cumulating defective genes that will eventually weaken the species. But it's also likely that modern medicine is preserving useful genes that would otherwise perish.

Other scientists don't subscribe to the theory that evolution has reached an impasse. One reason is that—as experts on both sides of the fence agree—cultural changes can affect evolution. A past example of that is the "grandmother effect," which explains why women don't die off soon after their childbearing years, as other female primates do. The speculation is that, as Earth's climate turned colder and drier and plants grew tougher and more deeply rooted 1.8 million years ago, having Grandma around to manage the increasingly hard work of foraging while Mom tended to the brood became essential to survival.

Proponents of ongoing evolution point to the continuing role of such cultural changes. Malaria, for example, wasn't a particularly widespread disease before early humans began clearing tropical forests to establish settlements, thereby creating an ideal environment for malarial mosquitoes. The first human genetic modifications designed to fight the disease appeared after that, about 5,000 years ago. Researchers cite other factors that may still shape the human gene pool, such as drugs that adversely affect people with certain genetic susceptibilities and the rise of "super-resistant" disease organisms bred by the overuse of antibiotics. At least one gene related to human heart disease shows signs of continuing evolution. And in the developing world, which faces plagues of infectious diseases such as malaria and HIV with very little access to modern medicine, "evolution is definitely not over."

In the end, even leading advocates of the theory that evolution is on hold say there's no guarantee it will remain there. "We're on the edge of a cliff," says Jones, "on the simple grounds that we're far more abundant in number than we ought to be." A single deadly epidemic on a global scale might bring back natural selection with a vengeance—unless human ingenuity once again finds a way to stop it.

King of Codes

"Ode to the Code" by Brian Hayes, in *American Scientist* (Nov.–Dec. 2004), P.O. Box 13975, 99 Alexander Dr., Research Triangle Park, N.C. 27709–3975.

It's been four decades since life's genetic code was cracked, yet a nagging question remains: Why does this particular system for communicating vital chemical instructions govern virtually all life on Earth? Shouldn't there have been significant variations in the code as it naturally occurred in life, thus making it, like all living things, subject to evolution over time?

Consider ribonucleic acid (RNA), which often carries instructions to cells telling them how to assemble amino acids into a specific protein. The RNA language uses an alphabet of four "letters" to make 64 three-letter words called codons. Each codon specifies one of 20 amino acids, or else serves as punctuation signaling the end of a message. But with those elements, there's still an astronomical number (10^{83}, to be precise) of ways the instructions could be coded. Why this one?

Francis Crick, co-discoverer of the double helix structure of DNA, argued that the code may have been a "frozen accident," becoming so deeply embedded in the core machinery of life at some point in the distant past that any further change became impossible, notes Hayes, a senior writer for *American Scientist*.

Resisting that theory, some scientists have pointed to "certain protozoa, bacteria and intracellular organelles [that] employ genetic codes slightly different from the standard one." But nobody can find any adaptive advantage in those variants.

Other researchers argue that the code as it exists is already close to perfect. Its most evident virtue: its apparent ability to minimize errors in the transmission of genetic information. For example, the way the code is set up—so that some of the 64 codons are "synonyms" for others, with the syn-

onyms physically clustered together—ensures that, even when an error occurs, the proper amino acids are often assembled. Computer simulations with up to a million random codes have shown the existing code to be "a stellar performer" in minimizing errors—"the best of all possible codes," as one team of researchers put it several years ago.

But the case is not entirely closed. The computer simulations have certain weaknesses, and scientists continue to speculate about the code. Some are intrigued by various mathematical patterns in the code—such as the fact that the number 64 is equal to both 4^3 and 2^6. The patterns suggest many possibilities, including, unlikely as it may seem, connections with the I Ching.

ARTS & LETTERS

A Prize for the Books

"Sitting in Judgment" by Fiammetta Rocco, in *The Economist* (Oct. 23, 2004), 25 St. James's St., London SW1A 1HG England, and "The Booker Prize for 2003" by Merritt Moseley, in *The Sewanee Review* (Spring 2004), 735 University Ave., Sewanee, Tenn. 37383.

A year ago, *Economist* literary editor Fiammetta Rocco picked up the phone to hear a thin, reedy voice ask if she would serve as a judge of the Man Booker prize. Fifty thousand pages later, Rocco and four other judges named Alan Hollinghurst's *The Line of Beauty* the 2004 winner, in a process Rocco sees as emphatic proof of the prize's value.

The Man Booker—or simply the Booker, as it's better known—has become enormously powerful. Presented each year for a novel written in English by an author from the British Commonwealth or Ireland, the $90,000 prize has prestige that reaches far beyond. The 2002 winner, Yan Martel's *Life of Pi*, has sold 1.75 million copies worldwide, and publishers often print thousands of additional copies merely on the strength of a book's mention on the shortlist of finalists.

In Britain, where more than 100,000 books are published every year—the same number as in America, which has five times the population—obscurity yawns just beyond the printing house. Of the 10,000 novels published, many never even reach major bookstores. So the Booker is more than a shot in the arm. It can mean salvation.

Rocco's turn as a Booker judge made her a demanding reader with no patience for timidity, limited vision, or flabby language. She read a "minestrone" of 132 books in 147 days: "Unhappy families featured prominently; so did alcohol and absent fathers. The music of Bruckner was mentioned more than once, and a quantity of Italian food was ruined either by a disgusting liquor or by an exploding espresso machine."

Many of the books were admirable, but only a few stood up to all-around scrutiny and gained serious consideration—and the attendant publicity. In a literary age when reviews and bookshop placement aren't the literary Good Housekeeping Seals of Approval they once were, and knowledgeable bookstore owners are an endangered species, Rocco believes that the Booker selection process is important. It showcases talents that might not otherwise get their due.

Critic Merritt Moseley, who has covered the Booker for *The Sewanee Review* over the past dozen years, has a slightly more jaundiced view. He sees in the Booker a grande dame that is still the most prestigious British literary award but has lost a bit of its strut in recent years to the Whitbread Prizes and the Orange Prize. The Booker response, in Moseley's eyes, has been to whip up hype. The four to six week interlude between the release of the shortlist and the naming of the winner is calculated to generate chatter: "interviews with the shortlisted authors, comments on the list by all and sundry, oddsmaking and betting, and leaks and speculations." And now there's a "longlist" of the 20-plus semifinalists, released even earlier.

Then there's the matter of the winner itself. When Moseley surveyed the competition in 2003, "the worst novel on the shortlist" won for the first time since he began following the