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Introduction

"OLD FOLKS are not afraid to talk. *Anic chij peyaquij mu'in.* [They know how to speak their minds]. And when they speak, the young people listen," explained Francisco, the chief of a Tsimane village located along the Maniqui River in the Bolivian Amazon, far from the nearest town.

He continued, "*Isho'muntyi* [old people] don't get lost in the forest, they know the short-cuts, they can find their way to get anywhere. . . . They lead [trips] into forbidden areas where the *jäjäba* forest guardians live."

The tropical moon was nearly full, and in the delicate shimmer of night, I could just barely make out his expression. He described other abilities and privileges held by older adults—the isho'muntyi with speckled hair who have lived many years.

His body quivered suddenly, and he began to chant, "*tsäquij tsäquij* . . . [it's dangerous, dangerous]. . . . To be on your own is dangerous. Children sometimes abandon their parents, they are stingy with them. Life can be hard." In the past, he explained, elders who were all alone would sometimes poison themselves by eating charcoal, and end their lives.

This conversation occurred almost five years after I had first visited Bolivia in 1999 and had the good fortune to live and work with the Tsimane (pronounced chee-MAH-nay) people. The Tsimane are Amazonian slash-and-burn "horticulturalists"—they are rain forest dwellers who make a living by growing a limited number of crops in small fields, crops such as sweet manioc root, corn, and rice. Like most other Amazonian groups, they also hunt, fish, and gather wild fruits and honey.

When I first came to Bolivia, I wanted to better understand all the intricate ways people work together to eke out a living. Not just the technical aspects, but the social and cultural means of binding fates—how do these help promote a long, healthy life? How do people like Francisco even reach old age in the harsh *infierno verde* (the "green hell," as it was called by outsiders who waded through the Bolivian jungles in the early twentieth century)?

As a graduate student in the late 1990s, I had studied how cooperation and sharing help buffer hunter-gatherers against food shortfalls and other common risks. I was privileged to study among the Ache of Paraguay for my doctoral dissertation.[1] Living among the Ache first opened my eyes to how survival in extreme environments was as much, if not more, about trusting others and having others trust you than about figuring out how to start a fire with wet logs or avoiding snake bites.

But in Bolivia, I was hoping to untangle how departures from a full-time foraging lifestyle might change survival strategies. How might a less nomadic lifestyle, where people farm and live in semipermanent settlements, affect how people survive the day-to-day and how they cope with different hardships and disasters? I wanted to know how these experiences might leave their imprint in the body, and how the body ages under such conditions. In the popular imagination, life in the wild is tsäquij, just as the Tsimane sometimes sing—requiring vigorous strength, close ties with others, and the know-how that comes from long-standing cultural traditions. Life, in the timeless and cynical words of the philosopher Hobbes, is "nasty, brutish and short." It's a young person's world. And so maybe there is no real aging under such conditions, just lives cut short close to one's prime; elders are just the lucky few to survive life's literal slings and arrows.

The above would seem to support the dominant narrative among many people—both lay public and scholars alike—that human life expectancy increased dramatically over the past two centuries but was low over much of human prehistory. And so, among our preindustrial ancestors, reaching a late-age life stage was a combination of lucky happenstance and honorable defiance against the elements. As the story goes, the dawn of mass sanitation, public health awareness, and antibiotics gave rise to the improved conditions that allowed growth, development,

health, and aging to be transformed in fundamental ways. Certainly there are some sweeping differences: the height of an adult man in the early nineteenth century was between 5 feet, 3 inches (Russia) and 5 feet, 7 inches (UK), and he lived to about 25 to 35 years of age, on average, whereas, by the end of the twentieth century, average height had reached about 5 feet, 10 inches in both countries, and men lived to about 60 years in Russia and 74 years in the UK. Though these facts about the changing human conditions over the past two centuries are true, we can still flip the traditional narrative on its head.

The dominant narrative ignores a basic biological fact: our body was built to last roughly seven decades, and this longevity has been a fact not only for recent centuries, but for many millennia. Our massive gains in life expectancy over the past two centuries reflect a larger percentage of people over time living to older ages, rather than any dramatic extension of longevity. Extended life has long been a part of our human experience. It is an immutable characteristic of our species. This human life course, like that of any species, is a coordinated system, whose moving parts that seem to age at different rates make sense only once we realize that we evolved to produce and convert energy into babies. But we achieved this in a particular way, given the new physical and social environments our hominin ancestors inhabited and helped create.

Modern amenities may further prolong healthy human lifespan, but major improvements are still in the realm of science fiction. Nevertheless, more people are reaching their longevity potential than ever before. This is a boon for the majority of us likely to celebrate many more birthdays. It's also a potential crisis, with headlines decrying the many implications of our rapidly graying population—on work, retirement, health care, housing, and caregiving. We're at a pivotal time to rethink aging, to imbue elderhood with purpose, and to entertain new opportunities to harness the experience, wisdom, and know-how of older adults.

In this book, I argue that our potential for a seven-decade lifespan first evolved at least 50,000 years ago, way back during the time of our hunting-and-gathering ancestors. Our seven-decade lifespan didn't

emerge after the Agricultural Revolution some 12,000 years ago, and it certainly didn't emerge after the Enlightenment of the eighteenth century or even after the Industrial Revolution. The evidence points to emergence in the early days of our anatomically modern species, *Homo sapiens*. But why? To better understand the mosaic of conditions that shaped the life history of our ancestors over past millennia, we can look to contemporary hunter-gatherers and other small-scale subsistence populations. These few remaining populations can give us a glimpse of how our long life came to be, and why. We'll come to see that a long lifespan is more than just a quirky feature of us hairless apes. It defines who we are and enables all that we generally take for granted—from our slow-growing children, our over-stuffed brains and the rich mythologies that fill them, and our multigenerational social grooming.

This capacity for long life is part of a bundle of traits that makes us unique among mammals and even among our primate cousins. This human "life history" includes the capacity to live not just a long life, but to live decades beyond menopause—an outlier in the natural world, where making babies to pass genes to future generations is the main metric of evolutionary fitness. For most animals, the body dwindles and declines at about the same rate as the diminishing ability to bear young. The decoupling of our ability to procreate from every other aspect of our physical body is a zoological anomaly—one that has only increased further in the twenty-first century. Globally, 24% of the human population, or 1.9 billion people, are now living at "postreproductive" ages (that is, over age 50)—a demographic feat unheard of in the history of our species. Even in 1950, the proportion of "over 50s" was 16%, or 0.4 billion, and by 2100, the UN projects it to be an astonishing 40%, or 4.4 billion people. By 2050, it's predicted that one in six of the global population will be age 65 and over. The number of people aged 80 and over will triple in the next three decades. United Nations projections label these trends a global "longevity revolution."[2]

The key to understanding aging and lifespan for any species is to grasp its natural history—the enduring exposures and selection pressures that shaped the way species evolved. For humans, this means appreciating aging in the context of a lifestyle of hunting and gathering. As a species,

we were full-time hunter-gatherers for most of our evolutionary history (which many still practiced until five hundred years ago). And for millennia we also included domesticated plants and animals as part of our ever-changing livelihoods as farmers and pastoralists.

This historical fact may seem uncontroversial, even obvious. But the biomedical and pharmaceutical industry, hell-bent on extending lifespan by slowing, halting, or even reversing aging, operates as if natural history matters little. Moreover, some researchers who focus on aging believe that study of our past and of high-mortality populations in the present only obscures understanding of how aging operates. The leading belief that dominates the longevity industry is that human aging can be studied and understood only in low-mortality populations like the United States, Japan, and Sweden, living under the best of conditions. Such a view is myopic and cannot provide much insight into the flexibility of human physiology.

What is relatively fixed as part of our species-typical biology versus modifiable through changes in lifestyle, diet, and our social interactions? Can aging be further slowed if mortality rates at late ages continue to decline according to current trends?

To address these and other gnawing questions, we'll first consider what old age is "for." To paraphrase a worn but wonderful quote: nothing about our body makes sense except in the light of evolution.[3] I harness evolutionary thinking to help reveal *why* we can live long lives and age the way we do. On our journey, we'll explore old age among hunter-gatherers and the critical but sometimes forgotten role of older adults, or elders as I respectfully call them (not elderly), in our own societies. We'll examine what older adults actually do in foraging and other subsistence populations, and how they live and thrive. This approach is relatively new territory because the study of aging and lifespan itself is a modern luxury. Most of what we know about aging and longevity comes from the past half century, and from Global North countries like the United Kingdom, United States, Sweden, and Germany.

The health-conscious public is usually captivated by considering potential lessons to be learned by stripping away the many layers of our contemporary uber-"civilized," ultraprocessed, and protected existence.

This sadly often reduces to platitudes about the simple joys of outdoor living among romanticized "noble savages." Or wild appreciation for the modern comforts that distance us from a less romantic view of what past life must have been like. Balancing the rich ethnographic record with my own good fortune to have lived with several small-scale subsistence populations, I hope to walk the fine line between selective grazing of "ancient" lives and overgeneralizing from too few examples. By stepping outside what is most familiar, we can gain fresh insight about our golden years. That insight can help us rethink how to gain purpose and meaning from our elderhood, and how to spend those years a little healthier and less lonely.

Practitioners of "geroscience" and other fields focused on molecular and cellular aging are overly confident that they can make what's merely possible become a reality. Gains may be achieved by pushing back with technological tools against vitality-sapping entropy—with a forward arrow of progress toward ever-longer lives.

Yet the study of nonindustrial populations offers a privileged opportunity for examining the conditions that have shaped not just our bodies and biology, but also our emotions and our minds. The quest to understand the whys and wherefores of old age across human populations helps orient us, not by showing how far we've come but by illuminating what might be possible about how to live, and to live well. Understanding how we lived and thrived in the past can help inform current initiatives to maximize human "healthspan," and help us better confront the current crises brought about by the "silver tsunami" of older lives. Such insights are sorely needed as we face the many challenges of global aging in the twenty-first century.

Organization of the Book

I've divided this book into three parts, operating on the idea that all good things come in threes (*omne trium perfectum*).

In part I, I address what we actually know about human lifespan and aging over the course of human history. Across time and space, many people have indeed survived well into their sixties. This evidence supports

my claim that the human body was built to last about seven decades under preindustrial conditions. Hunter-gatherers and other groups whose lifestyles are our best guess of what life might have been like prior to intensive agriculture and the Industrial Revolution all contain older adults as group members. Their life expectancies may be low, but a signal of long life potential manifests nonetheless. Our massive gains in life expectancy over the past two centuries reflect a larger percentage of people over time living to older ages, rather than any dramatic extension of longevity. Our whirlwind tour will take us from Australopith ancestors 4–6 million years ago through the origins of anatomically modern *Homo sapiens*. We'll go from prehistory to the earliest written indications of what old age may have been like, including examples from ancient Greece and Egypt.

We all hold different views of what aging is and is not, and my argument will shed light on this complex terrain by revealing why aging exists in the first place. To best situate "old age" as part of the natural history of our species, we'll cartwheel through many disciplines, especially evolutionary biology, demography, anthropology, and psychology. As I move through the demographics and theory on aging and longevity, I'll take some small detours along our journey, but I promise they'll be fun and interesting.

In part II, I lay out a proposal for how human longevity came to be in the first place. From the perspective of evolutionary biology, living beyond one's reproductive years is like a superpower. It's a puzzle rarely observed in nature, except in the case of a few mammals. To help reveal why postreproductive life itself is usually rare, I introduce the concept of the declining "force of selection" with age. Longevity and other unique traits make us stand out among our large-bodied primate cousins: our children grow slowly and require years of nurturing and care; our fat-rich energy-demanding brains help foster a lifetime of learning. It takes up to three decades to become proficient enough in the varied skills needed to make a living as a hunter-gatherer, but success yields surplus. Cooperation and sharing of bonanzas within and among generations are not just quirks of being a generous primate—they are fundamental to making our human life history possible. We'll play with some contentious

ideas in this arena, and debate whether we should thank women or men for our evolved longevity. We'll also contend with whether late life even has a "function," or whether it is instead just a by-product of greater robustness in adulthood.

The multigenerational organization of extended families with divisions of labor go hand in hand with cognitive and social abilities primed to promote efficiency and fairness in small groups: attention to others' abilities, work effort, level of need, and reputation. These nurtured sensibilities help boost the gains from helping and being helped. With this theoretical gloss rooted in the social economics of hunter-gatherers, we'll consider the many ways that elders in traditional societies help others—through food production, childcare, pedagogy, ritual expertise, storytelling, leadership, and conflict mediation, and as breathing, walking repositories of ecological knowledge. These roles provide benefits to kith and kin and help ensure that transfers of food and other goods and services flow along the generational ladder, from older generations to young, and back up the ladder as old age security.

Are proposed services provided by elders in small-scale societies of hunter-gatherers, farmers, and pastoralists—like education, leadership, and babysitting—just different flavors of entertainment filling idle time, or might these activities be important enough to help ensure that enough older adults are around to provide them? In the absence of these elders, would society collapse?

Cooperation is a critical human enterprise, and elders may be immersed in the daily goings-on in small-scale societies, but this doesn't mean that older adults are always treated well. To what degree are older adults held in high esteem, and what might be the tangible value of respect on individual lives? What do elders actually *do* in their "retirement"? Is there even a retirement to speak of? Why, as Francisco said, would suicide ever be considered a desirable exit, either for the sad neglected elder, or for the relatives left behind?

We'll cover the full range of treatment and regard, from gerontocracy to geronticide. The notion of "interdependence," the extent to which older adults supply irreplaceable goods or services, helps explain where older adults stand in this regard. Being of use in an interdependent

social landscape reliably predicts how much others look after older adults. Once utility is low enough, our own incentives to stay alive decrease, and others' vested interests in keeping us alive may plummet as well. Most cases of geronticide and neglect occur when families and communities deem older adults no longer useful. Given conflicts of interest within extended family networks, the opportunity for elder abuse, neglect, and exploitation is the dark underbelly of being prosocial.

In part III, we bring our new appreciation of ancestral human demography and of how lifespan fits within our evolved life history to help think about healthy "aging in the wild." Understanding "healthy aging" is big business, a worthy goal to maximize physical and emotional well-being for as long as possible. Is it realistic to maintain vigor and delay physical decline until the last of our years? The human body may have been built to last seven decades under more traditional, nonindustrial conditions, though in much of the developed world today, it appears to be eight or nine decades. *What has changed that now shifts our warranty period by over a decade?*

And how do we make sense of the patterned way in which things fall apart with age? You would think that natural selection should lead to a simultaneous rise and fall of all body functions and processes. And it would certainly be easier on us if everything fell apart abruptly and simultaneously only at the end of our days, much like Oliver Wendell Holmes's wonderful one-hoss shay—built to last intact until "it went to pieces all at once." Is there a logical method to the madness of physical change over the life course? Our knees tend to go out before our hamstrings, and our kidneys have a harder time working efficiently at later ages than our liver. These kinds of observations over the course of my career have made me wonder whether there is any part of our body that stays the same, or even improves with age. Though the body is a system of many systems, we'll cut through the morass and make sense of age-related changes in a few key domains: muscular strength and endurance, our immune system(s), and several types of cognition affecting decision-making, memory, and wisdom.

From there, we'll tackle key questions, like these: Are the chronic diseases of aging—the modern scourges of the Western world, like

heart disease, diabetes, cancer, and dementia—inevitable consequences of living past seven decades? Have they always been with us? Again, we look to contemporary hunter-gatherers and other subsistence societies to see whether they endure the same diseases that we've come to fear and dread in our old age. We take head-on whether these "diseases of civilization" are instead by-products of our evolved physiology, mismatched with modern lifestyles and the current environment.

With so much focus on physical aging and disease, it's easy to lose sight of the importance of mental health. But understanding how people maintain purpose, value, and connection despite declining physical health is essential to our discussion here. We'll assess well-being among older adults in small-scale societies. We'll learn that midlife crisis followed by late-age contentment is not universal, despite its commonly observed occurrence in the West. We also gauge the role that retirement has on our psychological well-being. Retirement is a modern luxury that, in its current form, contributes to less-than-ideal quality of life.

As social creatures, it may come as little surprise to learn that chronic feelings of loneliness may have the same effect on mortality as cigarette smoking and alcoholism. Social isolation, and the so-called loneliness epidemic, are now major public health concerns in the industrialized world. We're more likely to be living alone and to have lower community engagement ("bowling alone," as popularized by the political scientist Robert Putnam) than in decades past. If people are healthier at late ages than they were in the past, and more financially secure, then why does our psychological well-being remain so pegged to our connectedness with others? Throughout the book, we look beyond the familiar landscape of predator-free contemporary urban lives and discover the social world of older adults in small-scale societies.

What to Expect

Debates rage about the future of human lifespan. Strident optimists believe lifespan will continue to increase unabated, whereas cautious optimists expect only small increases on the horizon. Pessimists believe we have already reached the maximum limit afforded by our biology,

and thus tissue and organ regeneration may be the only way to immortalize our soma. Amid venture capital pitches for mTOR inhibitors, senolytic drugs, CRISPR gene-splicing organs, and parabiotic vampiric blood-sharing with the teenager down the street, the approach I take here is more humble. I confess that you won't find any radical new way to think about cellular aging in these pages. No miracle methods for slowing down aging. No prehistoric mind tricks to stave off dementia. There is no shortage of good books on those topics, nor is there likely to be in the near future. We need those books, too, because tackling aging will require different types of expertise.[4]

So, what does it mean to consider aging and lifespan from a broader evolutionary perspective, as I do in this book? While living a long, satisfying life is a nice achievement, evolution does not care about how long our lives are or how satisfied we are, if those don't serve to help maximize our reproductive fitness. Over thousands of generations, the mindless sieve of selection helped shape our bodies, our brains, and our variegated human nature. But the realization that natural selection has reproduction as its guiding light doesn't mean there aren't important lessons for urban dwellers in modern nation-states. And vice versa for nonindustrialized populations now experiencing rapid changes to their lives and livelihoods. By the end of the book, I will show how we all can best gain from the benefits of modernization without incurring all the tagalong costs.

This seven-decade lifespan is the anchor to which we will keep returning—whether talking about the filtering capacity of our kidneys, the fatness of our retirement savings, or the motivations we have for making new friends. Once we recognize that older age is built into our species-typical design—and is not just chocolate sprinkles on the ice cream of life—we are in a good position to reconsider our relationship with the past, and to gain insight to help reimagine our own life plan. Current longevity is not unusual but is, rather, an extension of a pattern that was already present. This simple fact is still unappreciated. Even with more people living to seven decades today than ever before in human history, ageism is alive and thriving, with elders often viewed

as problems, burdens, or threats. In contrast to that gloomy view, the thread throughout this book is how long healthy life is just the means to a functional end.

As President John Kennedy said in a now-famous 1963 speech a few short months before his death, we need to add life to years, not just years to life. More than what we eat, or how much we move our bodies, this involves our finding meaning and purpose. Helping the elderly become elders. By positioning older age as a normal part of our evolved life course, I hope to normalize later life and imbue it with the importance it has long held.

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