the 1950s, sperm could be frozen and then thawed for use. Public acceptance came slowly, but when cases of HIV transmission were reported in the 1980s and '90s, cryopreservation became a necessity, as it allowed sperm to be kept "on ice" until it tested clean.

Sperm banks store their wares in tanks of liquid nitrogen, cryogenically preserving the samples at -196 degrees Celsius.

Currently, tens of thousands of children are conceived in the United States each year with semen purchased from sperm banks. At companies such as California Cryobank, the samples are stored in numbered and color-coded vials: white caps for Caucasian, black for African American, yellow for Asian, and red for "all others." Donors who best match the ideal Euro-American standard are most desired. Yes, consumers are disproportionately white, but even within other racial and ethnic categories, the most marketable donors are fair, tall, and slender.

With the birth of sperm banks, power to select donors shifted from the paternalistic physician to the consumer who paid for the product. What troubles Daniels and Golden is that the business has proven a breeding ground for "popular eugenics," and heritable traits are often lumped with those that aren't—such as religion or a Ph.D. Today, sperm banks dangle the prospect of a kid with the genetic right stuff to run fast, ace math, and go to Sunday school.

When artificial insemination was still a dirty little family secret, doctors sought sperm that would produce a child who looked like the presumed proud papa, or at least like a relative. No more. Tall, blond donors produce dozens of children, but the 4'7" man need not even apply: Nobody wants the little guy to father Little Johnny.

Is Evolution Over?

"Are We Still Evolving?" by Gabrielle Walker, in *Prospect* (July 2004), Prospect Publishing, 2 Bloomsbury Pl., London WC1A 2QA, England.

As humans continue to advance, their evolution may be grinding to a halt. Natural selection works by picking and choosing among millions of random mutations that occur in each generation, favoring those individuals who bear traits conducive to survival and punishing those with less desirable traits. But we have molded our environments to such an extent that natural selection may have nothing left to work with, observes Walker, a British science writer.

All that's necessary to get everyone's genes on a level playing field is for people to be able to grow up and reproduce, claims geneticist Steve Jones, of University College, London. And modern technical and cultural developments have assured precisely that. In Britain, a baby who reaches six months of age today has a nearly 100 percent chance of surviving to adulthood. Only 150 years ago, about half the babies born in London died before they reached puberty.

Nature has lost its power to select, Jones argues, and even if certain diseases or conditions, such as obesity, cut a few years off the end of our lives, "evolution won't notice," because we're already past childbearing age. Some in his camp worry that, without the ability to weed out problem mutations, we won't merely cease to evolve, we'll start ac-

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-