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To Count Our Days: The Scientific and Ethical Dimensions of Radical Life Extension

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The prospect of dying has always fascinated, haunted and, ultimately, defined human beings. From the beginnings of civilization, people have contemplated their own mortality – and considered the possibility of immortality. Indeed, many of humanity’s oldest and best-known stories, from the Sumerian tale of “Gilgamesh” to the Old Testament Book of Genesis to Homer’s “Odyssey,” feature mortality and immortality as prominent themes.

Until recently, however, the possibility of dramatically extending human life has been consigned to the realm of speculation or science fiction. Scientists’ understanding of why people age – and how to stop aging – was not sophisticated enough to hold out hope that life could be extended much beyond traditional old age. But that may be changing.

Today, scientists at major universities and research institutions are talking about treatments that could extend average life spans by decades – or even longer. None of these medical prospects is yet a reality, and even the most optimistic researchers acknowledge that major breakthroughs could prove elusive. But for the first time in human history, some experts believe we may be at the threshold of a new aging paradigm, one that replaces the generally accepted limits of human life with more open-ended possibilities.

Throughout almost all of human history, life was, to quote 17th-century British philosopher Thomas Hobbes, “nasty, brutish and short.” A citizen of the Roman Empire, for example, could expect to live to be about 25. Even in 1900, the average American lived to be just 47, compared with an average of 78.7 years today.¹ One reason average life spans were so short is that many people died in infancy or childhood. Until the advent of modern public health and medicine in the early 19th century, many children died before their fifth birthdays.² However, those who survived into adulthood could reasonably expect to live into their 40s, 50s or even 60s. And reaching old age, while relatively rare, was not unheard of. After all, the Bible mentions people

¹ Today’s average life expectancy from U.S. Census Bureau, Population Division. December 2012. “Table 2. Projections of the Population by Selected Age Groups and Sex for the United States: 2015 to 2060 (NP2012-T2).” <http://www.census.gov/population/projections/data/national/2012/summarytables.html>.

² See Fishman, Ted. 2010. “Shock of Gray: The Aging of the World’s Population and How it Pits Young Against Old, Child Against Parent, Worker Against Boss, Company Against Rival, and Nation Against Nation.” Scribner, page 69. Fishman cites figures from 16th-century London showing that two-in-five children died by their fifth year.

living to be “seventy years, or eighty” in Psalms 90:10.³ And history is full of famous people who lived long, productive lives. For instance, many of the founders of the American Republic – including Thomas Jefferson, John Adams, Benjamin Franklin and James Madison – lived to be at least 80, with Adams dying at 90.

Still, by today’s standards, most adults had relatively short lives. Until the advent of antibiotics, countless millions died each year from what today would be easily treatable infections. Poor sanitation often spread diseases such as bubonic plague, cholera and typhus that could decimate populations without regard for age or wealth.

Today, people are continuing to live longer. In fact, every six years, the average life span in the United States increases by another year.⁴ According to the 2010 U.S. Census, nearly one-in-seven Americans are 65 or older. By 2050, the bureau estimates, that number will rise to more than one-in-five.⁵ Another sign of Americans’ increasing longevity is the growing number of people living well into old age. Between 1990 and 2009, the number of centenarians in the U.S. nearly tripled, from 38,300 to 104,099.⁶ By the middle of this century, the Census Bureau predicts, more than 400,000 people in the U.S. will be at least 100 years old.

The gradual increase in longevity in the United States and elsewhere has already brought about a slow-motion revolution in nearly every sector of society, from health care to housing to employment. But if radical life extension moves from the realm of fantasy to reality, that revolution will pick up considerable speed. Extending human life spans beyond those of even the oldest of our ancestors would raise a host of new social, political, economic, environmental, moral and other questions. Current ideas about marriage and parenting might change, for example, as people remain active for decades longer. Questions about environmental sustainability would likely increase if the number of people dying each year were to drop precipitously. And concerns about the divide between rich and poor might deepen if older people in wealthy countries spend large sums of money to prolong life while young children in the poorest nations continue to die of treatable diseases.

³ New International Version.

⁴ See testimony of Dr. Francis Collins before the Senate Appropriations Subcommittee on Labor, Health and Human Services, Education and Related Agencies on May 11, 2011. <http://appropriations.senate.gov/ht-labor.cfm?method=hearings.view&id=8a1dcace-6f68-4e35-ad94-4409966e2ffb>.

⁵ Source: U.S. Census Bureau, U.S. Population Projections. “Percent Distribution of the Projected Population by Selected Age Groups and Sex for the United States: 2010 to 2050.” <http://www.census.gov/population/projections/data/national/2012/summarytables.html>.

⁶ Figures cited in Brody, Jane E. Oct. 19, 2010. “Secrets of the Centenarians.” The New York Times. <http://query.nytimes.com/gst/fullpage.html?res=9E0DE5DA1639F93AA25753C1A9669D8B63>.

Religious organizations have traditionally played an important role in helping people think through end-of-life matters and respond to significant social changes. But since life extension has not made the journey from fantasy to fact, there has been little official or even quasi-official guidance in this area from churches and other religious groups. Still, religious people, from Pope Emeritus Benedict XVI to theologians and professors at religiously affiliated institutions, have started to think about the consequences of radical life extension. In particular, they have begun asking whether dramatically and artificially extending life is acceptable within the context of their religious traditions.

The questions religious officials and thinkers are asking about life extension, and the answers they are coming up with, are discussed later in this report and detailed more extensively in an accompanying summary, "[Religious Leaders' Views on Radical Life Extension](#)." (Also see a report on public opinion about radical life extension and related issues, see "[Living to 120 and Beyond: Americans' Views on Aging, Medical Advances and Radical Life Extension](#).")

A New Science

Until recently, most scientists did not take longevity research very seriously. Even today, in many parts of the scientific community, anti-aging research is viewed as science fiction posing as science. But scientists at some of the most prestigious universities and biomedical research institutes in the world are looking for ways to extend the length – and improve the quality – of human life. While few of these scientists confidently predict that their work will end aging or dramatically prolong the human life span, many are cautiously optimistic about the prospect of making significant progress in the coming decades.

Scientists do not know exactly why people age and die. They understand many of the mechanisms that lead the body to break down and stop working over time, but the underlying causes of aging are still a mystery. One popular theory holds that humans are essentially programmed to die after they are no longer needed to raise the children they produce. According to this theory, evolution has ensured that people are strong during their fertile years so they can produce and rear offspring, but this bodily vigor subsides after the reproductive and parenting years are over.⁷

⁷ For more information on this theory, see Kirkwood, Tom. 1999. "Time of Our Lives: The Science of Human Aging." Oxford University Press.

In the last 200 years, advances in medicine, nutrition and public health have substantially increased human life spans. But these increases have been achieved largely by helping more children live to adulthood and old age rather than by pushing the boundaries of human aging well past their known limits, which most experts put at about 120 years. (The oldest person on record – Frenchwoman Jeanne Calment – lived to be 122.⁸)

Today, a host of companies offer different treatments, from human growth hormone (HGH) to testosterone, aimed at helping people turn back the clock. But these therapies have been widely shunned by the mainstream medical community and, so far, they have not been scientifically shown to lengthen a person's life span in any meaningful way. Some, like HGH, are alleged to be detrimental to long-term health.

Most gerontologists predict that the average life span in the developed world will continue to grow steadily and slowly. For example, in the U.S., life expectancy is projected to increase from roughly 78 today to 83 in 2050.⁹ In addition, the number of people who live past 90, or even 100, will continue to grow rapidly.¹⁰ Without a doubt, the world is getting grayer.

Adding Years by Subtracting Calories?

So where and how does longevity research fit into this equation? The answer may begin with starving rats in a lab in Ithaca, N.Y. It was there, in 1934, that scientists at Cornell University announced they had roughly doubled the life spans of laboratory rats by putting them on a near-starvation diet. This finding seemed to fly in the face of conventional medical wisdom. After all, doctors had already fingered nutritional deficiencies as the cause of a host of maladies, from scurvy to rickets. But in the decades that followed, similar experiments in what was soon called “caloric restriction” were shown to lengthen the average life spans of other organisms, from yeast cells and fruit flies to hamsters and dogs.

⁸ Calment (1875-1997), who smoked until her 117th year, attributed her longevity to the regular consumption of olive oil, port wine and chocolate. See various obituaries from August 1997, including: <http://articles.latimes.com/1997/aug/05/news/mn-19639>.

⁹ U.S. Census Bureau, U.S. Population Projections. “Projected Life Expectancy at Birth by Sex, Race, and Hispanic Origin for the United States: 2010 to 2050.” <http://www.census.gov/population/projections/data/national/2012/summarytables.html>.

¹⁰ U.S. Census Bureau, U.S. Population Projections. “Percent Distribution of the Projected Population by Selected Age Groups and Sex for the United States: 2010 to 2050.” <http://www.census.gov/population/projections/data/national/2012/summarytables.html>.

More recently, in 2009, scientists at the Wisconsin National Primate Research Center released the findings of a 27-year study showing that rhesus monkeys fed a diet with 30 percent fewer calories than usual were much less likely to contract the diseases of old age – including cancer, diabetes and heart disease – than those on a normal dietary regimen.¹¹ Many longevity researchers hailed the Wisconsin experiment as particularly important because rhesus monkeys are among man’s closest biological relatives in the animal kingdom. It is one thing to prove that caloric restriction extends life in yeast cells, they said, and another to do so in a creature that shares 93 percent of man’s DNA. Equally important was the fact that the caloric-restriction experiments extended not only life span but *healthy* life span.

But the results of a parallel study, released in 2012, have called into question the claims made by the Wisconsin researchers. This second study – begun in 1987, five years after the Wisconsin research – has shown no appreciable difference in longevity between rhesus monkeys fed a normal diet and those given 30 percent fewer calories. The second experiment, conducted by the National Institute on Aging (NIA), did show a lower incidence of cancer in monkeys given the low-calorie diet when they were young and lower levels of blood sugar and cholesterol in another group started on fewer calories in old age. But so far, the monkeys fed the normal number of calories are, on average, living as long as those fed less.

For many researchers, the NIA study shows the safeguards built into the scientific method: Results that cannot be replicated are not valid. But others contend that while the NIA study has raised many legitimate questions about the effectiveness of caloric restriction, the jury is still out on whether eating fewer calories extends the lives of primates.¹² For one thing, they say, the oldest monkeys involved in the NIA study are only 22 years old – five years younger than the oldest monkeys in the Wisconsin experiment. So while NIA researchers have been able to show no difference in longevity so far, they have not determined whether those monkeys who are still alive and still on the low-calorie diet will live longer than those fed a normal number of calories.

Still, even if the Wisconsin results ultimately prove more accurate than those put forth by the NIA, important questions remain about caloric restriction. First, there is no widely accepted proof that putting humans on an extreme low-calorie diet will help them in any way. Some

¹¹ See Wade, Nicholas. July 9, 2009. “Dieting Monkeys Offer Hope for Living Longer.” The New York Times. <http://www.nytimes.com/2009/07/10/science/10aging.html>.

¹² See Kolata, Gina. August 29, 2012. “Severe Diet Doesn’t Prolong Life, At Least in Monkeys.” The New York Times. <http://www.nytimes.com/2012/08/30/science/low-calorie-diet-doesnt-prolong-life-study-of-monkeys-finds.html?pagewanted=all&r=0>

people have embraced caloric restriction, but since people live a lot longer than mice or even rhesus monkeys, there has not been enough time to evaluate the long-term effects, if any, of such a diet. Second, there is evidence suggesting that less complex creatures derive much more benefit from caloric restriction than more complex species. In relative terms, starving roundworms (with an average life span of two weeks) are able to extend their lives much more than starving mice (who live a number of years). Finally, caloric restriction is very difficult for most people to maintain, and according to some studies, it tends to make those on the diet look and feel tired and run down.

Mimicking Caloric Restriction

The challenge of living on a near-starvation diet has led some researchers to search for a way to mimic caloric restriction without requiring people to drastically reduce their caloric intake. These scientists hope that one day people will simply take a pill or “flip” a genetic switch and fool their bodies into thinking they are living on fewer calories, without actually suffering the hardship of eating dramatically less.

One substance that might hold the key to mimicking caloric restriction is resveratrol, a compound found in the skin of grapes and certain other plants. Some scientists believe resveratrol is behind the much-ballyhooed evidence, known as the “French paradox,” that regularly drinking moderate amounts of red wine could be good for a person’s health. In 2003, Harvard University biologist David Sinclair published his findings that high doses of resveratrol extended the healthy lives of yeast cells. More recently, Sinclair duplicated this experiment in mice and once again showed that those subjects taking resveratrol lived longer, on average, than those that did not.

Meanwhile, another ongoing study at the NIA involves giving resveratrol to rhesus monkeys. Because these monkeys live decades – much longer than yeast cells or mice – this NIA study will not directly focus on longevity and instead will examine whether the substance reduces the likelihood of the diseases of aging, such as diabetes and heart disease. If resveratrol reduces the incidence of these and other ailments, it might also increase longevity.¹³

Sinclair believes that resveratrol works by activating a specific gene (SIRT1) that also is activated during periods of caloric restriction. SIRT1 is part of a family of seven genes, called sirtuins, that are thought to regulate the body’s cellular waste-management system, thus

¹³ See Wade, Nicholas. Jan. 10, 2011. “Doubt on Anti-Aging Molecule as Drug Trial Stops.” The New York Times. <http://www.nytimes.com/2011/01/11/science/11aging.html>.

keeping people healthy at the cellular level. As people age, sirtuins become less active and the body's cellular waste system becomes less effective, giving people a progressively greater chance of contracting certain disorders, including cancer and Alzheimer's disease.

Sinclair and others believe that caloric restriction and resveratrol activate or energize sirtuins, thus keeping the body's waste-management system in peak form throughout a person's life.

Sirtris, a pharmaceutical company that Sinclair co-founded and pharmaceutical giant GlaxoSmithKline purchased in 2008 for \$720 million, has tested three different synthetic versions of resveratrol in humans as potential therapies for age-related maladies and is exploring other ways to activate sirtuins.

So far, none of the drugs tested at Sirtris have borne fruit and, in 2013, Glaxo closed the company's offices.¹⁴ However, the pharmaceutical giant (through its larger, in-house research operation) continues to examine the medical potential of sirtuins, using research and even researchers from the now-defunct Sirtris. The hope is still that one or more compounds will help keep diabetes, heart disease and other age-related problems at bay and, as an added benefit, significantly extend healthy life span.

Some longevity researchers are placing their hopes on another drug, rapamycin, which also might prompt the body to mimic caloric restriction and thus extend life span. For years, rapamycin, an antibiotic, has been used as an immunosuppressant for organ transplant patients. But animal tests have shown that it might also have properties that promote longevity. For instance, in one experiment, researchers at Jackson Laboratory in Bar Harbor, Maine, found that rapamycin extended the average life span of female mice by 14 percent, even though the drug had not been properly administered during the first 600 days of the experiment. This mistake on the part of the lab meant that the mice did not actually begin feeling the impact of the drug until they were well into mouse middle age. Some scientists speculate that rapamycin could have extended the lives of the female mice by 20 percent or more if it had been administered early enough.¹⁵

Proponents of rapamycin say it works by ramping up the body's cellular waste-removal system through suppression of the activity of a gene called mTOR, which produces certain proteins

¹⁴ See Edes, Alyssa. March 13, 2013. "GlaxoSmithKline to close Sirtris unit in Cambridge." The Boston Globe. <http://www.bostonglobe.com/business/2013/03/12/glaxosmithkline-moving-sirtris-five-years-after-buyout/unHXAJB3ZxfSAAtMp0LOi5I/story.html>

¹⁵ See Harrison, David E., Strong, Randy, et al. July 2009. "Rapamycin Fed Late in Life Extends Lifespan in Genetically Heterogeneous Mice." Nature, pages 392-395.

that help control cell metabolism. Those working with the compound hope that, in addition to extending life, rapamycin can be used to fight specific diseases, namely cancer.

Genetic Engineering and Other Methods

While some researchers have been trying to extend healthy life using chemical compounds, others have been trying a different approach: genetic engineering. The idea is that since different animals have radically different life spans, there must be genes in all living creatures that regulate age. If these genes can be found and effectively manipulated, life can be dramatically extended.

In the early 1980s, scientists began looking for so-called “Methuselah genes” in roundworms by turning on or off one particular gene and then seeing how long the mutated worms lived. Roughly 1,000 mutations later, in 1988, a biomedical researcher at the University of California at Irvine named Thomas Johnson showed that turning off a particular gene he called age-1 more than doubled the affected worm’s life span.

Other researchers, notably Cynthia Kenyon of the University of California at San Francisco, have subsequently produced much longer-lived roundworms, with life spans up to six times greater than normal. A similar experiment with fruit flies, also at UC Irvine, yielded significant gains in life span as well. But whether such a longevity gene exists in humans – or even in higher-order animals, such as cats or monkeys – is still an open and hotly debated question. Recently, scientists at the Albert Einstein College of Medicine in New York City have found a molecule that may provide another possible path to extending life.

In May 2013, the researchers announced that they had discovered a chemical called NF- κ B in the brains of mice – specifically in the hypothalamus – that appears to trigger aging processes throughout the body. Suppressing the release of the chemical in middle-aged mice allowed them to live longer and with fewer age-related illnesses. If this phenomenon also occurs in people, the researchers said, it would better explain the causes of aging and could eventually lead to effective anti-aging treatments.¹⁶

SENS and Singularity

¹⁶ See Palmer, Chris. May 1, 2013. “Molecules in the brain trigger ageing.” Nature. <http://www.nature.com/news/molecules-in-the-brain-trigger-ageing-1.12891>

Drugs such as resveratrol and rapamycin and experiments with Methuselah genes have the allure of a magic bullet: take a pill or flip a genetic switch and live an extra 20, 30 or even 40 healthy years. Some in the anti-aging movement, however, believe real gains will not be made by regularly ingesting one compound but through a combination of medical therapies.

One advocate of this approach is Aubrey de Grey, a former Cambridge University researcher and the closest thing the anti-aging movement has to a spokesman. De Grey, the chief science officer at an anti-aging think tank in Mountain View, Calif., the Strategies for Engineered Negligible Senescence¹⁷ (SENS) Research Foundation, believes aging will be conquered through a variety of “rejuvenation biotechnologies” that will repair and maintain the body indefinitely, much in the way a good mechanic can keep a vintage car running indefinitely. Under this scenario, various treatments, including stem cell and gene therapies, would be applied at the cellular level to halt the damage to the body caused by aging. “I’d say we have a 50/50 chance of bringing aging under what I’d call a decisive level of medical control within the next 25 years or so,” de Grey said in a 2011 interview.¹⁸

Some experts believe aging ultimately will be conquered by engineers and computer scientists rather than biomedical researchers. Ray Kurzweil, an American computer scientist and inventor whose work has led to the development of everything from checkout scanners at supermarkets to text-reading machines for the blind, says that what might seem outlandish today eventually will become possible because technological change is exponential rather than linear, meaning that technology is becoming more capable and more powerful at an ever-faster rate. “The reason information technology grows exponentially is that we use the latest technology to create the next,” he said in “Transcendent Man,” a 2009 documentary film about his life and ideas. “So each new generation of technology grows exponentially in capability and the speed of that process accelerates over time.”

According to Kurzweil, who is now the director of engineering for Google, this accelerating pace of technical change is already producing computers and other machines that give biomedical researchers much greater capabilities. For instance, “it took us 15 years to sequence HIV; we sequenced SARS in 31 days,” he said during a 2005 interview, referring to efforts to

¹⁷ In microbiology, senescence refers to a maturing of cells.

¹⁸ Quoted in Reuters article. July 4, 2011. “Who Wants to Live Forever? Scientist sees aging cured.” <http://www.reuters.com/article/2011/07/04/us-ageing-cure-idUSTRE7632ID20110704>.

sequence the genomes of HIV in the 1980s and '90s and of SARS (Severe Acute Respiratory Syndrome) in 2003.¹⁹

Using technology to improve traditional medical research is just the beginning, Kurzweil predicts. Soon, technology will give mankind the ability to place powerful machines in the human body to replace or improve existing biological systems. Machines, from pacemakers to cochlear implants, already play a huge role in medicine, and one does not need to be a science fiction writer or a professional futurist to see that the role of technology will continue to grow. Kurzweil and other scientists say that greater computing power combined with extreme miniaturization (nanotechnology) will allow scientists to put microscopic machines in the body – at first to protect and maintain people’s organs and ultimately to effectively replace them. In essence, Kurzweil says, scientists will “reverse engineer” bodily systems so they can be replaced with much more reliable machines.

But Kurzweil does not stop at this “bionic man” scenario. Eventually, he claims, human beings will achieve immortality by fully merging with machines. Kurzweil predicts scientists will one day find a way to “reverse engineer” the brain and download human consciousness into it. Blood, bone, skin and organs (what Kurzweil and others call “wetware”) will no longer be necessary.²⁰ “Our ability to reverse engineer the brain – to see inside, model it, and simulate its regions – is growing exponentially,” Kurzweil writes in his 2005 book, “The Singularity is Near: When Humans Transcend Biology.”²¹ Once this reverse engineering is complete, Kurzweil says, not only will human beings be able to live potentially forever, but we “ultimately will be able to vastly expand our intelligence.”²²

Many Questions, Many Answers

Even if scientists find ways to extend life only for decades rather than centuries, such a development would raise a variety of questions. Some of them fall into the realm of public policy: What would extra decades of life mean for the solvency of programs such as Social Security and Medicare? Would dramatically longer life spans make it substantially harder to

¹⁹ Quoted from NPR: Talk of the Nation, Science Friday. Dec. 23, 2005.
<http://www.npr.org/templates/story/story.php?storyId=5067661>.

²⁰ See Garreau, Joel. 2005. “Radical Evolution: The Promise and Peril of Enhancing Our Minds, Our Bodies – and What It Means to Be Human.” Broadway Books, page 104.

²¹ Quoted in Kurzweil, Ray. 2005. “The Singularity is Near: When Humans Transcend Biology.” Penguin Books, page 144.

²² Ibid.

promote environmental sustainability? Would having many more healthy older people lead to dramatic increases in unemployment among the young?

Life extension also would lead to many important social questions. For instance, would a doubling of the average life span change how many, if not most, people view marriage? Would people enter into marriage fully expecting, at some point, to marry again? And since children are often considered a hedge against mortality, would most people still want to have them? If they did, what would happen to traditional generational relationships? In a world where people may not look or act much older than their parents, grandparents and even great grandparents, would relationships remain the same?

There are many ethical issues, too. At a very basic level, some fear life extension could fundamentally alter people's sense of what it means to be human – and not for the better. According to Leon Kass, who chaired the President's Council on Bioethics under George W. Bush, one of the "virtues of mortality" is that it instills a desire to make each day count. Knowledge that one will soon die "is the condition ... for treasuring and appreciating all that life brings," he says.²³

Stanley Hauerwas, a noted author and theologian at Duke University's Divinity School, agrees that the certainty of death makes life more fulfilling. Without death, Hauerwas argues, love as we know it would cease to exist because it is the finite nature of life that prompts people to wholly commit themselves to others. "Death ... creates an economy that makes love possible," he said in a 2011 interview with the Pew Research Center. "If you lived forever, there would not be the necessity of loving this one, not that one. You could love them all."

But others see the possibility of significantly longer life as a blessing – one that people will adjust to and embrace, just as they have prior social and technological advances. De Grey of the SENS Foundation says that people fear much longer life spans only because they have talked themselves into believing that death is natural, and even good. He calls this a "pro-aging trance," which he says was "a sensible way of coping with the inevitability of aging" when it was inevitable. But now that aging and dying might not be inevitable, this mindset "becomes part of the problem."²⁴

²³ Quoted in Than, Ker. May 24, 2006. "Would Life Extension Make Us Less Human?" LiveScience.com. http://www.msnbc.msn.com/id/12953517/ns/technology_and_science-science/t/would-life-extension-make-us-less-human/.

²⁴ Quoted in "Why We Age and How We Can Avoid It." July 2005. Speech at a TED Conference in Oxford, England. <http://www.youtube.com/watch?v=8iYpxRXlboQ>.

When you come out of the trance and look at aging in the cold light of reality, de Grey says, you realize that it is not good or necessary. “It is a disease,” he argues. Curing this disease, like eliminating any particular ailment, will lead to much less suffering and much more human happiness, de Grey predicts.²⁵

Life Extension and Faith

So far, the religious community has made relatively little contribution to the debate on radical life extension. Even the Roman Catholic Church – famous for its extensive teachings on nearly every aspect of life – has not issued any official pronouncements on the subject. But some members of the clergy, theologians, ethicists and other religious leaders are beginning to ponder the implications of dramatically extending life. [Their views](#) offer the first glimmers of how religious institutions might respond to radical life extension if it becomes a reality.

For those who follow the Abrahamic faith traditions – Judaism, Christianity and Islam – views on life and death are heavily influenced by the creation stories found in the Book of Genesis (for Jews and Christians) and the Quran (for Muslims). In particular, theologians focus on humanity’s ultimate fall – as a result of disobedience to God – and subsequent expulsion from Paradise. It is clear in these narratives that after the expulsion, death became part of God’s plan for humanity. In Genesis 3:19, for instance, God tells Adam and Eve that, as a result of their sin, they will “return to the ground, since from it you were taken; for dust you are and to dust you will return.”²⁶

So does this mean that if radical life extension were to become possible, Jews, Christians and Muslims would uniformly object to it? Not necessarily. As with other ethical issues, such as abortion and stem cell research, the answer might depend on the particular denomination or religious tradition.

For instance, Paul Nelson, a Lutheran theologian at Wittenberg University in Springfield, Ohio, says that many mainline Protestant churches in the United States – including his own, the Evangelical Lutheran Church in America – probably would not oppose a new therapy that could dramatically or even indefinitely extend life. Instead, Nelson says, his church and other mainline Protestant denominations would approach such a development with caution and humility and avoid drawing bright lines. In fact, according to Nelson, some mainline churches

²⁵ Ibid.

²⁶ New International Version.

might do little or nothing about it at the national level. Instead, he says, they would let local church leaders and their congregations decide how to respond to the issue. “I think they would look to the congregations, the grass roots, for guidance on something like this.”

At the same time, some evangelical Protestant churches might be more inclined to publicly oppose, or at least warn against, new ways to dramatically prolong life. For instance, Albert Mohler, a leading thinker in the Southern Baptist Convention, the largest evangelical denomination in the U.S., has questioned the morality of trying to live significantly longer.²⁷ Other evangelical leaders have expressed concern that life-extension therapies might involve human cloning or embryonic stem cell research, both of which violate the strong pro-life teachings of many evangelical churches.

But Nigel Cameron, a bioethicist and the president of the Center for Policy on Emerging Technologies, a think tank in Washington, D.C., believes that while church leaders might reject artificial longevity, many rank-and-file evangelicals – and most Americans – ultimately would accept and use life-extension therapies. “With a few exceptions, evangelicals adopt the custom and practice” of the broader culture, says Cameron, previously dean of the Wilberforce Forum, an evangelical Christian think tank in Washington.

There are some indications that the leadership of the Roman Catholic Church also might have serious reservations about life extension. The recently retired pope, Benedict XVI (Joseph Ratzinger), has expressed concern that dramatically postponing death could end up stripping people of their richest experiences – including the search for the transcendent and the need to have children – and leave society in a state of aged paralysis. “Humanity would become extraordinarily old, there would be no more room for youth [and] capacity for innovation would die,” Benedict warned in a 2010 Holy Saturday homily.²⁸

On the other hand, some scholars believe the Catholic Church might make some allowances for more modest life-extension efforts, especially as part of a broader attempt to cure disease and alleviate suffering, says Father Nicanor Austriaco, a professor of biology at Providence College. He cites the church’s mandate to help the aged and sick as the reason it has often supported new and even potentially problematic research, such as genetic engineering.

²⁷ Quoted in Jarvik, Elaine. Jan. 7, 2006. “Shall We Enhance?” Deseret News.
<http://www.deseretnews.com/article/635174444/Shall-we-enhance.html?pg=all>.

²⁸ Quoted in Homily of His Holiness Benedict XVI. April 3, 2010.
http://www.vatican.va/holy_father/benedict_xvi/homilies/2010/documents/hf_ben-xvi_hom_20100403_veglia-pasquale_en.html.

While Christians grapple with what they perceive as the possible costs and benefits of life extension, most Jews would be open to the development, say a number of Jewish rabbis of different traditions. Indeed, most Jews would likely view a prolonged human life span as an opportunity to better serve God and man, says Rabbi Barry Freundel, an ethicist and theologian who also leads an Orthodox Jewish congregation, Keshet Israel, in Washington, D.C. “The goal in Judaism is to make the world better and [extended life] would allow us to do more of that,” Freundel says.

Radically extending life also would not be a problem for most Muslims, according to Aisha Musa, a professor of religion at Colgate University who has written about life extension from a Muslim perspective.²⁹ According to Musa, Muslims believe Allah knows each person’s exact life span – from birth to death, or what the Quran calls one’s “term appointed” (Sura 40:67). As a result, many Muslims likely would see new life-extending technologies as part of God’s plan for humanity.

Likewise, for Buddhists and Hindus, life extension probably would not create major concerns, according to thinkers in those faiths. Dramatically longer life would give Buddhists more time to learn wisdom and compassion and achieve nirvana, or freedom from suffering, says James Hughes, a former Buddhist monk who now serves as executive director of the Institute for Ethics and Emerging Technologies, a think tank in Hartford, Conn. Hindu scriptures, meanwhile, describe a “golden age” in the deep past when people lived 400 years. “Life extension would be seen as a return to this golden age,” says Arvind Sharma, a professor of comparative religion at McGill University in Montreal who has written about Hinduism and life extension.

Whether dramatically extending life would lead to a golden age or a nightmarish dystopia is, at this point, unknown. It is more certain that life extension, if it came to pass, would challenge and in some cases alter many social, political and religious norms. And our most enduring institutions, especially religious institutions, would be called upon to guide people through the moral implications of this new reality.

This report was written by David Masci, senior researcher at the Pew Research Center’s Religion & Public Life Project.

²⁹ See Musa, Aisha. 2009. “A Thousand Years, Less Fifty: Toward a Quranic View of Extreme Longevity.” In Maher, Derek and Mercer, Calvin. “Religion and the Implications of Radical Life Extension.” Palgrave Macmillan.