

The future of homo sapiens: A species perspective

by [Owen Gingerich](#) in the [Dec 01, 1999](#) issue

The colleague with whom I teach astronomy likes to challenge our students with the question, "Are we any smarter than the ancient Greeks were?" We surely have a great deal more knowledge—especially about technology, medicine and the natural world—than Plato, Aristotle or Aristarchus had, but few of us equal them in brain power or logical reasoning. Nor have we surpassed Jesus in moral reasoning. Two or three millennia are not long enough for natural selection and variation noticeably to augment brain capacity. It took 2 million years to double the cranial volume of homo habilis to that of modern homo sapiens.

But approximately 200,000 years ago something new was added to the evolutionary picture: the invention of language and social evolution. The DNA information in each human cell is roughly equivalent to the amount of information in 25 sets of the *Encyclopaedia Britannica*. A cutting-edge personal computer has approximately the same capacity, but the human brain has many times more. The flexibility of this cranial capacity has allowed our core of information and our understanding of the physical and biological worlds to increase exponentially. Our great-grandfathers would undoubtedly feel more at home in 16th-century Europe than in present-day America.

Will homo sapiens be smarter 2,000 years from now? Let me tackle that question by first presenting two scenarios for human eschatology, one pessimistic, one optimistic. First, the pessimistic. Nearly 40 years ago an article in *Science* proposed a formula for representing all the available historical data on world population and for predicting future population growth. The formula gave 2.7 billion as the 1960 world population and predicted that population growth would become infinite by Friday, November 13, 2026—a prediction that earned it the name "the Doomsday Equation." We are now more than halfway to that deadline, and the equation has proven eerily accurate thus far. World population doubled to 5.5 billion by 1993, the halfway point. Today the number of people alive is larger than the combined total of

all previous centuries. In 1900 there were 16 cities with a population of more than a million; today there are 400.

Clearly the Doomsday Equation cannot be right, since the formula predicts that early in the year 2026 the population will double in six months—a prediction at odds with the human gestation period. The rate of population growth has slowed worldwide; it is no longer as threatening as it was a decade ago. Nevertheless, the formula helps us realize that human expectations must change radically during the next three decades. Either life expectancy or the birth rate will have to fall drastically.

How might the death rate rise dramatically? For years we have lived with the Damoclean sword of nuclear warfare hanging over our heads. The collapse of the Soviet Union has lessened that threat. The *Bulletin of the Atomic Scientists* has moved back the hands of its doomsday clock, so that they no longer hover so close to midnight. But genocide continues apace in our troubled world, though not yet at a rate sufficient to stem the population tide.

Might starvation be the instrument for increasing the death rate? The Anasazi Indians disappeared from Chaco Canyon 900 years ago. They seem simply to have cut down too many pine trees, creating erosion that led to a shortage of food. A few years ago more than a million people in Somalia were on the brink of starvation; perhaps as many as 100,000 died in the summer of 1992. Might such starvation become widespread?

Perhaps disease will curb population. Africa's AIDS epidemic threatens to halve the continent's population within a few years. Yet even this extent of suffering would set back the area's explosive population growth by only 25 years. Are we facing even more devastating worldwide epidemics?

If we compare energy resources to population growth, we see that the world cannot possibly be heading toward a more equitable distribution of these resources. The per capita use of energy in the U.S. and Canada is 20 times higher than in Nigeria. At present use rates, the world's oil reserves are expected to last for roughly five or six more decades. If conservation and new automotive technologies decrease the demand, we could make oil resources last until about 2050—if energy use does not increase in China, India or Africa. We have enough coal to last for several hundred more years, but coal pollutes the atmosphere and increases the greenhouse effect. As the world's oil supply diminishes, competition for this precious and increasingly

expensive resource will grow, as will the threat of armed conflict—including nuclear conflict.

The oversupply of people and undersupply of energy makes it easy to be pessimistic about humanity's prospects. If not extinction, we might be facing a bleak and even brutish future. The story of the apocalypse and a final millennium seems all too real.

But there is also an optimistic scenario. Philip Morrison, a professor emeritus at MIT and an astute observer of the scientific scene, says he would give *homo sapiens* "about 10 million years." That, he says, is the typical lifetime for a complex species. Certainly the fossil record demonstrates that extinction is the name of the game. It is not reasonable to expect humankind to be exempt from the general rule.

Morrison says that "there will be plenty of energy if we exploit solar power. Of course, we'll have to learn to live with only about a tenth of the present world population." He expects that sea levels will rise, that "half of Florida will be under water." And he expects nuclear weapons to be used, perhaps in the Middle East, but only "enough to teach people that this is a bad idea." There won't be a global exchange that will bring us to the verge of extinction.

To me, 10 million years seems an unreasonably long time for the survival of *homo sapiens*. The first of the genus *homo* appeared about 4 million years ago, and already a dozen of its species are extinct. The difficulty of the transition to a sustainable population and the thriving scientific environment needed to harness solar energy will, I expect, lead to an exponential increase in biological knowledge. Fifty years ago we still did not know the exact number of chromosomes in human cells; today we are mapping their genetic patterns. Soon we will be able to correct crippling genetic defects. In 50 more years geneticists will surely be able to manipulate genes in order to create stronger, healthier, more intelligent people. In 2,000 years *homo sapiens* will indeed be smarter—if they even exist as the same species!

If *homo sapiens* are still on earth 10 million years from now, it will be in zoos or special preserves, as throwbacks much like Przewalski's horse is today. Evolutionary biology and anthropology give me this reading, which is neither pessimistic nor optimistic, but realistic. Cosmological eschatology, with its timescale of many billions of years, is irrelevant when measured against any reasonable scenario of future human existence on earth or in the cosmos.