

encourage low-income women to have children, push affirmative-action programs which stimulate "highly educated married women to invest more heavily in their careers and less heavily in raising families." On the other hand, he favors the entrepreneurial thrust of private enterprise and the free market to promote the high-IQ baby of choice: "But it does at least seem possible that the political failures of the eugenics movement will be followed by a kind of invisible, unorganized triumph off in the private sector" where entrepreneurial scientists will give us the ability to abort any fetus below genius level.

To justify his fixation on eugenics, Seligman gives a wondrously biased version of the IQ debate where, in his distorted perspective, the hereditarian position is always "compelling" and "persuasive" whereas the environmentalists have a "political agenda," presumably hidden and self-defeating. The lay reader would be hard pressed to realize that Seligman's fawning presentation is prejudiced in the extreme.

The vast majority of people who believe that g loading and reification [by which I mean improper use of factor analysis to infer causality and physical existence in the brain of the abstract concept, general intelligence] are nonsense, draws his ultimate condemnation: emotional and therefore unscientific commitment. Yet, on the flimsiest of grounds, he asserts that Cyril Burt was framed, giggling is genetic as is also—and I am not making this up—dipping buttered toast into coffee, not to mention liking John Wayne movies and Chinese food. And he can claim of the U.S. military, "It is a regime almost without discrimination and almost entirely without reverse discrimination," a stunning remark given the military's current homophobia and past racial practice.

But if you've spent forty years hobnobbing with CEOs, your judgment is apt to be warped. Sanger embraced eugenics as a means to further her ends of protecting people from the burden of too many children. For Seligman, eugenics is his emotional rationalization for maintaining his comfortable *status quo* which he sees as being under threat from the masses and, ironically, from high-IQ people who don't suffer from problematic public relations.

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The Rebirth of Nature: The Greening of Science and God, by Rupert Shelldrake. New York: Bantam, 1991, 272 pp. \$21.95 (c) (available from The Sourcebook Project, P.O. Box 107, Glen Arm MD, 21057).

Reading Rupert Shelldrake's *The Rebirth of Nature* brought to mind a macabre joke I heard several years ago at an environmental conference: Ques-

tion: "How do you save the earth?" Answer: "Kill the humans." Like the joke, Sheldrake's latest book offers an uncomfortable reminder that Mother Nature can get along without us very well.

Sheldrake trained as a biochemist at Cambridge University and achieved notoriety early in his career with two popular books that challenged the traditional view of life and evolution. In *A New Science of Life* (1981) and *The Presence of the Past* (1988), he introduced and later developed the provocative hypothesis of "formative causation": that Nature has a "memory" that guides both the development of cells and the instinctive behavior, the habits if you will, of higher organisms.

Formative causation re-emerges in *The Rebirth of Nature*. This time it finds application in larger systems, including the planet, cosmos, natural laws, and God himself. Open your mind to the evidence that is literally blooming all around you, Sheldrake suggests, and you cannot help but conclude that Nature is evolving in some purposive fashion.

On the face of it, the idea that Nature is positively dynamic is friendly, if not downright comforting. "A refreshing antidote to the current plethora of prophets of planetary doom," remarked reviewer Larry Dossey, M.D., author of *Meaning & Medicine*. Writing in *Nature*, James Lovelock, author of *The Ages of Gaia*, lauded Sheldrake for providing "a new window into biology . . . well written and rich in good quotations." Deepak Chopra, M.D., author of *Unconditional Life*, offered similar praise and proclaimed the book "beautifully written."

There is no question that Sheldrake, whom I have always considered an especially skillful writer, is at the top of his game. If all scientists were half as effective in communicating their ideas, there would be no cultural chasm separating the scientific and popular cultures. Science writers like myself would probably find it harder to find work. Beyond being an example of good science writing, *The Rebirth of Nature* makes a solid contribution to the ongoing philosophical debate about humankind's relationship with nature.

As in his earlier books, Sheldrake does a masterful job of showing his readers a familiar landscape from a totally unexpected perspective. This time he examines the Gaia concept of a "living earth" through the lens of his own formative-causation hypothesis. He weaves a presentation that is so logically seamless, so positive in its approach to the data, that the darker implication of the synthesis of Gaia and formative causation remain hidden until the reader has finished the book and begins to consider the sinister shadows cast by contemporary events, about which more later.

Sheldrake builds his case for what he terms "purposive nature" in three parts. In Part One, "Historical Roots," he reminds us that our current view of Nature as dead and mechanistic is somewhat of a philosophical novelty. Only within the past 300 years have humans been thinking about Nature as something other than a living entity. Much of this discussion will be familiar to those acquainted with Joseph Campbell's studies of the origins of myths, but Sheldrake's approach to spiritual issues is somewhat less culturally sensitive

than Campbell's. His matter-of-fact discussion of the Papacy's intentional embrace of animistic beliefs as a means of popularizing the Catholic faith among heathens will, I am sure, seem impertinent to those who learned church history from Sister Mary Agnes.

In Part Two, "The Rebirth of Nature In Science," Sheldrake blends textbook history of science with an introduction to his formative-causation hypothesis. Readers will learn how formative causation assumes the existence of invisible, and presently undetectable, information carrying "morphic fields."

Sheldrake believes that on the cellular level, information contained in morphic fields tells DNA how to express itself—thereby causing fingers to spring from hands instead of elbows, for instance. Since Watson and Crick sketched their first double helix, discovering why DNA expresses itself differently in different cells has been a sort of Holy Grail of developmental biology. The currently accepted theory, which came into vogue more than a year after *The Rebirth of Nature* was published, suggests a family of so-called "morphogens" acting as molecular guidance counselors, telling each cell what to become when it grows up. Morphogens have thus far been isolated in mice, zebra fish, and chickens; their eventual discovery in humans is considered a foregone conclusion.

Although no mainstream development biologist has or is likely to come out and say so, the isolation of morphogens greatly simplifies the operating mechanism needed to make Sheldrake's hypothesis work. Without morphogens, accepting Sheldrake's concept meant acknowledging that morphic fields acted upon each individual base-pair in the DNA. Now, it is only necessary for a morphic field to activate the proper morphogen, sending it on a pre-determined route, a mail carrier making her appointed rounds.

On the species-wide level Sheldrake proposes that morphic fields spread behavioral information, and in so doing account for what we commonly call animal instinct. As the population of a particular species increases, individual morphic fields become mutually supportive, creating "morphic resonance." As with the morphic fields that guide cellular development, species-specific morphic fields also defy detection using state-of-the-art instrumentation: we are limited to seeing their end product in patterns of animal behavior, for example, my Newfoundland's habit of circling three times before settling down to sleep.

Over the years Sheldrake has compiled a large collection of anecdotal accounts that he claims demonstrates the existence of species-specific morphic fields. My favorite, which I am pleased to see retold in his current book, involves the spread of larcenous behavior among Blue Tits, small British birds closely related to the American chickadee. In the 1920s, milk bottlers in Southampton, England, switched from metal caps to paper lids. The morning after the change, local distributors were inundated with calls from irate customers who had found drowned birds wedged in the necks of their milk bottles. Apparently, the birds learned to tear through the paper lids, then promptly drowned in leaning too far forward to sip the top layer of cream. Several days later, as mysteriously as it started, the drownings stopped. It was as if the Blue Tits had all attended a seminar on safe cream-stealing techniques. The oddest

part of the story, and the part which Sheldrake uses to reinforce his argument that animals acquire their instinctive behavior from nature's memory, occurred several decades later. During World War II, milk deliveries were suspended. Several generation of Blue Tits were hatched and died without seeing, let alone learning to steal cream from, milk bottles. Yet, after the war, the very morning milk delivers resumed, the current generation of birds began stealing exactly the right amount of cream, just as their long-dead ancestors had learned. The memory of the right way to steal cream remained alive, in Nature.

In Part Three of his book, "The Revival of Animism," Sheldrake expands the idea of Nature's memories beyond individual species and suggests that, if Nature truly is alive, she—like the Blue Tit—must be capable of not only acquiring but also changing habits. "The organismic or holistic philosophy of nature that has grown up over the last sixty years is a new form of animism," he rejoices. "It . . . regards all nature as alive. The universe . . . is a developing organism . . . so are the galaxies, solar systems, and biospheres within it, including the earth."

At first the notion of a developing universe comprising morphic fields within morphic fields appears to be a friendly, inviting place. It offers an intuitively comfortable "unified theory of everything." Data from experiments in the physics laboratory attain equal intellectual footing with legends about the power of sacred places, prayers, and rituals. Science and God remain separate but equally valid expressions of an overarching order: God's in his Heaven, even if Professor Heisenberg is unable to say exactly where he is or how fast he travels.

But, like a coating of fresh snow on a partly frozen pond, the inviting facade presented by Sheldrake's purposive Nature conceals some nasty surprises. In the Gaia hypothesis the earth is a conceptually complete creation. True, the planet's tenants change as new species evolve and other become extinct; and global redecorating takes place on a more or less regular basis, as oceans erode shorelines and continental plates collide. However, through all of this the "house rules," what scientists call oxygen, carbon, and nutrient cycles, remained as unchangeable as the laws of Nature from which they arise. This core stability of the earth mirrors its Creator, an even more permanently stable God.

Enter formative causation. Sheldrake sees Nature, and by extension both science and God, as works forever in progress, hence his book's subtitle, "The greening of science and god." What we humans consider to be immutable natural laws, Sheldrake warns, are simply very old habits created by the morphic field of a very old planet within a very old cosmos. Old does not necessarily mean permanent. Like the feeding habits of Blue Tits, Nature's habits can undergo sudden and profound change.

The spiritual implications of Sheldrake's expansion of the Gaia concept are enormous. Adopting his worldview we can successfully argue that a shaman's incantations don't work as well in 1994 AD as they did in 3000 BC because God is out of the habit of listening to those types of prayers.

By far the most disturbing implication of Sheldrake's global extension of formative causation has to do with evolution, which brings us to his concept of purposive Nature. The consensus among developmental biologists has long been that evolutionary changes are sparked by random events, the spontaneous development of birth defects if you will. If randomness produces a departure from normality that gives the bearer a competitive advantage over his fellows, the species evolves. Sheldrake argues that randomness has nothing to do with it. Species evolve because Nature is pulling her many and diverse children toward some ever-moving endpoint. In other words, Nature is purposive. The question we humans need to ask is: Purposive for whose benefit?

Sheldrake avoids a direct answer. Important clues will, however, be found in the very same examples he uses to prove the existence of morphic fields. Let's return to the Blue Tit mystery for a moment. If we ask ourselves who benefited from the change of habit that spread successful cream-robbing behavior, the obvious answer is the birds. They obtained needed nutrients, albeit at the expense of the humans from whom the milk was pilfered. Score: Blue Tits one, Humans zero. In this case the outcome is trivial; although some Englishmen might argue the point, cream for morning tea really isn't essential to the perpetuation of the human species, whereas the nutrients contained in the stolen cream could very well be crucial in enabling the home-loving Blue Tits to continue to survive in a habitat where their usual food supplies had been reduced by the expansion of human settlements.

If, as Sheldrake suggests, Nature is purposive, then she has some larger reason for maintaining a healthy population of Blue Tits in Southampton. The broader scientific literature, which contains scores of examples of other species adapting to human encroachment, suggests a possible explanation: Nature has developed a habit of maintaining a high level of species diversity. How far a purposive Nature will go to insure diversity is a matter that demands our immediate attention. If, as Sheldrake suggests, Nature is a fundamentally nurturing Mother, then we might expect her to equally favor all her children. This being the case, we humans may be overdue for a major adjustment in our numbers. As the Black Death of the Middle Ages and the Spanish Flu following World War I demonstrate, a small mutation in an existing disease can reduce the human population very, very quickly.

Although it is implicit in his theory, Sheldrake never suggests the possibility that a purposive Nature unleashes pandemics to maintain species diversity. Indeed, it is precisely because of the lack of doomsday predictions that his book received such positive reviews. Had I reviewed *The Rebirth of Nature* when it was published in 1991, I too would have joined their chorus. Since then an event has caused me to change my thinking about Nature's capacity to tolerate humankind—or its willingness to do so, if you consider Nature to be purposive. The event occurred on April 16, 1993: the Centers for Disease Control (CDC) announced that a new ongoing series, "Emerging Infectious Diseases," would become a regular feature in its Morbidity and Mortality Weekly Report (MMWR). Although I had reported on health and environmental issues for al-

most two decades, I found the editors' rationale surprising: "Despite predictions earlier in the century that infectious diseases would soon be eliminated as a public health problem, infectious diseases remain the major cause of death worldwide," they wrote. "Since the early 1970s, the U.S. public health system has been challenged by a myriad of newly identified pathogens and syndromes . . . hepatitis C virus, human immunodeficiency virus, Legionnaires and Lyme disease, and toxic shock syndrome."

In the following months, CDC documented unexplained outbreaks of blindness in Cuba, toxigenic *Vibrio Cholerae* 0139 Strain in California, and Hantavirus Pulmonary Syndrome in the Southwest. It was against this backdrop that I turned the first page of *The Rebirth of Nature* in December of 1993. Are the emerging diseases reported by CDC examples of Sheldrake's purposive nature attempting to restore balance to species diversity? And the joke about saving the earth by killing the humans comes back to mind. In light of CDC's developing data on emerging infectious diseases, *The Rebirth of Nature* is a far more important book today than when it was first published in 1991. It is a book that deserves to be read and needs to be widely discussed.

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Editorial postscript: A very informative review of the whys and wherefores of new diseases is "The Emergence of New Diseases," Levins et al. (Harvard Working Group on New and Resurgent Diseases), *American Scientist*, 82 (January-February 1994), 52-60.