Merchants of Immortality

Chasing the Dream of Human Life Extension

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PROLOGUE

The Never-Ending Life

Several years ago, while spending a weekend in the country with my family, I stepped out onto the porch of the cabin where we were staying one night and looked up into the sky. It was unusually clear for a summer night in the Catskills, and every familiar jot and scrawl of the firmament was writ large — the Polestar, Little Bear, filaments of the Milky Way strewn like pulled cotton right down the middle of the dome, the entire landscape "apparelled in celestial light," as Wordsworth put it in his "Ode: Intimations of Immortality." A field of tall grass and wildflowers sloped down from the porch, and hundreds of fireflies blinked on and off in the middle distance, so that the line where our earthly, mortal light yielded to the celestial became beautifully blurred in the darkness. As I stood at the rail, I could hear the uniquely peaceful sound of untroubled sleep behind me in the cabin — my wife and two children. I scanned the dark sky for a shooting star. I even had a wish ready.

Since I didn't happen to see a shooting star that night, I don't think it will betray any cosmic confidences to reveal what my wish would have been, especially since it was so predictable. I wished for long, healthy, productive lives for my family, especially my children. In doing so, I know I was indulging a desire as ancient as our fascination with the heavens, a longing as timeless and fierce as the biological instinct to protect one's brood. A desire so old, in fact, that it is not only about nature, but a part *of* human nature, at least for the only species of life on earth known to be aware of its own mortality. And as an amateur student of aging, I also knew, as I stood at that porch rail, that my Darwinian warranty was about to run out. In strictly evolutionary terms, I'd just about outlived my biological usefulness to the species and would not much longer enjoy the built-in genetic protec-

tions crafted by eons of natural selection. Indeed, those two cherubs sleeping inside were the agents of my inevitable demise. Evolution protected me long enough for me (and my wife) to have children, but became biologically (and, in a sense, lethally) indifferent to us once we reached a certain age. From paramecia to primates, from the single-celled denizens of pond scum to poet laureates, natural selection stops caring about us once we have lived long enough to reproduce. Evolution in that sense is a strange ship: it moves ever forward through dark waters, keeping the species alive, even as it throws each and every member of the species overboard. I was nearing fifty years of age. My primary care physician had retired and I'd been forced to switch to a new doctor. His name — no joke — was Dr. Faust. And so this midsummer night's wish of mine, stripped of its conflicted humility and its faux altruism, revealed itself to be transparently self-referential. And here I'm tempted to add "like most of the wishes of my generation." Because what I was really saying was: Let us *all* live a long time, we're not quite ready to . . . to . . . I couldn't bring myself to utter the D word, even in a conversation with myself. I was content to reiterate the ancient ritual of submitting a time-honored petition to indifferent gods on dark, starry nights.

In the same way, I feel that an entire generation — a generation new to mortality, you might say — has been poised to file that same petition as a kind of generational class-action suit against the laws of nature. Many of us have been similarly poised at the railing of middle age, in the twilight of something more permanent than a summer night, launching that same fervent petition on behalf of our parents, our children, and, of course, ourselves. I am speaking in part of the baby boomers, 75 million strong in the United States alone, as well as our similarly entitled post–World War II siblings spread throughout the developed world. This is a generation, it goes without saying, that thinks of its petitions as somewhat special, a generation that is perhaps a little more insistent about answered prayers.

Or so it appears superficially. If you think beyond the demographic clichés, however, it's hard to believe with much conviction that the baby boomers are any more concerned about their mortality than previous generations and previous cultures. Can we possibly experience more feral emotions than the hunters and gatherers of 10,000 years ago, whose very mortality attached to the success of finding their next meal? Can we summon more urban angst than the average citizen of ancient Rome, who

could expect to live only about twenty or twenty-five years? Can we honestly argue that we feel a more exalted fear of death than the soldiers of the greatest generation, teenage boys like my father, huddled in foxholes, dodging bullets? I have a hard time convincing myself that this is so. What makes this particular moment so unusual in the age-old posting of these timeless wishes is that they might actually be answered in an altogether different way, with altogether unexpected consequences, in the not-too-distant future. Perhaps I was looking in the wrong place for my shooting star, because in a sense the truly meteoric agency capable of delivering on these wishes may be found not in the world of cosmology but biology; the high priests of our secular age, the molecular biologists, have begun to address mortality in a way no group, no generation, and no society has ever dreamed of before.

They may not succeed, of course, and the purpose of this book is not to conflate promising science with the wishful thinking of an entire generation. It is enough to note that in the last decade the most skilled, ambitious, and indeed arrogant of our sciences has lined up to tackle the "problem" of aging (and its faithful sidekick, death) in a way fundamentally different from that of any previous era of medical intervention. This is happening at the very same time that an enormous demographic bulge in our population is burying parents and picking out gray hairs in the mirror. If nothing else, these trends make for a fascinating convergence of social desire and scientific ambition; of deeply personal psychological needs (and fears) and the shamelessly public promissory notes that issue from the lips of biologists, businesspeople, and other incurable optimists; of the inevitable decline of the human body (or soma) and the almost alchemical, regenerative capabilities of bland cells in plastic dishes; of the highest intellectual aspiration for basic knowledge that contemporary civilization can muster, alongside the most common and infinite capacity for greed and personal advantage that has ever sullied the name of human nature. Looking at this intersection from one perspective, nothing less is at stake than a partial or nearly total repeal of mortality; from another perspective, we might be witnessing a postmodern, molecular version of the Fountain of Youth tale, a spectacle of promise and hubris and failure that will make the Ponce de León story look like bad summer stock.

Medicine, especially in the last century, has consistently helped prolong life (or, if you prefer, forestall death), to the point where more people

in developed societies are living to a greater age than ever before in human history. Because we've done such a spectacular job of minimizing the agents of premature death — diseases, accidents, poor hygiene, injuries, not to mention predation, starvation, and exposure — we are living so long that aging itself has only recently emerged as a subdiscipline of medicine. In a sense, we didn't even know aging existed as a biological phenomenon until we started living well beyond reproductive age, which is really all that evolution is interested in protecting. Now that we know aging exists as a separate, degradative phenomenon, and are beginning to understand it, we naturally want to see if we can tinker with the process. That is what we do, and that is what I have set out here to chronicle: an account of some of the people who have begun to revolutionize medicine's assault on aging, and the type of science they are doing. Inevitably, my encounters have also led to a cultural contemplation of what it might mean to us, as individuals and as a society, to repeal, even partially, the laws of mortality.

For most of the recorded past, humans could expect to live on average about twenty years (although that number is deceptively low because of the high incidence of infant and childhood mortality). A century ago, Americans born in 1900 could expect to live roughly forty-nine years. Some lived longer, of course, but many still perished at a very young age. Civilization — in the form of antiseptic medicine, sanitation and public hygiene, vaccination and other measures — has dramatically increased the amount of time we can expect to spend on earth. Indeed, as a prominent gerontologist, Leonard Hayflick, puts it, "Aging is an artifact of civilization."

Some of these thoughts were on my mind on a sunny day in December 2000, when I headed north from San Francisco in a rented car. It was a professional pilgrimage, in that I was setting out to talk to Hayflick, a scientist well known within the biological community (indeed, almost infamous) and yet virtually unknown outside it. In 1961, Hayflick achieved a rarely attained degree of academic celebrity when he discovered that normal human cells grown in the laboratory have a finite lifetime — that is, they are programmed to divide a more-or-less fixed number of times (known now as the "Hayflick limit") and then simply stop replicating and senesce. *Senescence* is a word groaning with metaphoric throw weight in the context of human gerontology; cellular senescence begins a process of biological lassi-

tude and decay that ultimately leads to cell death. Hayflick's discovery brought together a powerful mix of scientific interests: aging, life span, the biology of cells, immortality. It put the biology of aging — and therefore the biology of life and death — squarely in the crosshairs of the biologist's microscope.

Hayflick had sent me meticulous instructions on how to reach his home — a map marked with arrows, annotated directions of key crossroads, even aesthetic admonishments ("Go slow on Highway 1 for safety and to observe the beauty! Careful around blind curves . . ."). As I headed north on Highway 101 and cut across Mendocino County toward the Pacific Ocean, it was hard not to notice the everyday auguries of aging and mortality that color the way in which we view the world, even from a car window. Outside Guerneville, the road curved past — deferred to, actually — a number of towering redwoods crowding the asphalt. Some of those massive and long-lived creatures have lorded over this landscape for centuries (and yet they represent a lesson in complexity and paradox as well as longevity, for as Hayflick has pointed out in one of his books, only a tiny fraction of their cells are actually alive, the rest inanimate pulp). At another point, within spitting distance of the Russian River, several birds that I took to be buzzards — high-shouldered, glowering gatekeepers of the afterlife — perched on a wire, waiting, their patience seemingly informed by the knowledge that they never have to wait too long. Even when you weren't exactly looking for them, the signs and symbols of life and death were everywhere, just as they are every waking day, gentle but persistent reminders that mostly blend into the background of our busy days.

That's what made this a personal pilgrimage, too. At the time, I had just turned forty-nine and was about to trip an important threshold on my own actuarial odometer. My parents, both in their seventies, were alive and in reasonably good health. I had a daughter who had just turned five, a son soon to turn three. Those little details would normally be irrelevant intrusions in a scientific narrative; in this one, however, they form a kind of background matte to the portrait of science that occupies the foreground. It is our children, especially, whose lives may well be altered by this new science. Even without being crassly self-interested, it is impossible not to think about the science possibly to come in very personal terms.

In conversations with Hayflick and other scientists over the next few days and in subsequent months, I heard outlined, in sketchy but tantalizing

detail, a medical future so bold in its ambitions, so profound in its potential impact, that if even a tenth of the promises pan out, it will fundamentally change how we think about life and what it means to be human. There was talk of genes that, when properly manipulated, might significantly extend life span. There was talk of stem cell therapy, a celebrated new technology that holds the hope of replacing aging or failing or diseased organs and other body parts. I even talked to several people whose cells were being used to clone them, in an attempt to create a short-lived, utilitarian embryo that could be harvested for stem cells and, perhaps, immunologically compatible cells and organs. In almost every instance, a biotechnology company had been formed, or was in the works, with dreams of commercializing a technology that would extend life or regenerate human tissues and cells. Indeed, the catchphrase of the day was "regenerative medicine," referring to a discipline that had its own meetings, its own funding and supportive foundations, its own ambitious agenda, and its own little swarm of bioethicists and journalists flitting around like gnats, trying to figure out what was going on and what it all meant. And it was happening very fast: on the ride to Hayflick's home, the news on the radio had been dominated by the still-unresolved Florida vote count in the 2000 presidential election. I think it is safe to say that no one, during those weeks of uncertainty, could have predicted that the new president's first major televised address to the nation would focus on, of all things, embryonic stem cells.

As I traveled around and heard these stories, it was impossible not to think back to that moment on the porch, to hear a little voice in my head say, with all the requisite self-interest of a baby boomer: What's in it for me? What will this mean in my lifetime? Will I live longer, or better? What's in it for my parents, who have both survived to about the predicted life expectancy of people born now (79.5 years for women, 74.1 for men in this country) but are not without medical problems that will need addressing sooner or later? And most of all, what will it mean for my children, for all children? When they reach middle age and beyond, will they indeed avail themselves of a vastly different pharmacopoeia, a spectrum of treatments that could well include cellular therapies, replacement organs grown from scratch, enzymes that immortalize cells? Just how satisfying will that longer life ultimately be, for myself and my children? And what will it mean if our society becomes disproportionately weighted on the elderly end?

It is too soon to provide any definitive answers to these questions, but

it's a good time to begin asking them. And, as I quickly began to learn, there are plenty of strong and conflicting opinions about this future, beginning with the man who, in a sense, started it all.

Early the next morning, I followed the final instructions — the last of three pages — to the Hayflick residence, a handsome two-story contemporary home on a little cul-de-sac overlooking the ocean. The natural wildness of the site was spectacular, but not nearly as spectacular as the scientific story Leonard Hayflick told inside. We spoke for about seven hours (the fruits of that conversation form the basis of chapter 1), but one moment particularly sticks in my mind.

It was late in the afternoon, after many hours of talk, and Hayflick was sitting on an ottoman in his living room. The silvery light off the Pacific, muted and dulled by high clouds on this December day, nonetheless seemed to ricochet off the white walls and high ceilings of Hayflick's home. As soft and cool as the afternoon light was, Leonard Hayflick was building up an indignant head of steam. To those who know him, including many who admire his remarkable career in science, the fact that he can still, at the age of seventy-two, climb up on his high horse is no surprise; he's never been one to hide his opinions, and for much of his life he's expressed those opinions without reservation and lived with the consequences. What provoked his ire on this day was a question I had asked. I admit to baiting him a little, because I suspected what his reaction might be, but I hadn't quite expected the magnitude of the reply. I asked about a single word that has increasingly crept into routine scientific discourse, into newspaper headlines, into New Age wish lists: *immortality.*

Hayflick has been a prominent cell biologist for four decades and is a former president of the Gerontological Society of America, so I naturally wanted to know what he thought about a stream of recent public statements by respectable scientists regarding the prospects of significantly extending the human life span through the related technologies loosely known as regenerative medicine, and the increasing use of the I word. (I can't claim to have come to this discussion with entirely clean hands; about a year earlier I had written an article for the *New York Times Magazine* about the discovery and commercialization of embryonic stem cells, and the illustrations — not my handiwork, I hasten to add — depicted octoge-

narians frolicking on scooters and in convertibles, accompanied by the words "Racing Toward Immortality.")

Several days before I spoke with Hayflick, for example, the first annual meeting of the Society for Regenerative Medicine convened in Washington, D.C. In his remarks to the group, William Haseltine, a cigar-smoking and ostentatiously optimistic bio-mogul who serves as chairman of the company Human Genome Sciences, predicted that several emerging technologies — stem cell therapy, tissue engineering, and the use of gene-related proteins — would change the way medicine is practiced, and would forever change our expectations of how long we might live. More to the point, Haseltine had been quoted several times as predicting that twenty-first-century medicine would achieve a kind of "practical immortality."

Perhaps inevitably, the West Coast version of this genre of meeting took the form of the annual gathering of the Extropy Institute in Berkeley, a meeting attended by several excellent hard-core molecular biologists and later amusingly chronicled by Brian Alexander in *Wired* magazine. Michael Rose, an evolutionary biologist at the University of California at Irvine, was quoted as saying, "I am now working on immortality . . . Who gives a fuck what people consider flaky! If it's the truth, it's the truth." Cynthia Kenyon, a well-respected molecular biologist at the University of California at San Francisco, spoke of her work identifying a "grim-reaper gene" and a "fountain of youth gene" in nematodes, and was quoted as predicting that dramatic life-span extension would become a reality in the twenty-first century. Michael West, the head of a company called Advanced Cell Technology, did not attend the meeting but was definitely there in spirit. "We are close to transferring the immortal characteristics of germ cells to our bodies and essentially eliminating aging," he told *Wired*. "That sounds spectacular, but I believe those are the facts." In what passed for scientific caution and restraint, Calvin Harley, head scientist at the biotech company Geron, said he believed it was not inevitable that our "somas" — our bodies — are dead-end carriers. "We are all born young," he said. "There is a capacity to have an immortal propagation of cells. The way we have evolved is to go from germ line to germ line, with our somas the dead-end carriers." "But," he added, "that is not inevitable."

As I recited each remark to Hayflick, I could see him alternately stiffen and squirm. "How shall I put it?" he began after a long pause, clearly offended by the hubris of his colleagues, several of whom he considers close

friends. "I've been in this field longer than any of the people that you've mentioned, which," he conceded with a laugh, "probably doesn't mean a helluva lot. But I'll say it anyhow. Every five years, for the past forty years, there have been pronouncements made by people with names other than those that you mentioned, and with expectations identical to the ones that those people made. I'm still waiting. And I'm afraid I'm going to wait not only through my lifetime, but probably forever.

"The problem," he continued, shifting into second gear of his dudgeon, "is that there is a failure to understand the universality of a phenomenon. If they can show me the simplest way to prevent aging in their own automobiles, to have them live for a hundred years, then there will be some reason to buy into the biology argument. But they cannot do the simple thing, like keep their cars from aging for a twenty-year period, to say nothing about biology. And furthermore, what makes them think that the molecules that compose living things are any different from the molecules that compose inanimate objects, in respect to deterioration over time? And finally, and probably the most telling argument, which will never ever surface in articles like that, is the stupid question, Why do you want to do it in the first place? What is the benefit? People have this underlying, tacit belief that increasing human longevity, or curing aging, or however you want to characterize it, is a good. They've never asked themselves or never described what that good is. And I challenge *all of them* to provide a single scenario that makes sense. Any scenario that they're liable to describe will come closer to science fiction than probable scientific reality."

"But," I replied, "it is in the air now."

"It's been in the air since human history has been written in caves!" Hayflick almost shouted. "It's *always* been in the air. It's no different between now and any other period of time. There just happen to be more people involved. More people who haven't taken the time to understand this field, unfortunately."

Hayflick had especially unkind words for the genetics of aging, a field that has recently exploded with discoveries both in model organisms like fruit flies and in human centenarians. "There are no genes for aging," he insisted. "I'll say that categorically, and I'll defend it despite what you have heard and will hear from Cynthia Kenyon and others. People like Kenyon and Leonard Guarente and others are not working in the field of aging at all. They're working in the field of, to be liberal, longevity determination —

to be more specific, developmental biology. Aging is a deteriorative process, as most people should know, and those folks are not working with that aspect of the animals they're working with that involves the deteriorative changes that occur during aging. They're manipulating biological development with the beautiful experiments that they're doing, and there's no denying that and I'm not speaking to their experimental design. I'm speaking to their understanding of what aging is and what aging isn't. The fact is that everything *will,* whatever the hell you do. Everything in the universe ages."

Hayflick has earned the right to express these opinions, because he arguably laid the groundwork for the entire field of molecular gerontology — the notion that aging, its causes as well as potential remedies, might fruitfully be attacked at the level of cell biology and molecular intervention. And he is well versed in the demographics and statistics of longevity determination; in fact, not long after my visit he became so infuriated by the reductionist hubris of some of his fellow biologists that he teamed up with gerontological demographer S. Jay Olshansky and dozens of other prominent aging experts to prepare a manifesto decrying the misguided messages imparted to the public about antiaging research.

The would-be practitioners of "practical immortality" were spinning out a far more optimistic, revolutionary view of the future. A couple of days after visiting Hayflick, I paid a visit to the laboratory of Cynthia Kenyon at UCSF. Kenyon looks younger than her forty-six years and, despite locutions that sometimes flirt with Valley Girl diction, possesses a breadth and depth of knowledge that is immediately apparent and instantly intimidating. She cut her teeth working under several of the most celebrated molecular biologists of the last half-century, including Sydney Brenner at Cambridge and Mark Ptashne at Harvard, and has narrowed her focus to several intriguing genes in a small worm known as *Caenorhabditis elegans.* These tiny nematodes, when viewed through a microscope, appear to have no other purpose in life but to endlessly carve sinuous arabesques in their growth media, their movements mesmerizing and beautiful. Whatever their purpose in life, Kenyon and her colleagues have found a way to extend that life — quadruple it, in some cases — by altering a single gene. She is unapologetically exuberant about the possibilities this might hold for human biology and human medicine.

"You know, if you look at an old worm under a microscope, it has all these tissues, and the tissues have all our genes in them — you know, myo-

sin or transmitters, whatever — and the worm looks awful. And then you change one gene and the *whole* worm, all the tissues, looks good. So you'd never think you could do that with one gene. And once you see it happening in a worm — the impossible has already happened. What you would think would be absolutely impossible is *not* impossible. You can do that. Now, whether you can do it in a human and blah-blah-blah? Well, the big jump has been taken. You can do it in an animal. That's the main thing. Whether or not you can do it in a human? Maybe, sure, I could see maybe you couldn't for some reason," she said, pausing to give this possibility its due. "But I doubt it." Although she hedged her words scientifically during our conversation, she has not hedged her bets entrepreneurially. In the fall of 2000, she formed a company with MIT scientist Leonard Guarente that has as its ultimate goal the creation of medicines that would extend the human life span. One venture capitalist with whom I spoke called it "the hottest technology around right now."

In all the years she spent doing elegant experiments on the genetics of nematodes, Kenyon told me, hardly anyone outside the scientific community paid any attention to what she had accomplished. But as soon as she began to tackle the molecular biology of aging, she was inundated with requests for interviews. "Night and day," she said, "night and day. The public is absolutely fascinated by aging. They don't want to get old. And you can see — read Shakespeare. Read the sonnets. They're all about aging. A lot of people have an interest in biology that really doesn't extend much further than their desire to cure a disease, I think. But no one likes to get old, and no one likes to see their parents get old, or their grandparents . . . You know, it's just . . ." — and she reached for the right sentiment — "it's a very, very powerful human desire, I think, not to get old. And you really feel that in a *big* way when you study aging." That emotion has become tethered to the most sophisticated science of our time.

Longevity genes, replacement body parts, stem cells, immortalizing enzymes — you won't find reference to any of them in the sonnets of Shakespeare. But Kenyon's remark inspired me to go back and read the sonnets; I found that she was right. There in abundance you will find the timeless, anticipatory human sadness about aging, about "winter's ragged hand" and "that churl death," that, four hundred years later, fires our social fascination with the topic. We prick our ears at any breakthrough, whether marketed by clairvoyants or molecular biologists, that purports to arrest or

reverse the inevitable process of aging, or even to extend the human life span in such a way that it no longer seems preposterous to speak of a certain, practical immortality.

But as Hayflick's exasperation suggests, there is an abiding division and tension, even among biologists, on whether the human life span can be extended through better biology. It is a debate that is going to be played out before an extremely attentive audience over the next decade or so.

In my journey up to Sea Ranch, I later realized, I had unintentionally followed an earlier pilgrim, someone who has perhaps understood the link between the emotional, cultural longings for an extended life span and the science that might deliver it better than anyone else in this story.

In the summer of 1992, a young man named Michael West drove those same roads, took those same cliff-hugging turns past Monterey pine and Douglas fir, passed that same wild and ravishing seascape on the way to visit Leonard Hayflick. For West, this truly was a pilgrimage, a journey to pay homage to a master, for Hayflick was the scientist whose work had prepared the bed in which all of West's dreams had begun to take root. A few months earlier, in the fall of 1991, West had blown away a roomful of jaded West Coast venture capitalists with his vision of creating a business to develop medicines that would treat the process of aging, based on several cutting-edge molecular technologies just then coming out of academic labs. The money people had watered the seeds of West's ambitious ideas with millions of dollars, and by March 1992, he had a company on paper. It was called Geron, and it was the first biotechnology company explicitly devoted to the molecular biology of aging.

West had much on his mind in those days — hiring scientists, finding lab space, riding herd on research, scouting out new technologies. But one of the first things he did was drive up to see Hayflick. And Hayflick was thrilled to have him. "He spent the weekend up here," Hayflick recalled, "and stayed in the guest room. He was so riveted by this concept. I took him out to dinner and he hardly touched his food, he was so busy talking about what he wanted to do. It was very refreshing to see somebody who — I've known a few scientists who burn with a white-hot flame, and Mike is one of them."

They talked all weekend long — both are excellent talkers and story-

tellers. They talked about aging research. They talked about personalities in the field. They even talked about some of the classic medical textbooks in the field of aging, and exchanged copies of first editions of these seminal books. Hayflick showed West the famous letter he had received from a Nobel laureate, rejecting for publication a 1961 paper that subsequently became one of the most widely cited in twentieth-century science. "He was really one of the first young people to enter the field who had a sincere interest in the history of aging research, and that was extremely impressive," Hayflick told me. "I thought to myself, 'Here's a fellow to be cultivated.'

"It's immodest of me to say it," Hayflick continued, "but he knew the history of the field, and he was fascinated by my discovery of the limits on cell replication in culture" — the discovery, that is, that cells grown in a lab dish don't, and can't, live forever. "And he just wanted to talk to me about that. How did I discover it? What went through my mind? What were my views on the company, on its direction, on people who might be hired? I think that weekend stimulated him, because he knew he could rely on me to provide help, suggest people to contact, and so on." Hayflick paused here, then added, in a speculation rife with implications, that he might also have served as "kind of a father figure, maybe" for West.

That speculation may actually get closer to the reality of things, not least because it hints at the way in which that relationship may have influenced a pitched public-policy debate nearly a decade later. While there is no question about the crucial role Leonard Hayflick played in the early days of molecular biology's attack on aging, and how his early experiments have inspired a fabulously productive area of contemporary science, what's far less appreciated is how he also served as a role model and inspiration for Michael West — not simply for his science, although that was important, but for his attitude, his temperamental readiness to defy authority, and his willingness to pay a price, an enormous and almost unconscionable price, to do something he believed was right, even when everyone else in the world believed he was wrong. And it's quite possible that after his weekend at Sea Ranch, West appreciated — as does almost anyone who speaks at length with Hayflick — a deeper moral to Hayflick's story. Although he can be stubborn and antagonistic and even bombastic, perhaps Leonard Hayflick's greatest sin and scientific transgression was that he was way ahead of his time. It was a lesson that West, who shares many of the same qualities, took to heart.