The question has been a topic of philosophy from its beginnings. Greek philosopher Aristotle, for example, believed that all humans were inherently good but that potential could be realized only within society. He therefore called our species *zoon politikon*, the political animal.

Christianity introduced a view of humans as more flawed. Despite being created in God's image, humans were marred by the failure of sin. Only faith redeemed humans before God—but it did not by any means make them good.

Seventeenth-century English philosopher Thomas Hobbes considered ours to be a species of wild animals that constantly oppress our own kind. Our instinct for self-preservation expressed itself in an unquenchable lust for power, which would inevitably result in a battle of all

against all if not for the presence of a king, who made possible social cohesion within a state.

Enlightenment thinkers of the 18th century took a rosier view, believing that goodness and altruism were part of human nature. In his novel *Emile*, French-Swiss philosopher Jean-Jacques Rousseau proposed that the key to happiness for everyone was the free development of each child's personality. By allowing children's naturally good tendencies to unfold, adults would prepare the way for a harmonious society. English philosopher Anthony Ashley Cooper, third earl of Shaftesbury, said that our inborn enthusiasm for the good, the true and the beautiful rendered us so virtuous and decent that a social order might be possible in which, ideally, we could even forgo the sanctions that ensured good behavior. —E.F. and S.-V.R.

Charles Darwin's 1859 *On the Origin of Species* posited that any organism that is less than completely engaged in the struggle for food, sex and territory lessens its chances of passing on its characteristics to offspring. In 1874 Darwin wrote that a tribe that collaborated "would be victorious over most other tribes; and this would be natural selection." Nineteenth-century economists and social scientists constructed a theory of *Homo economicus*, according to which *Homo sapiens* strive exclusively to maximize their own advantage.

In 1976 British evolutionary biologist Richard Dawkins reopened the public discussion dramatically with his best-seller *The Selfish Gene*. He argued that molecular genetic material uses its host—whether it is an amoeba, hippopotamus or human—as a "vehicle" to maximize its own propagation. "We are survival machines—robot vehicles blindly programmed to preserve the selfish molecules known as genes," Dawkins wrote.

Following those precepts, altruism becomes a form of disguised egoism. Philanthropy is less the expression of a love of humankind than of the cool calculation of the entrepreneur who seeks to ensure future profit by clever public relations. For example, according to the sociobiology theory of reciprocal altruism, people are most likely to help one another if frequent contact is expected in the future: "I'll scratch your back if you scratch mine." The giver assumes that his generosity will be reciprocated at a later date. Reputation theory, which explains another form of altruism that results in personal gain, proceeds from the assumption that it is generally advantageous to establish a reputation for benevolence and impartiality

through the use of well-targeted good deeds. The result is to enhance one's image and improve the potential for long-term profits. *Homo geneticus* is closely allied with *Homo economicus*.

Rising above Nature

But can we simply explain away loving, selfless behavior with such an all-encompassing model? Aren't there countless examples of people coming to the aid of others—even when it is to their personal disadvantage? What about volunteers who risk their lives to help perfect strangers after an earthquake or other disaster? Such self-sacrifice does not follow the rules of evolutionary biology. If the immediate family does not profit and if neither reciprocal aid nor aid aimed at improving reputation promise future advantage, then selflessness gains nothing. Worse, it is costly in terms of resources, health or money. By this logic, there really should not be any good samaritans. Yet they clearly exist.

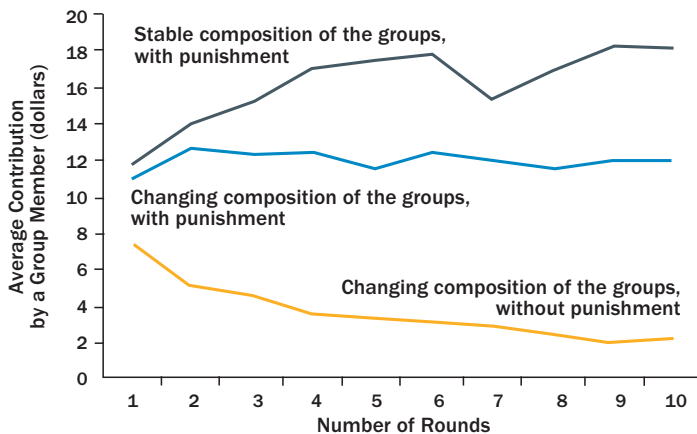
Humans appear to be a special case among animals—a finding supported by a significant number of laboratory experiments conducted by economists and social scientists over the past several years. The experiments come from a relatively new branch of research called experimental economics. The field uses methods such as "punishment"

(The Authors)

ERNST FEHR and SUZANN-VIOLA RENNINGER cooperated in the writing of this article. Fehr is director of the Institute for Empirical Economic Research at the University of Zurich in Switzerland. Renninger, a biologist, has a Ph.D. in philosophy and works as a journalist in Zurich.

Altruism is costly in terms of resources, health or money. **By this logic, there really should not be any good samaritans.** Yet they clearly exist.

Trust but Verify



In an experiment, groups of four participants could invest portions of their initial individual capital of \$20 in a project for the public good. If the players were permitted to punish noncontributors with fines, the level of cooperation was consistently higher—even when the groups were shuffled and the punishers and those punished did not play together in subsequent rounds.

games, which show that many people—even when facing high monetary stakes—are willing to penalize others at a cost to themselves to prevent unfair outcomes or to sanction unfair behavior.

We conducted one such experiment with 240 male and female students at the University of Zurich. Each person sat at a computer terminal in a sort of compartment isolated visually and acoustically from everyone else. Network connections linked groups of four, who played the game together. None of the players knew with whom they were playing, because their various partners were identified only by numbers on a computer display. After each of six rounds, the approximately 60 groups were randomly reconstituted.

A Free Ride?

At the beginning of a round, all participants received a virtual sum equivalent to \$20 as start-up capital; they would be able to convert their virtual currency into real money at the end, so they were motivated to consider carefully how they played the game. The players in each quartet could choose to invest all or part of their money in a common project that consisted of some public

good. Economists define a public good as any social institution or service from which everybody profits, even if everyone does not contribute to it. In the experiment we never told the participants exactly what constituted the public good; they were to infer this from what ensued.

After every round, the chief investigator increased the total sum pooled by each group of four by 60 percent and distributed the proceeds evenly among all four members, regardless of the amount of each individual's contributions. In the best-case scenario, all four players invested their entire initial capital, and each then received \$32 (\$12 profit plus the initial capital) for the round. If the test subjects contributed a total of only \$40 to the public good, this amount was then increased to \$64, and each participant got back \$16. In this case, a person who paid nothing, called a free rider, received the same \$16 profit as everyone else. A player who invested \$10 netted \$6. Someone who invested his entire wad of \$20 ended up an exploited dupe; he lost \$4.

For the individual selfish actor behaving rationally, it would be unwise to invest so much as a single cent under these conditions, because each dollar invested in the public good returns a mere 40 cents, a net loss of 60 cents. In other words, a player who invests nothing is guaranteed at least her initial \$20, plus her share of the proceeds (assuming, of course, that the other players are willing to cooperate and trust in the process). The dilemma for the test subject was that if no one else invested in the project, she took home only her initial capital.

Up to this point, the setup is similar to the classic public-good experiments that economists have done for close to 20 years. But our trial went one crucial step further. After each of the four members had made their investment decisions, we told them how much the other three players had paid in, and we gave them the option of punishing free riders by reducing their profits as much as they deemed just. If a player decided to penalize the free riders, the chief investigator reduced his assets. Applying a fine of \$3 cost the punisher \$1; a docking of \$6 cost \$2, and so on.

The results will surprise proponents of the *Homo economicus* model: far more than 80 percent of participants penalized another player at

least once during the six rounds, even though doing so cost them and they gained no immediate advantage. More than 30 percent meted out punishment during each round. The free riders suffered the most. The less they contributed to the common project, the higher the penalty they received. And participants who invested more than an average amount in the public good were far more likely to penalize others.

To get a better understanding of the effects of such sanctions, we carried out a variant of the experiment. The procedure was identical, except we gave no provision for punishment. Almost 95 percent of the participants invested considerably less than we had observed in the earlier game. In fact, during the last round, 60 percent contributed nothing to the public good, compared with three quarters of the players who ponied up \$15 or more when a penalty was at stake [see box on opposite page].

How can we explain such results? It is clear that in the first version of the experiment, the threat of penalty was not the only reason for the surprisingly high level of cooperation. The actual penalty was important as well: castigated free riders invested an average of \$1.50 more in the public-good project during the next round. Rebuke for unfair behavior thus led to improved cooperation in subsequent rounds.

The only players who derived no advantage were those meting out the punishment. They got nothing from correcting the behavior of the free riders, because they were not in the same quartet during the next round. The punishment benefited some other, unknown players. In other words, those who made cooperation possible by threatening sanctions acted altruistically and apparently without considering personal advantage. Sociobiologists call this behavior strong or true altruism to differentiate it from the weak or false altruism of nepotism or actions that anticipate later payback. The strong altruist is one who does good out of motives other than mere nepotism or strategic gain.

Evolutionary theorists have sometimes argued that strong altruism is maladaptive, a kind of evolutionary carelessness. At its core, this argument states that an altruistic behavior that may have been appropriate and successful at one time has become disadvantageous in changed circumstances. The forebears of *Homo sapiens* lived in small, largely isolated groups and were extremely dependent on one another. Uncooperative group members who behaved unfairly would have been excluded from rewarding group activities or even



punished. In this situation, free riding did not pay. Encounters with outsiders, which are typical in modern societies, were rare. As a result, there was little evolutionary pressure to differentiate between these two social situations. According to the maladaptation argument, a person living in today's world who demonstrates true altruism in an experiment may in fact be unable to make this crucial differentiation.

Seen from this perspective, strong altruism is merely a kind of habit—the experiments' participants had not internalized the fact that the members of their quartet would be shuffled after each round. As a result, they behaved as if they would always be dealing with the same people. Their altruism was based on considerations that, though apparently inappropriate to the situation, were nonetheless strategically plausible for survival—that is, they were selfish.

To test this hypothesis, our team conducted a third experiment, in which the composition of the groups remained unchanged for 10 rounds. If the maladaptation argument were correct, the test subjects should have acted exactly the same as when the groups were changed after each round.

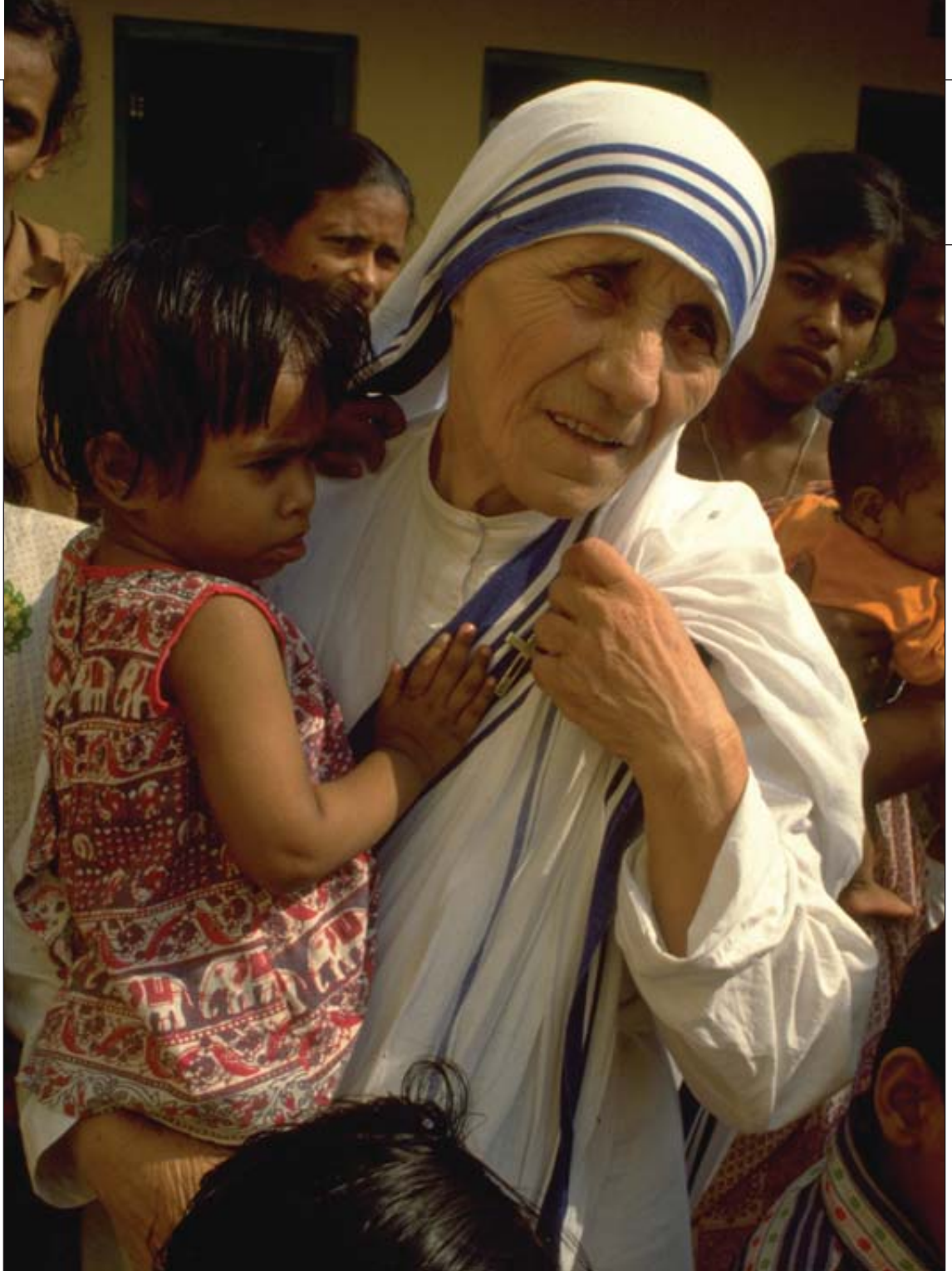
But the results did not support this hypothesis. In the groups in which the players got to know one another, payments to the common project rapidly increased after the first round by an average of 50 percent more than those in the groups whose members were shuffled after each round.

Rise of Altruism

Now that we know that a body of evidence supports the notion that *Homo sapiens* is the only species capable of strong altruism, the question becomes, How did this characteristic arise? Natural scientists always consider the possible genetic basis for altruistic behavior. In so doing, however, they quickly find themselves contradicting the selfish-gene theory. In the final analysis, if genes caused their “vehicle” to engage in disadvantageous be-

The members of the colonies of naked mole rats forgo reproduction in favor of their queen and spend their lives toiling on her behalf. Only humans cooperate with strangers and act with no prospect of reward.

Mother Teresa, for many people, exemplified charity. Exactly what drives people to selfless behavior is the subject of research in various disciplines.



havior, that vehicle would soon self-destruct. And then the egoists would have the world to themselves.

A possible way out of this dilemma might have been that altruists exclusively populated some early communities. Such communities could have flourished because the altruists would not have been exploited by free riders. An aspect of evolutionary theory called group selection could support such an idea, and therefore also the development of altruistic behavior. In this model, groups compete for resources just as individuals do and

are equally subject to selection. If one band is more successful than another because of some special characteristics of its members—such as a greater capacity for selfless cooperation—then it seems reasonable that their chance of long-term survival should be greater.

But group selection has been anathema to sociobiologists for the past 40 years, because the conditions under which it might operate are almost never met empirically. The biggest problem for group selection favoring altruistic societies is

CORBIS SYGMA

An egoist in a group inhabited by altruists was probably punished by altruists who did not care whether they derived personal advantage.

posed by the infiltration of egoists. As soon as any egoists gain entry, their chance of survival becomes much greater than that of the altruists, because they do not bear the costs of the public goods whose benefits they enjoy just the same. This means that they would tend to have the opportunity to reproduce more abundantly than their altruistic neighbors and thus would increasingly push them to the margins. After some time, communities that had previously been dominated by altruists would no longer differ from others, and group selection would no longer be effective.

Cultural Evolution

Anthropologists Robert Boyd of the University of California at Los Angeles and Peter Richerson of the University of California at Davis propose another hypothesis, which may support differences between groups during the early stages of human development. This idea is based on the theory of coevolution, in which nature and culture intertwine and interact in the formation of genetic and *cultural* characteristics. The capacity of human beings to learn is crucial for such a hypothesis to take hold. As they put it in “Cultural Evolution of Human Cooperation,” a chapter in *Genetic and Cultural Evolution of Cooperation*, edited by Peter Hammerstein (MIT Press, 2003): “We believe that the human capacity to live in larger-scale forms of tribal social organization evolved through a coevolutionary ratchet generated by the interaction of genes and culture. Rudimentary cooperative institutions favored genotypes that were better able to live in more cooperative groups. Those individuals best able to avoid punishment and acquire the locally relevant norms [of behavior] were more likely to survive.”

When an egoist immigrated to a group inhabited by altruists, he was probably punished for his actions by the altruists who did not care whether they derived personal advantage from their action. As a result, the egoist’s behavior brought him only disadvantage, and in all likelihood he sooner or later began to imitate the predominant selfless behavior. This effectively put a stop to the damaging infiltration of the society by egoists, enabling the group to prosper. No well-established analytical or population genetic models yet support this hypothesis. But using computer simulations, Boyd



and his colleagues have demonstrated that such a scenario is plausible. Some combination of cultural and genetic factors may preserve and perpetuate these altruistic tendencies through the subsequent generations.

Richard Dawkins once challenged readers “to teach generosity and altruism, because we are all born selfish.” We argue that this well intended advice can now be reframed. We still should promote tolerance, generosity and altruism, but educators will find encouragement in current research that suggests not only are we capable of altruism, it is possible that our genes even guide us toward such behavior. Perhaps we are born with the potential to be *selfless*.

In an age of enlightenment and secularization, scientists such as Charles Darwin shocked contemporaries when they questioned the special status of human beings and attempted to classify them on a continuum with all other species. Humans were stripped of all that was godlike. Today biology is restoring to them something of that former exalted position. Our species is apparently the only one with a genetic makeup that promotes selflessness and true altruistic behavior.

Business deals largely depend on reciprocity. Selflessness is something else.

(Further Reading)

- ◆ **The Economics of Fair Play.** Karl Sigmund, Ernst Fehr and Martin A. Nowak in *Scientific American*, Vol. 286, No. 1, pages 82–87; January 2002.
- ◆ **The Nature of Human Altruism.** Ernst Fehr and Urs Fischbacher in *Nature*, Vol. 425, pages 785–791; October 23, 2003.
- ◆ **The Science of Good and Evil.** Michael Shermer. Henry Holt, 2004.
- ◆ More information on altruism research can be found on the Web at www.iew.unizh.ch/grp/fehr/ and at www.sscnet.ucla.edu/anthro/faculty/boyd/Publications.htm