DR. OZ ON HOW AI CAN HACK OUR GENETICS

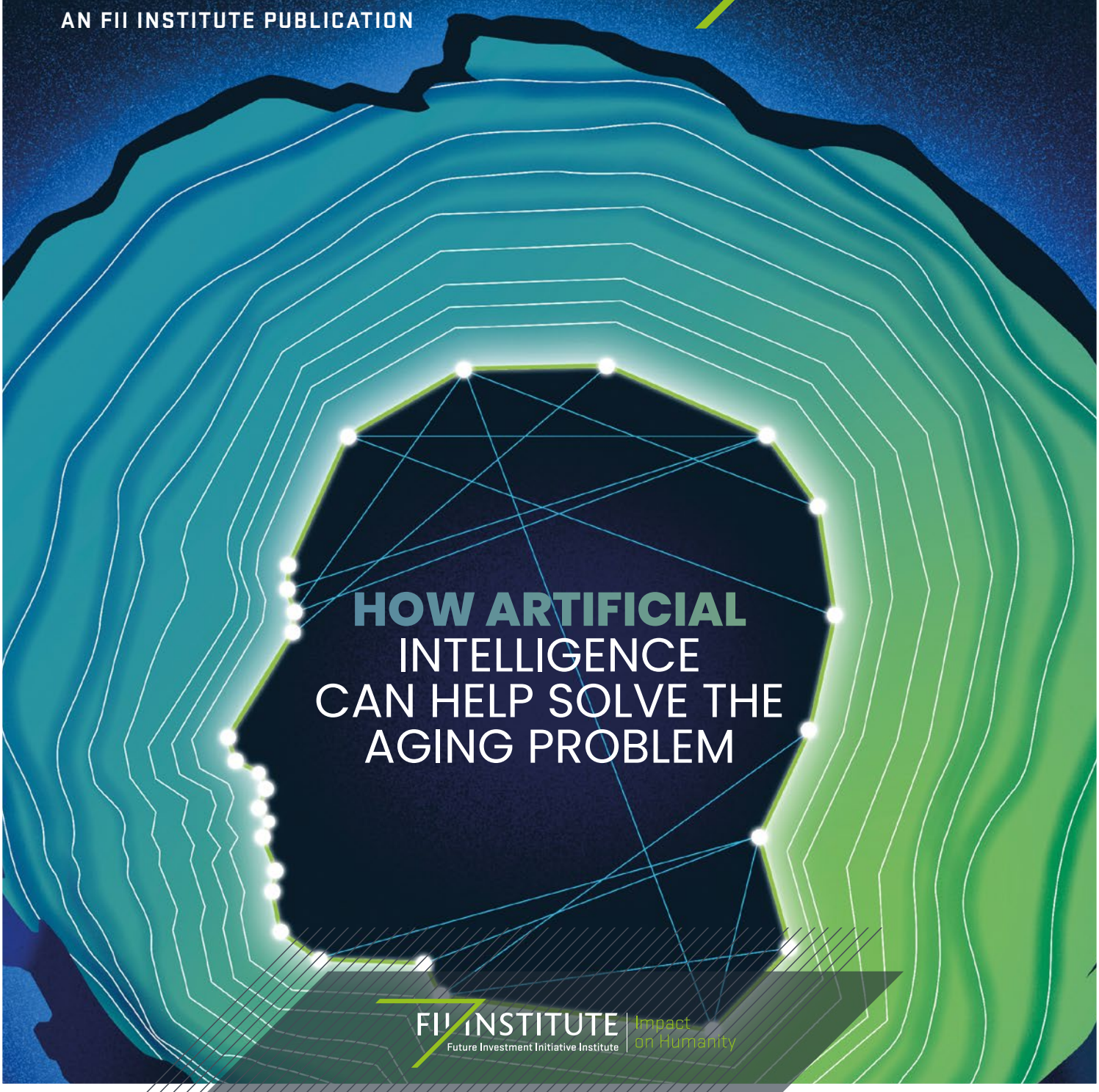
PETER DIAMANDIS ON EXTENDING HEALTH – AND LIFESPAN

MEHMOOD KHAN ON FUNDING FUTURE INNOVATION

AI AND LONGEVITY

IMPACT 2024

AN FII INSTITUTE PUBLICATION



HOW ARTIFICIAL INTELLIGENCE CAN HELP SOLVE THE AGING PROBLEM

FII INSTITUTE
Future Investment Initiative Institute | Impact on Humanity

EDITORIAL

LIVING HEALTHIER AND LONGER WITH AI

THE POWER OF ARTIFICIAL INTELLIGENCE to transform our lives has energized our FII Institute community at events around the world over the last two years. Discussions at our PRIORITY summits have focused on a number of areas, from how AI can help improve food security to powering our economies.

But in this report, we look much closer to home – at how the power of AI can be put to help us live longer and healthier lives.

In combination with our superb guest editor, whose invaluable insights have helped shape our thinking, and a panel of esteemed experts who have been studying the field of longevity and AI's impact on it since long before the public spotlight was thrown on the technology, here we unpick what the world needs to know about the potential of AI to help us live more fruitful lives.

And of course, our conversation never stops within this community of likeminded decision-makers. Make sure to listen to our special conclave and panels discussing this subject at FII8 in Riyadh between October 29-31.



COVER: OLLIE HIRST; PHOTO: FII

Richard Attias

Richard Attias
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GUEST EDITOR

BRINGING TO BEAR DECADES OF DEVELOPMENT

WHEN I STARTED MY CAREER AS A Chemist and Chemical Engineer focusing on materials engineering and synthesis and applications in imaging with nanoprobes, it was scarcely imaginable that we could understand the intricacies of how our bodies operate at a highly detailed level and at a nano and molecular scale. But in my time in the scientific sector, we have seen huge advances – and in the last two years in particular, great leaps enabled by AI.

AI offers unprecedented opportunities to enhance our understanding of complex biological systems, speed up drug discovery, and personalize medical treatments – work that fits firmly in the intersection of my own interests. I was therefore delighted to guest edit this Impact report by the FII Institute, where I sit on the Board of Trustees.

The report looks at how AI can be brought to bear on the biggest medical question facing humanity: how to live longer, healthier lives. What's exciting, as you'll learn, is how significant are the strides we have already taken are. What's even more invigorating is the way in which AI as an all-purpose technology could be deployed in ways we haven't yet considered.



PROFESSOR ADAH ALMUTAIRI

Professor Pharmaceutical Chemistry, University of California (UCSD); Board Member, FII Institute

ILLUSTRATIONS BY

OLLIE HIRST

Ollie is an award-winning Conceptual Illustrator, based in Manchester, UK. Illustration makes him tick. Though it's not the only thing that does. He's a lifelong cardiac pacemaker patient/bionic man. So, while he puts his heart into drawing, it gets help most of the time. Ollie has a natural affinity to science, tech, health and the human experience and likes his work to hinge on a strong idea, diluting complex topics into digestible visual concepts, helped by a splash of color, for editorial and commercial, globally.

ILLUSTRATION: OLLIE HIRST; PHOTO: FII

AI AND LONGEVITY

AI is poised to transform human longevity, offering huge opportunities to extend and enhance life. AI-driven analysis of vast medical datasets is accelerating drug discovery and enabling personalized treatment plans, potentially unlocking new therapies for age-related diseases. At the same time, sophisticated AI algorithms are also enhancing early detection of health issues, allowing for more timely interventions.

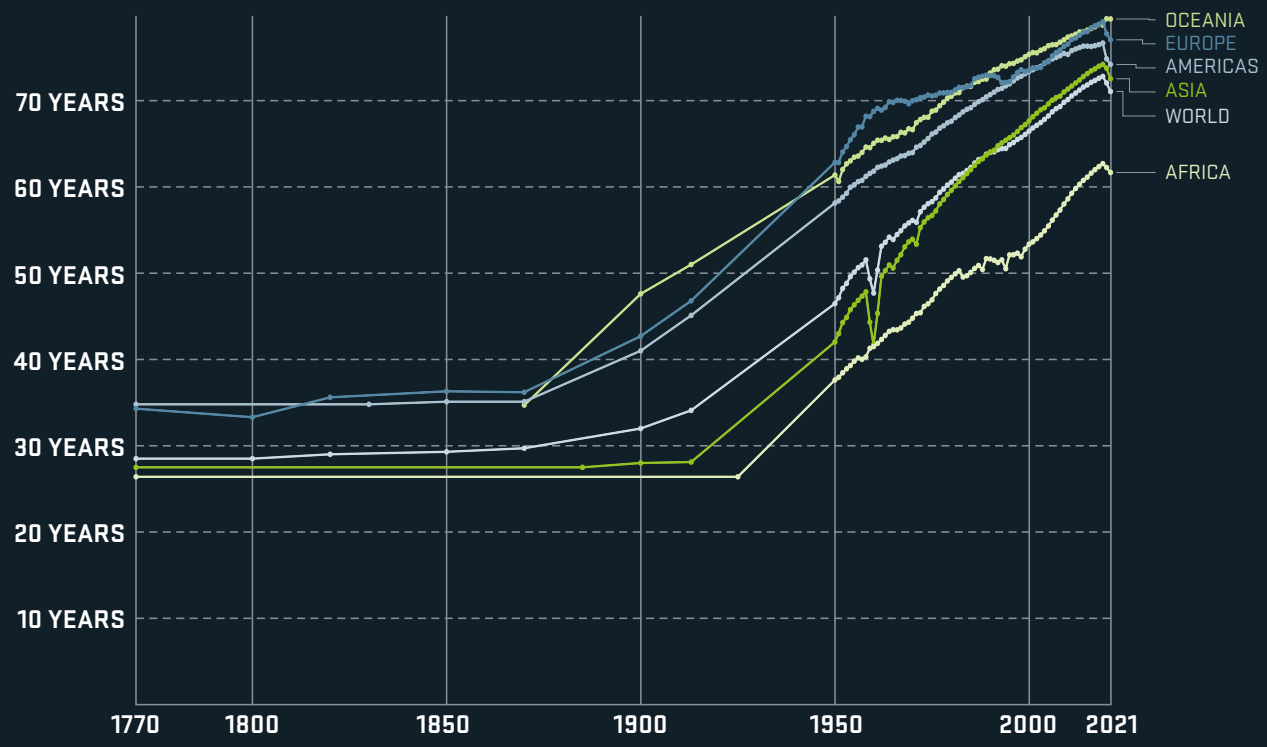
Beyond medicine, AI is helping people optimize lifestyle factors crucial to longevity. Crunching through data, it's possible to see more clearly which lifestyle changes can contribute to a longer lifespan. This constant feedback loop promotes healthier living and may significantly reduce the risk of chronic diseases.

However, the AI longevity revolution is not without its challenges. Concerns around data privacy, equitable access to AI-enhanced healthcare, and the potential widening of longevity gaps between socioeconomic groups have to be addressed, alongside praising and welcoming the opportunities.

But one thing is abundantly clear: As AI continues to evolve, its impact on human longevity will likely be profound, reshaping our understanding of aging and mortality.

LIFE EXPECTANCY

Period of life expectancy at birth, in a given year



125 AI companies

265 investors

23 hubs worldwide

... operating in the longevity space

SOURCE: AGEING ANALYTICS AGENCY, 2023

32 average life expectancy of someone born in **1900**

71 average life expectancy of someone born in **2021**

SOURCE: OUR WORLD IN DATA

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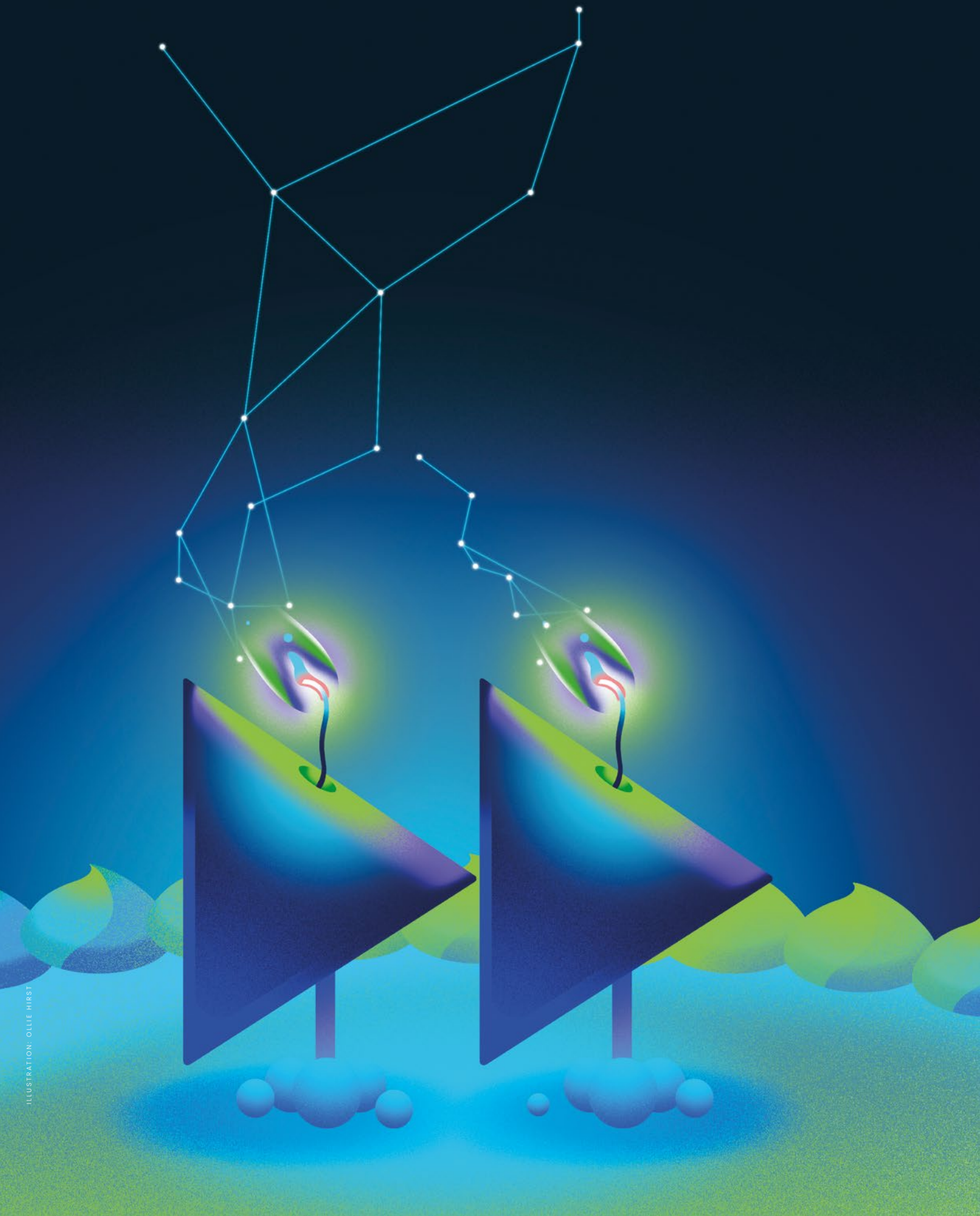


ILLUSTRATION: OLLIE HIRST



THE LONGEVITY OPPORTUNITY

A world where you could reach your 150th birthday used to be a fantasy – yet it could soon be a realistic goal. Thanks to AI and the advent of new technologies, we are on the cusp of a world where age-related diseases may shortly become relics of the past, and vitality persists well into what we once considered "old age." Boosters believe we could be about to rewrite the story of human aging.

ILLUSTRATION: OLLIE HIRST

IN HUMANITY'S QUEST TO EXTEND HUMAN LIFE, AI has become a game-changing tool. Unpicking patterns in vast amounts of biological data means AI can lift the lid on the intricate mechanisms of aging, and help us understand it at pace.

Algorithms can sift through terabytes of genetic data, health records and lifestyle factors to identify the potential biomarkers of aging – those molecular signals that indicate how well-wound our biological clocks are. Forewarned is forearmed – and the hope is that knowing could improve our understanding of how we age – and open new ways to make a positive intervention.

EARLY SUCCESSES

The potential of this approach was demonstrated in 2023 when researchers at Insilico Medicine used AI to develop an "aging clock" based on blood biochemistry.

"We have long used DNNs [deep neural networks] to better understand human disease and aging biology," says Alex Zhavoronkov, Founder and CEO, Insilico Medicine. "Now, with great advancements in generative AI capabilities, including AI-based transformers, we are able to further accelerate this process to make an aging clock that can not only identify where aging and disease intersect, but connect that information to actionable therapeutic targets."

As AI decodes the aging process, it's also ushering in an era of precision medicine, where treatments are tailored to individual genetic, environmental and lifestyle factors. Imagine an AI system analyzing your genome and health data to predict your susceptibility to diseases such as heart conditions or Alzheimer's years before symptoms appear. This foresight enables the creation of proactive, personalized health strategies that could dramatically extend healthy lifespans. It's a topic that has been discussed at past FII Institute events.

GET SMART

The concept of an AI-powered health assistant that monitors your vitals, analyzes your diet and activity, and provides real-time recommendations to optimize your longevity is, in some ways, already here. Apple's Health app and Google's Fit are early iterations of this technology, with more advanced versions on the horizon. In the near future, we might all have a personal AI longevity coach in our pockets, nudging us toward life choices that improve our health and extend our life.

But AI won't only help there. One of the most exciting applications of AI in longevity research is in drug discovery and development. The traditional process of bringing a new drug to market is notoriously slow and expensive, →



PHOTO: INSILICO MEDICINE

Companies such as Insilico Medicine, whose CEO, Alex Zhavoronkov, is here monitoring work conducted by robots, have harnessed AI's power for change.



PHOTO: INSILICO MEDICINE

Blood biochemistry analysis, aided by AI, has been able to understand our "aging clock," potentially unlocking the ability to reverse it.

→ often taking over a decade and billions of dollars. AI is dramatically speeding up this process, particularly in the search for anti-aging compounds.

Machine learning algorithms can analyze millions of compounds in silico, predicting their efficacy against aging-related targets. This approach has already yielded promising results. Novel senolytic compounds, or drugs that selectively eliminate aging cells, are being developed by biotech start-ups that could offer major breakthroughs in extending human healthspan.

GUT CHECK

As AI delves deeper into the biology of aging, it's also unveiling the crucial role of our gut microbiome in the process. The trillions of microbes residing in our gut have a profound impact on our overall health and longevity. AI is helping to decode this complex ecosystem, analyzing vast amounts of microbiome data to develop personalized probiotic and dietary recommendations that could enhance longevity.

Companies like Viome and DayTwo already offer AI-driven microbiome analysis service to consumers, with more comprehensive health optimization available as the tech develops. In the future, your diet might be precisely tailored to nurture the specific microbial communities that promote longevity in your unique biological makeup.

The race for longer life seems like a no-brainer. But while the potential of AI in longevity research is immense, it also raises ethical and social questions the world has to consider. Extending human life is a noble goal, but not if access to these treatments is only limited to the wealthy.

RIPPLE EFFECTS

And a longer-lived population could strain global resources in unprecedented ways – though AI could help model and predict these potential impacts, helping policymakers and researchers develop sustainable approaches to population longevity, heading off issues before they arise.

The sensitive nature of the health and genetic data used in longevity research demands robust data protection measures, while eliminating biases in AI-powered systems to ensure that longevity advancements benefit everyone equally is crucial.

And although the fusion of AI and longevity research could extend life, it could also redefine it in ways that we're only beginning to comprehend. As we unravel the mysteries of aging, we're not just pushing the boundaries of science. We're challenging what it means to be human. →

THE QUANTIFIED SELF

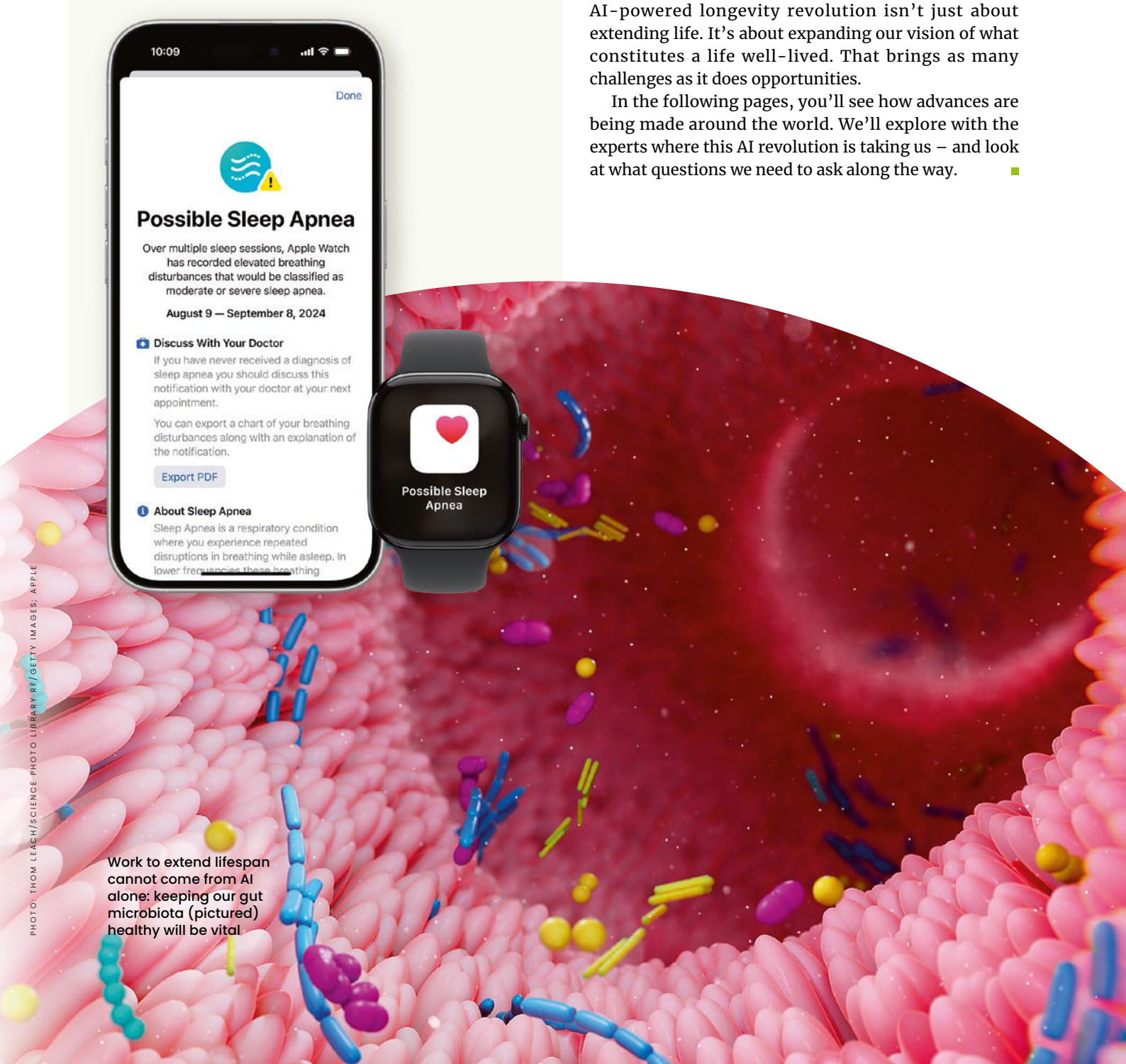
With devices such as the Apple Watch and Oura Ring analysing more health data than ever before, it has become easier to intervene to stop health issues before they arise. The tech giant has recently started moving further into this space, with its AirPods now being used for hearing tests.

→ FACE THE FUTURE

This journey raises profound questions that extend far beyond the realm of biology. How will longer lifespans change our societies, our relationships, our sense of purpose? Will careers spanning centuries become the norm? How will we adapt our economic and social structures to accommodate a population that remains vital and productive well past what we now consider retirement age?

For decision-makers in positions of power, the AI-powered longevity revolution isn't just about extending life. It's about expanding our vision of what constitutes a life well-lived. That brings as many challenges as it does opportunities.

In the following pages, you'll see how advances are being made around the world. We'll explore with the experts where this AI revolution is taking us – and look at what questions we need to ask along the way. ■



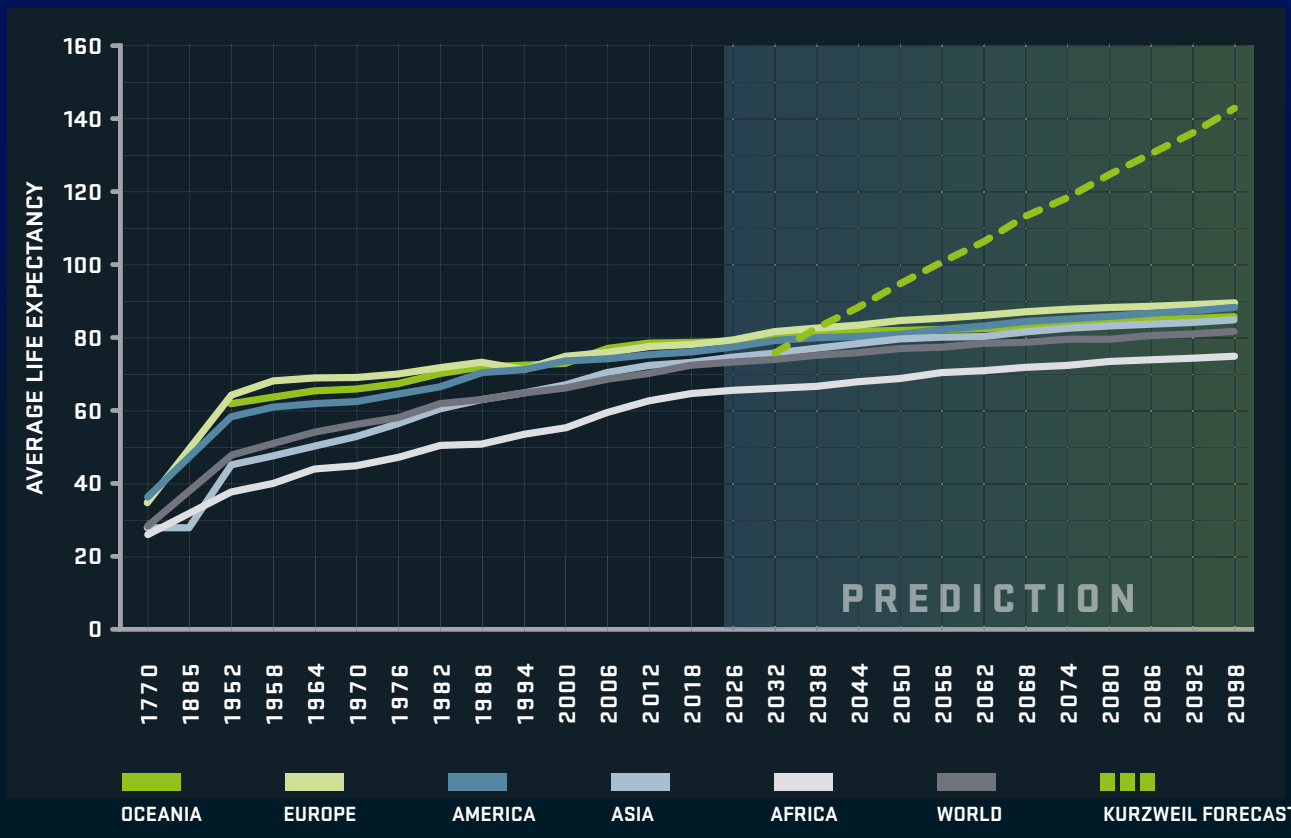
Work to extend lifespan cannot come from AI alone: keeping our gut microbiota (pictured) healthy will be vital

PHOTO: THOM LEACH/SCIENCE PHOTO LIBRARY RF/GETTY IMAGES; APPLE

A LIFE WELL-LIVED

Societal progression over centuries has helped extend lifespan – with opportunities for further improvements thanks to AI.

Advancements including better hygiene, clean running water and better food supplies have improved lifespans. And they're expected to improve going forward. But AI-powered longevity could take things further. By 2030, Ray Kurzweil believes some will reach "longevity escape velocity," when every year you live adds a year to life expectancy. Here's what that could look like.



SOURCE: FII INSTITUTE ANALYSIS OF UN WORLD POPULATION PROSPECTS (2024) DATA; THE SINGULARITY IS NEARER: WHEN WE MERGE WITH AI BY RAY KURZWEIL

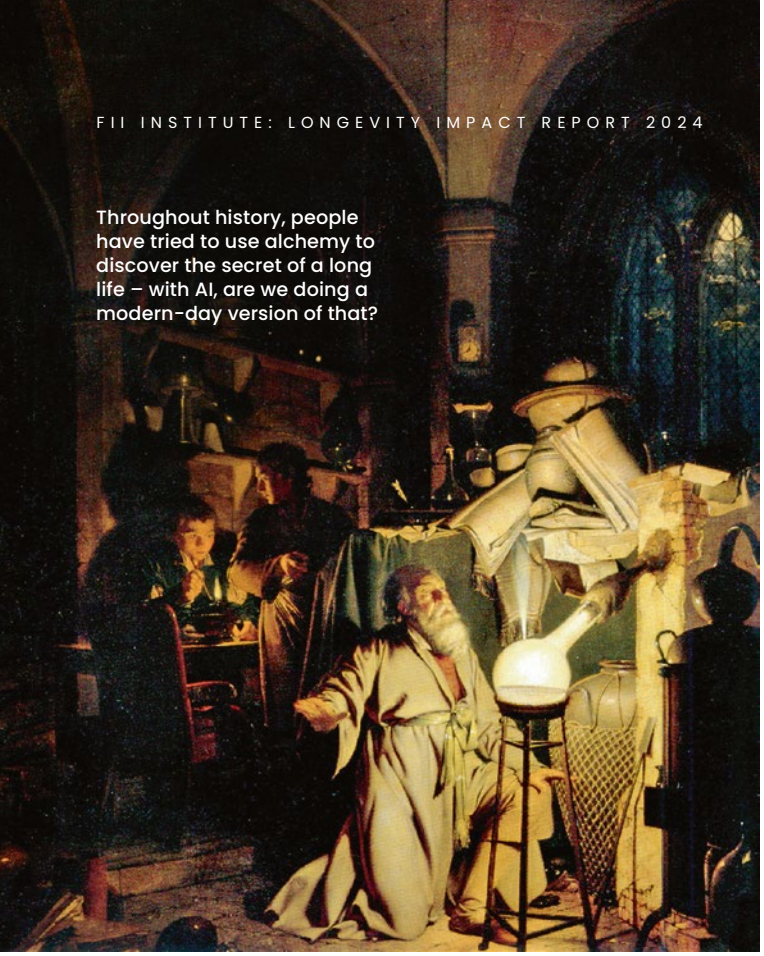
ILLUSTRATION: OLLIE HIRST

A SHORT HISTORY OF LONGEVITY

To understand where we're going, you need to know where we've come from.



ILLUSTRATION: OLLIE HIRST



Throughout history, people have tried to use alchemy to discover the secret of a long life – with AI, are we doing a modern-day version of that?

PHOTO: ARTCOLOR/PICTURE ALLIANCE; CANALI – INDEX/HERITAGE-IMAGES/PICTURE ALLIANCE

FEW QUESTS CAPTURE OUR COLLECTIVE IMAGINATION quite like the pursuit of a longer, healthier life. From ancient alchemists seeking the elixir of immortality to modern scientists untangling the mysteries of cellular aging, the desire to extend our time on Earth has been a constant driving force of innovation and discovery.

Few moments in history have allowed us to walk the walk as well as talk the talk. Yet artificial intelligence (AI) has emerged as a powerful ally in our age-old battle against time itself. To understand why this AI-enabled moment is different for the history of longevity, we need to know its past.

As soon as human civilizations were first recorded, they were already preoccupied with the concept of eternal life. In China, Taoist philosophers sought the elixir of life, concocting potions believed to bestow immortality. And in ancient Greece, philosophers grappled with the concept of aging. Aristotle viewed it as a natural process of decay, while others, like the followers of Pythagoras, believed that a carefully regulated lifestyle could extend life.

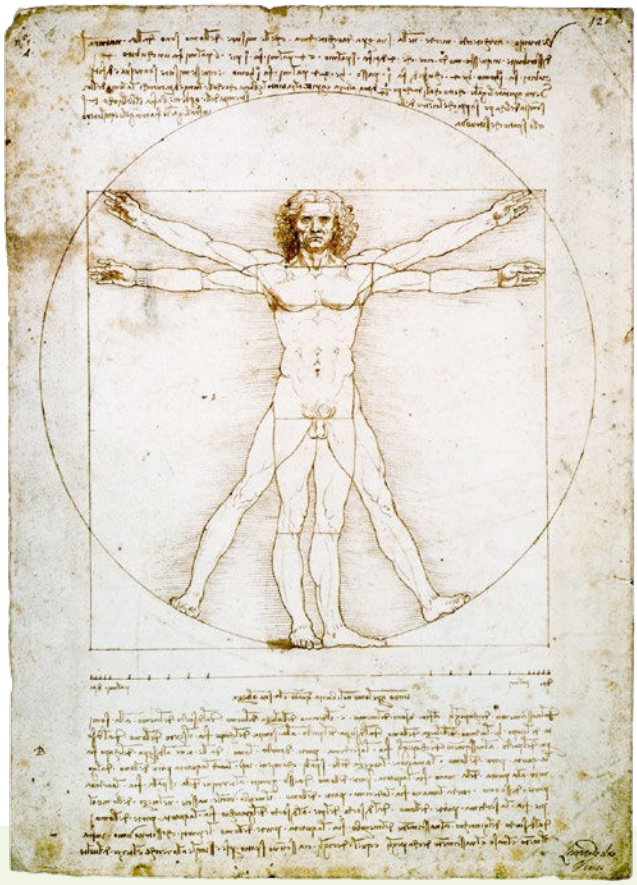
AN ALCHEMICAL OPPORTUNITY

During the Middle Ages, the search for longevity became associated with alchemy. The famed philosopher's stone, a substance believed to turn base metals into gold, was thought to hold the secret of the elixir of life. Alchemists across Europe and the Islamic world devoted their lives to creating it. They didn't, but in the process they inadvertently laid the groundwork for modern chemistry.

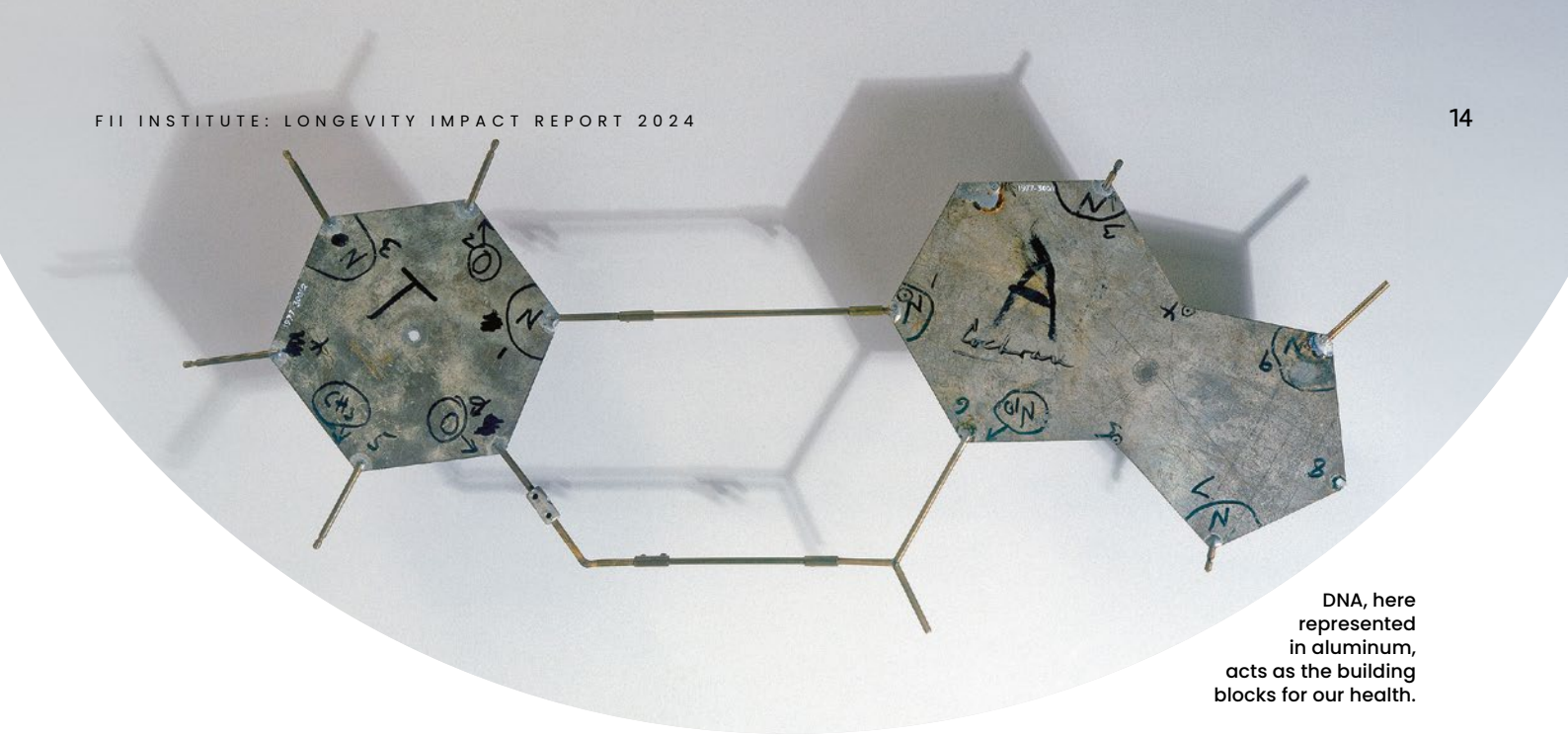
One of the most famous figures in this quest was the 13th-century English philosopher Roger Bacon. In "The Cure of Old Age and the Preservation of Youth," his 1683 work, Bacon proposed various methods to prolong life, including a balanced diet, proper rest, and the use of certain chemicals.

Leonardo da Vinci conducted some of the first systematic studies of human anatomy, while 16th-century Italian scholar Luigi Cornaro wrote influential books on longevity, based on his own experience of living to an advanced age through dietary moderation.

The Age of Enlightenment brought further, well … enlightenment. In 1665, Christiaan Huygens suggested that improvements in medicine might one day extend human life to 200 years or more. This period also saw the emergence of demography as a scientific discipline, with John Graunt's pioneering work on life tables providing the first statistical analysis of human lifespan. Medical hunches were being backed up by provable, statistical evidence. →



Understanding the human body, as Leonardo da Vinci sought to do centuries ago, is the goal of those seeking longevity.



DNA, here represented in aluminum, acts as the building blocks for our health.

PHOTO: SSPL/GETTY IMAGES

→ ENTER MODERN MEDICINE

The 19th century marked a milestone. Louis Pasteur and Robert Koch discovered germ theory, which led to improved sanitation and the development of vaccines, dramatically reducing mortality rates. Meanwhile, the work of Gregor Mendel in genetics laid the foundation for understanding hereditary factors in longevity.

The dawn of the 20th century brought new insights into the biological mechanisms of aging. In 1908, Élie Metchnikoff, a Russian zoologist dubbed the "father of gerontology," proposed that aging was the result of toxic bacteria in the gut, and suggested that lactic acid could promote longevity. He was wrong on the detail, but right on the concept. It foreshadowed modern research on the gut microbiome and its impact on health and aging.

In the 1930s, Clive McCay's research on calorie restriction in rats demonstrated for the first time that dietary interventions could significantly extend lifespan in mammals.

MOLECULAR MARVELS

The discovery of the structure of DNA by James Watson and Francis Crick in 1953 brought about a new era of molecular biology, providing the tools to investigate aging at the genetic level.

In 1961, Leonard Hayflick discovered that human cells in culture could only divide a limited number of times – a phenomenon to which he gave his name: the Hayflick limit. This discovery challenged the prevailing view that cells were immortal and opened up new questions about the nature of cellular aging.

The end of the 20th century saw the emergence of geroscience – an interdisciplinary field studying the relationship between aging and age-related diseases. Key discoveries during this period included the identification of the first longevity genes in model organisms like yeast and worms. In 1993, Cynthia Kenyon's lab demonstrated that a single gene mutation could double the lifespan of C. elegans worms, which electrified the field of longevity research.

MAPPING HUMANITY

But it was the completion of the Human Genome Project in 2003 that marked the beginning of a new era in longevity research. Armed with the ability to analyze entire genomes, scientists began large-scale studies to identify genetic factors associated with longevity in humans. The rise of big data and artificial intelligence has further accelerated progress in recent years. Machine learning algorithms are now being used to analyze vast datasets of genetic and health information, identifying patterns and potential interventions that human researchers might miss in an instant.

We are a little over a decade into the big data revolution. In 2013, Google launched Calico, a research and development company specifically focused on longevity and anti-aging technologies. This marked a significant entry of the tech industry into the field of longevity research, bringing new resources and approaches to bear on the challenge of extending human healthspan.

Those new approaches are numerous. Advances in areas such as senolytics – or drugs that eliminate senescent cells – epigenetic reprogramming, and AI-driven drug discovery are opening up new possibilities for interventions that could significantly extend the human healthspan, and potentially lifespan alongside it. True immortality still remains more science fiction than science fact, but the prospect of significantly extending humans' healthy lifespan is now firmly in the realm of science fact. ■

2021
Several biotech companies begin human trials of senolytics and other potential anti-aging interventions

2019
World's first AI-discovered drug enters human clinical trials

2016
The Salk Institute reports first successful use of cellular reprogramming to reverse signs of aging in live mice

2013
Google launches Calico, focusing on longevity research

2009
Elizabeth Blackburn, Carol Greider and Jack Szostak win Nobel Prize for work on telomeres and telomerase

1930s
Clive McCay demonstrates life-extending effects of calorie restriction in rats

1993
Cynthia Kenyon's lab doubles C. elegans lifespan through single gene mutation

2003
Completion of the Human Genome Project

1908
Élie Metchnikoff proposes his theory on aging and intestinal bacteria

1889
Brown-Séquard claims rejuvenating effects from animal testicle injections, marking an early attempt at hormone therapy

1665
Christiaan Huygens suggests possible life extension to 200 years through medical advances

200 BCE
Qin Shi Huang's search for the elixir of life in ancient China

1513
Ponce de León's fabled search for the Fountain of Youth in Florida

2000 BCE
Epic of Gilgamesh, one of the earliest written accounts of the quest for immortality

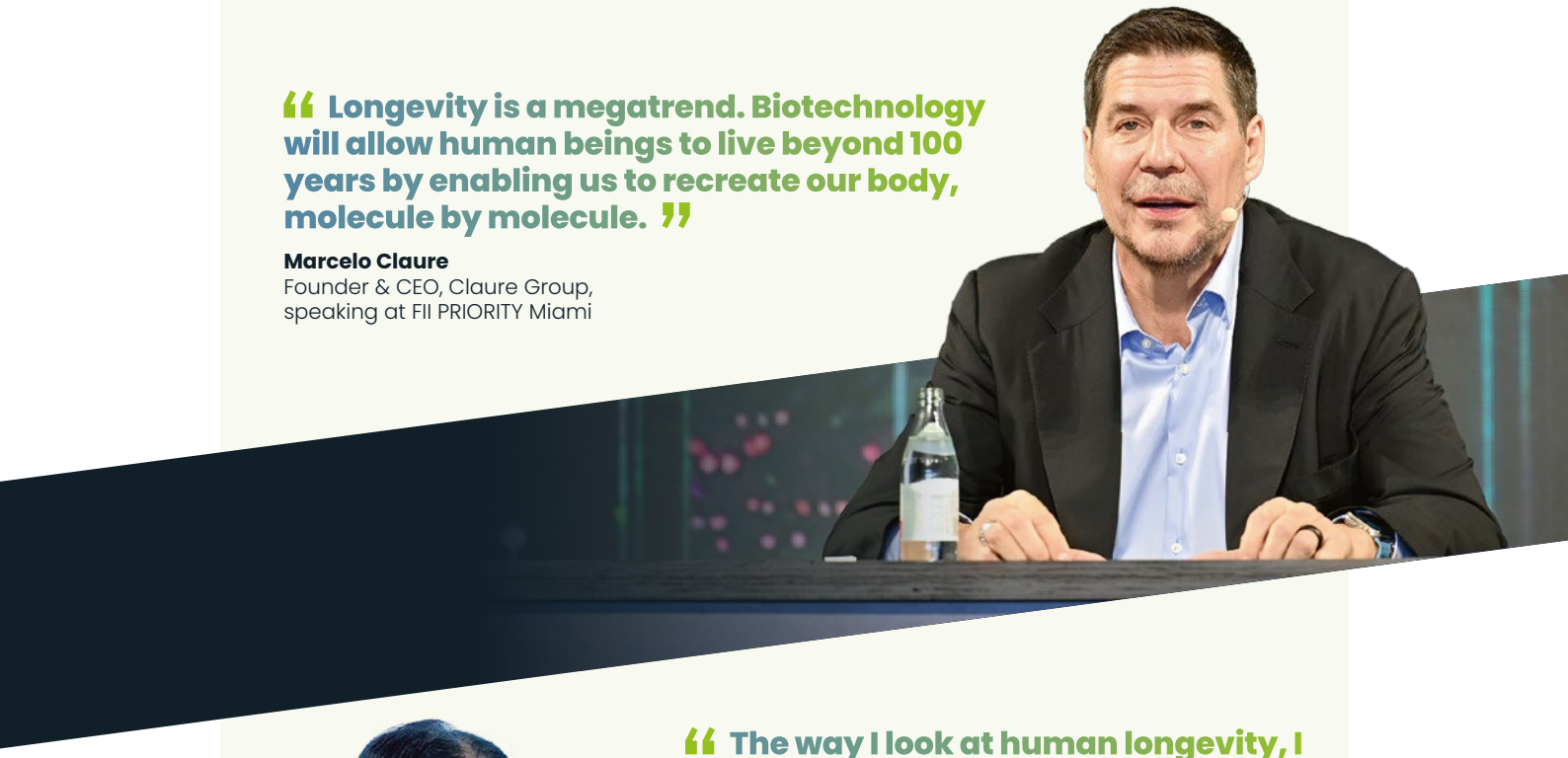
AN ONGOING CONVERSATION

How to improve longevity has been a longstanding debate within the FII community.



PHOTO: FII

Events organized around the world allow members of the FII community to discuss pressing issues such as longevity.



“ Longevity is a megatrend. Biotechnology will allow human beings to live beyond 100 years by enabling us to recreate our body, molecule by molecule. ”

Marcelo Claure
Founder & CEO, Claure Group,
speaking at FII PRIORITY Miami



“ The way I look at human longevity, I think less of the overall lifespan and more of the quality of life during our lifespan. ”

Prof. Adah Almutairi
Professor & Codirector, The Center of Excellence in Nano-Medicine & Engineering,
University of California San Diego,
speaking at FII PRIORITY Hong Kong

“ SBE strives to expose people to the power of AI for health and wellness. We are not just selling luxury; we are saving lives. We provide you with the data, guidance and network to achieve your health goals. ”

Sam Nazarian
Chairman & CEO, sbe,
speaking at FII PRIORITY Miami



PHOTOS: FII



> **“ Longevity involves prediction, testing and reversal. We’re showcasing how to live to 100 through advanced biohacks and experiential ideas, questioning the data behind them and how to make these experiences joyful. ”**

Dr. Mehmet Oz
Professor Emeritus, Columbia University,
speaking at FII PRIORITY Miami

> **“ Innovative diagnostics, such as affordable blood tests detecting Alzheimer’s, are crucial in a world where this disease affects 50% of those over 85. ”**

Nisa Leung
Managing Partner, Qiming Venture Partners,
speaking at FII PRIORITY Hong Kong



PHOTOS: FII



> **“ We are at the dawn of a revolution when it comes to digital health and digital biology. Big data and AI are growing our understanding of the biggest disease: aging. ”**

Stefano Benedikter
Founder and CEO, Nuraxi Holdings,
speaking at FII PRIORITY Hong Kong

“ AI is going to play an extraordinary role in terms of healthcare and research, with the potential to triple drug production. ”

Stephen A. Schwarzman
Cofounder, Chairman & CEO, The Blackstone Group,
speaking at FII PRIORITY Miami





“ The rapid advancements in AI may pose major implications for the healthcare industry. ”

Courtney Powell
Managing Partner & COO, 500 Global,
speaking at FII PRIORITY Miami

“ How are we thinking about data and security in healthcare? What type of data are we giving up so that we can live longer and better? ”

Adrian Aoun
Founder & CEO, Forward Health,
speaking at FII PRIORITY Miami



PHOTOS: FII



> **“Longevity isn’t just about living longer; it’s about living healthier. Our goal is to enhance healthspans, ensuring productive and disease-free lives.”**

Joshua Fink
Founder & Managing Partner, Luma Group,
speaking at FII PRIORITY Hong Kong

> **“The longer horizon is the big driver of activity, advances of health longevity and innovation in technology and AI.”**

Harvey M. Schwartz
CEO & Member of the Board,
The Carlyle Group,
speaking at FII-7





> **“My thesis says that the disruption point at which healthcare tech will change is AI and it is here with us today.”**

Punit Singh Soni
Founder & CEO, Suki, speaking at FII-7

PHOTOS: FII



> **We have, for the first time in history, the largest foundational model in biology. It has the greatest potential to revolutionize it, advancing human health and extending lifespans.**

Dr. Fred Hu
Founder & Chairman, Primavera Capital Group,
speaking at FII PRIORITY Hong Kong



> **Innovation in healthcare is already here, and there will be even more innovation on the way very soon**

Grace the robot
speaking at FII-7

THE CONVERSATION CONTINUES

Don't miss further debate on how longevity can be achieved at FII8, held in Riyadh this October. To get your tickets to the summit, or to watch along live online, visit https://fii-institute.org/.

PHOTOS: FII

HOW TO DO LONGEVITY RIGHT

With so many options available, how can you fruitfully extend health and lifespan?

ILLUSTRATION: OLLIE HIRST

ON DOCTOR'S ORDERS

Whether boosting traditional preventative medicine or biohacking and spa hacking, there are a wealth of ways to tackle longevity – and AI can help in all of them, as Dr. Mehmet Oz explains.



ILLUSTRATION: OLLIE HIRST

ASK DR. MEHMET OZ, PROFESSOR EMERITUS, Columbia University, about longevity, and the tricky conundrum of getting old can be distilled down to a single, simple sentence. "Aging is really an information problem," he says. And because it's an information problem, it's suited to the skills of AI.

Artificial intelligence can be an invaluable tool in unraveling the mysteries of longevity and developing targeted interventions, leveraging its capabilities in pattern recognition and predictive modeling. And Dr. Oz believes there are three key planks to the approach (see box). One is helping use traditional preventative medicine better with AI, which should help people surpass the average life expectancy of around 80 years today.

The other two planks involve putting AI to work to help biohacking, which can include everything from taking supplements to changing your lifestyle to prolong healthspan, and to help spa hacking, or eking out benefits in physical therapies such as hyperbaric chambers, cold plunges, infrared saunas and other discoveries.

Yet before we embrace AI as the killer app to unlock longevity at scale, it's worth noting a word of caution. "AI is important," he said, "but before we get to that, we've got to understand what it is that AI is going to help us figure out."

AGING EXPLAINED

At its core, aging is not simply a side effect of living, but a complex biological process that accelerates after our reproductive years. And three major chemical pathways contribute to the ageing process: sirtuin, mTOR and AMPK.

"Sirtuin is the main way we fix our epigenetics," Dr. Oz said. "mTOR is the main way that our body drives cell growth. It senses whether we have nutrients or not. And AMPK is like a gas monitor in your car. It's the senses and alarms 'low energy' to metabolic control enzyme in the body."

Understanding these pathways and how they interact is crucial to develop effective anti-aging interventions. However, the complexity of these systems makes it challenging to analyze and interpret the vast amounts of data generated. This is where AI comes in. →

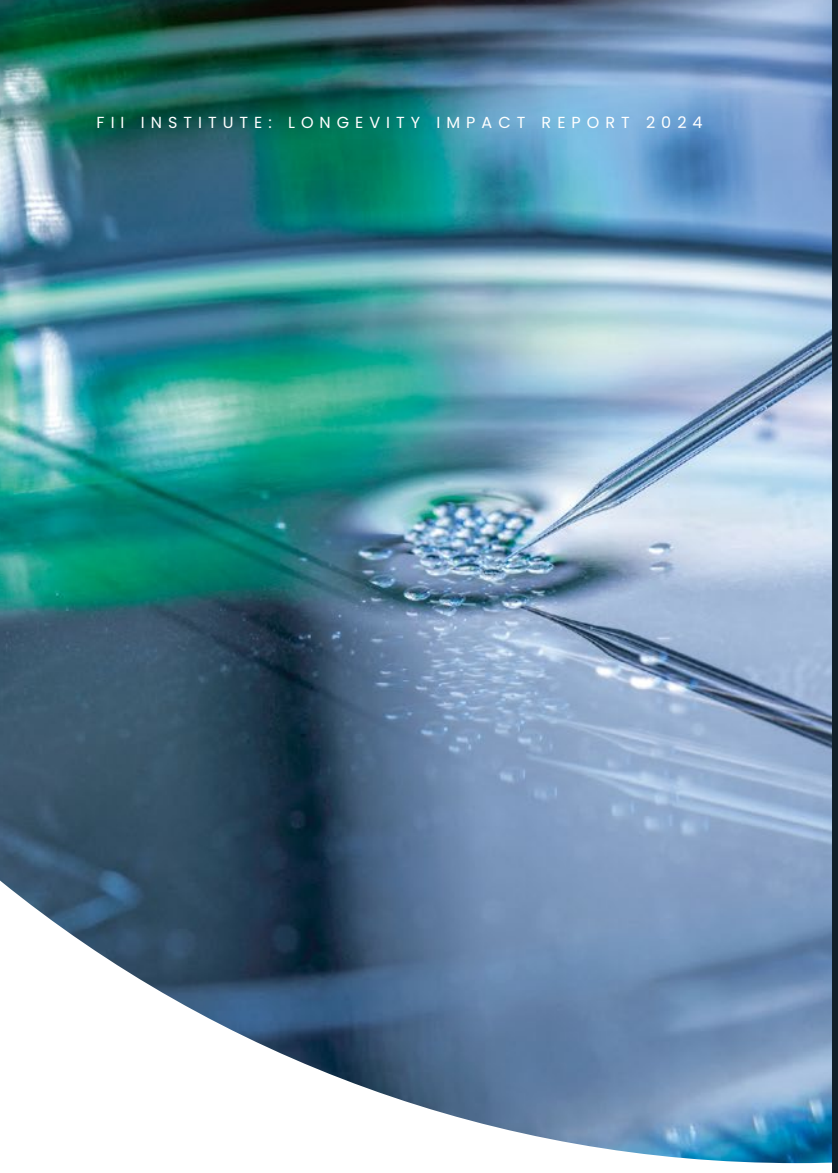




ILLUSTRATION: OLLIE HIRST; PHOTO: ART STREIBER/CBS/SONY PICTURES TELEVISION

DR. MEHMET OZ

Dr. Oz won a Hollywood Walk of Fame Star and Nine Daytime Emmy Awards for "The Dr. Oz Show," and hosted his show for 13 years before earning the nomination of the Pennsylvania Republican party for the US Senate in 2022. He is professor emeritus at Columbia University, Advisor iHerb, Sandbox AQ, and Housey Pharma.



> **“We have to have interdisciplinary collaborations ... biologists and gerontologists and clinicians ”**



PHOTOS: WESTEND61/GETTY IMAGES; AHMET SERDAR ESER/ANADOLU/PICTURE ALLIANCE

→ IT’S ALL IN THE GENES

One of the most promising applications of AI in longevity research is in genomic and proteomic analysis. AI can analyze vast amounts of genomic data to identify genetic markers associated with longevity and age-related diseases. This information can then be used to develop personalized medicine approaches tailored to individual genetic profiles.

Dr. Oz believes personalized healthcare approaches will be vital in helping boost longevity. “AI will help us figure out how the sirtuin and mTOR and AMPK of the world are changed by lifestyle,” he said. “And you’ve got to do it every single day. You can’t change these just once.”

Biomarker identification is another area where AI is making significant strides. By analyzing data from various sources, including surveys, tracking devices, and clinical tests, AI can identify biomarkers that are indicative of biological age rather than chronological age. “These biomarkers can be used to monitor the effectiveness of anti-aging therapies in real-time,” Dr. Oz says.

IN SILICO SIMULATION

One of the most exciting developments in this field is the use of AI to simulate biological processes. “AI can create simulations of cellular and molecular processes to study how aging occurs and test potential interventions in silico,” he says. “These simulations can reduce the need for animal testing and speed up research.”

This approach is particularly valuable in longevity, where decade-long clinical trials are often impractical. “In silico examination of potential may be the only realistic means of testing promising approaches,” Dr. Oz explains.

AI is also revolutionizing drug discovery and development in the longevity field. Machine learning algorithms can analyze vast datasets of chemical compounds and biological targets to identify potential drugs that affect longevity-related pathways. And AI can help in repurposing existing drugs for anti-aging applications, which can be faster and more cost-effective than developing new drugs from scratch. →

→ There are real opportunities in the potential of this approach: "AI could predict target impact, and help you avoid that mistake or make a modification to the molecule so that it won't do that," he says. Doing so could double the chance of a trial working. "Right now 1 in 20 clinical trials works," he says. "It should be 1 in 10 at least."

CHALLENGES AND OPPORTUNITIES

Using AI in longevity research won't be without its challenges. Data privacy and security are significant concerns, as AI requires access to vast amounts of personal health data. Dr. Oz acknowledges this could be a concern for some, but says the potential benefits outweigh any concerns: "There's so much opportunity in return for that payment that I think it's worth it," he says.

Another challenge is ensuring the quality and relevance of the data used to train AI models. "If it's mediocre quality data, the models will generate increasingly far out solutions that aren't there and aren't right," he says.

Despite these challenges, the potential of AI in longevity research is enormous. Dr. Oz envisions a future where AI can provide personalized recommendations for extending lifespan and improving healthspan. "AI will be your coach in your pocket that will translate all the complicated and nuanced knowledge available on your body," he says. "And then I can actually give you the advice you need when you need to hear it." →

CRUNCHING THE NUMBERS

The potential of AI in areas like drug discovery could be life-changing, particularly when thinking about longevity. Here's how things could be improved in a matter of years thanks to the power of AI.

12–15 years
the timeframe from starting a drug discovery program to regulatory approval

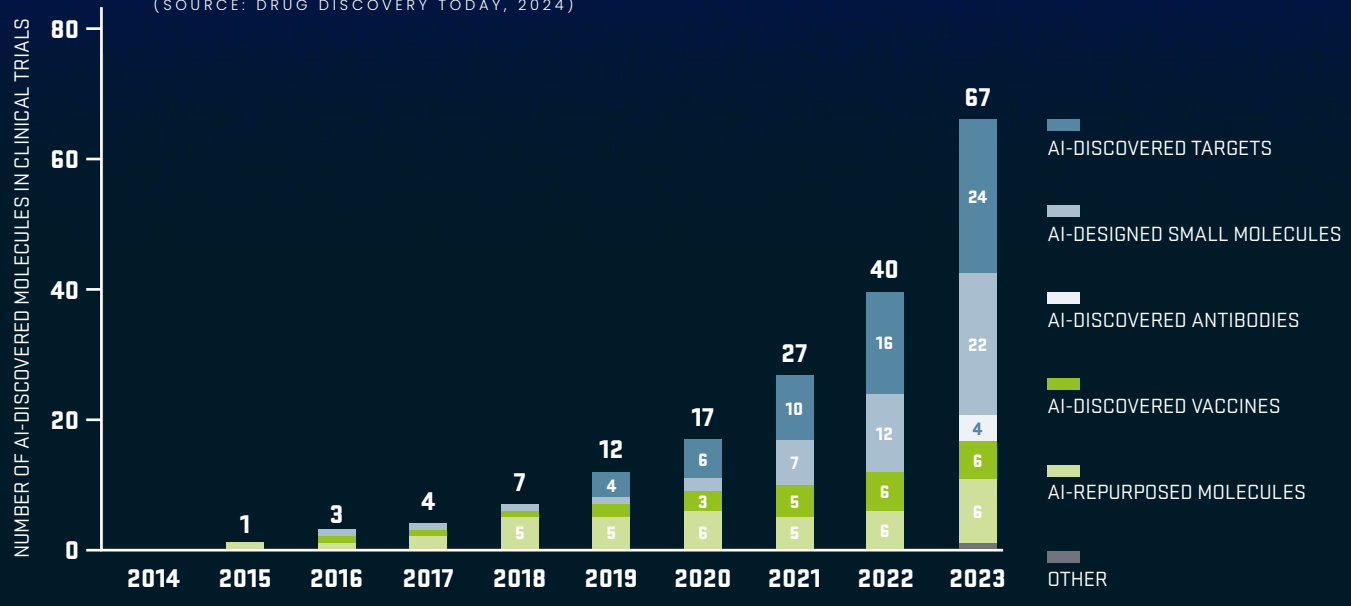
$2.5 billion
average cost to bring a drug to market

9 in 10
drugs that enter clinical trials fail approval processes
(SOURCE: NATURE, 2023)

25–50%
time and cost savings in drug discovery by using AI
(SOURCE: BCG AND WELLCOME TRUST, 2022)

AI-DISCOVERED MOLECULES BY MODE OF DISCOVERY

(SOURCE: DRUG DISCOVERY TODAY, 2024)



→ A BOLD FUTURE

Looking ahead, Dr. Oz highlights the importance of interdisciplinary collaboration to fully realize the potential of AI in longevity research. "We have to have interdisciplinary collaborations," he says. "We've got to get biologists and gerontologists and clinicians and people who don't usually work together to talk to each other and start working on AI applications that are grounded in biologic insights and have clinical relevance."

The opportunities ahead won't be reached unless we see public-private partnerships form to advance the field. "You need big government funding for some of these quantum computing systems," says Dr. Oz. "But you need private sector intuition to figure out how to do it."

For Dr. Oz, AI will play a crucial role in shaping the future of human health and lifespan. And while plenty of challenges remain, the potential benefits are immense – and make overcoming those issues worthwhile. As he put it: "I think that's ultimately how we win this game." ■



PHOTO: JASMIN MERDAN/MOMENT RF/GETTY IMAGES

A LIFE WELL-LIVED

AI can be used in three key areas, argues Dr. Oz – each of which will help bolster and extend healthspan and lifespan, and combined could potentially extend our lives beyond the currently believed biologic age limit of 120 years.

TRADITIONAL PREVENTATIVE MEDICINE

AI can help identify issues with our DNA and other parts of our body that misfire and misconfigure – causing the illnesses that result in an early death. It can also be put to work in drug discovery, helping find innovative new treatments that can manage problems when they occur.

Average life expectancy: Beyond 80 years

BIOHACKING

AI-enabled biohacking could range from more customized lifestyle recommendations to supplementation with prescription and non-prescription ingestible or infusible products, as well as hormones, peptides, stem cells, exosomes and therapies that are still being developed. Dr. Oz subscribes to the 80-20 rule, believing 80% of the gain in lifespan will come from AI-powered biohacking.

Average life expectancy: Around 110 years

SPA HACKING

Spa hacking, with the help of AI, can include fine tuning hyperbaric oxygen treatment – "helpful for chronic injuries, when you need more blood supply to allow the body to heal," says Dr. Oz – and bringing other treatments like infrared saunas and plunges to reality. "Anything that stresses your body without hurting it is actually good for you because it trains the body to deal with pathology, so your body can deal with the challenges when they happen," he said. This would account for the last 20% of AI-enabled gain in lifespan.

Average life expectancy: Around 120 years

THE OPPORTUNITIES FROM AI

Living longer and better lives is now possible, thanks to a slew of inventions on the cusp of commerciality.

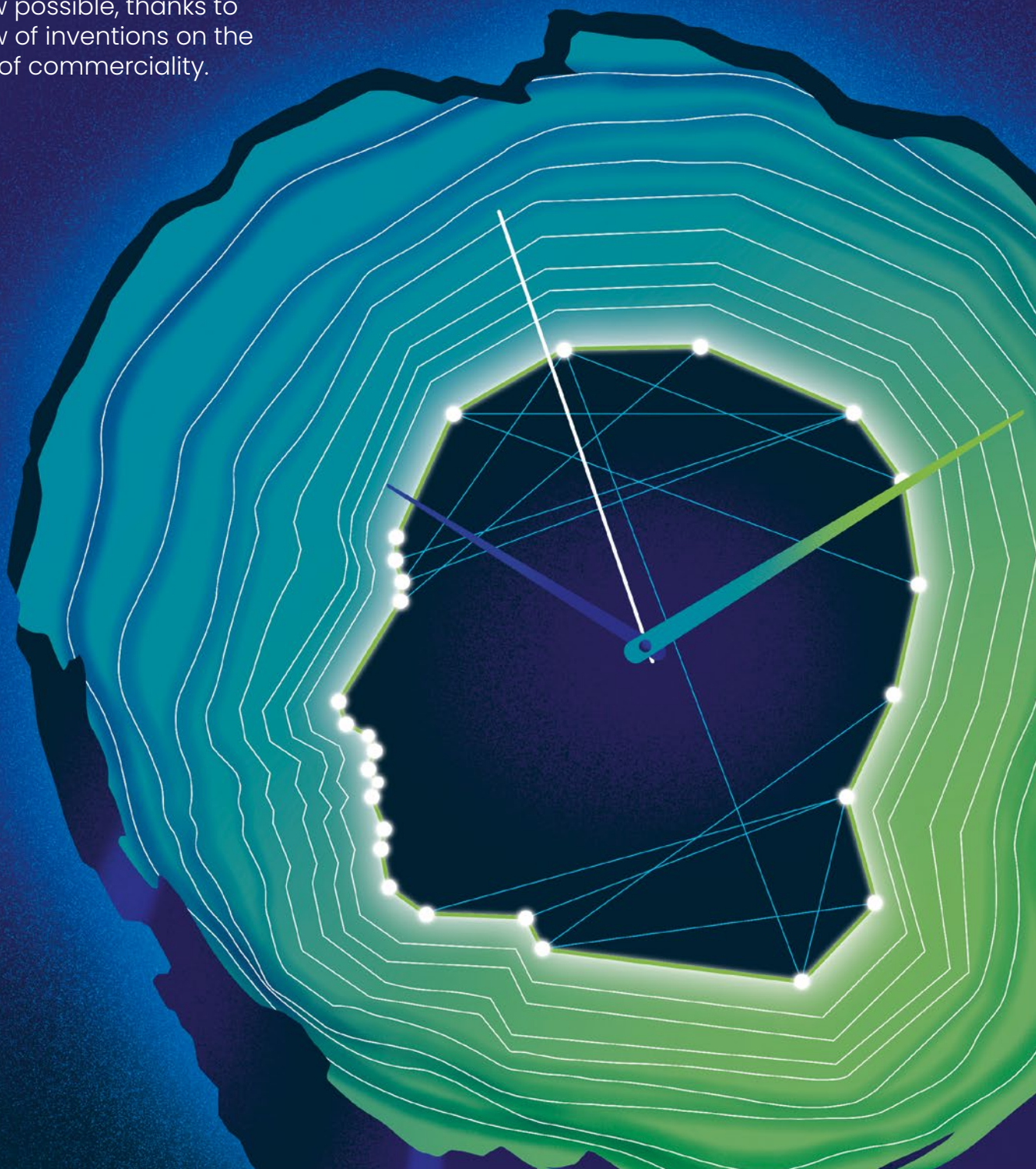


ILLUSTRATION: OLLIE HIRST

FIRST, IT WAS CALLED THE "QUANTIFIED SELF." Then it was "biohacking." Today, the longevity movement is stronger than ever, with search interest and public debate gathering speed. In part, that's because we've grown more aware about the impact lifestyle decisions have on our life- and healthspan. But it's also because technology is catching up to turn science fiction into fact.

One of the most exciting and promising applications of AI is its potential to help humans live longer, healthier lives. Leveraging continuous monitoring, personalized health coaching, and advanced molecular modeling, AI is at the forefront of efforts to extend human longevity.

And the AI movement is combining with existing tech in exciting new ways. "I wear a continuous glucose monitor, an Oura ring and an Apple Watch," says Peter H. Diamandis, M.D., Founder & Executive Chairman, XPRIZE Foundation. "There are a whole set of wearables that are coming to monitor us, not once a year, but continuously."

Diamandis equates it to his hobby as a pilot. "When I fly my plane, I've got all my gauges, and I know exactly what's going on. If anything's out of whack, I can take an action, but we don't know that for our bodies." Until now.

CONTINUOUS MONITORING AND DIAGNOSIS

One of the most compelling ways AI can contribute to human longevity is through continuous monitoring and diagnosis, an area where technology allows for real-time health assessments that were once unthinkable.

Traditionally, individuals have relied on periodic check-ups to detect and address health issues. But diseases, especially chronic conditions, can progress significantly between these spaced-out visits. However, AI-powered devices and platforms are changing that, allowing for continuous health monitoring that offers a constant flow of data and, more importantly, the ability to detect subtle changes in health before they become significant issues.

Wearable devices, like those Diamandis mentioned, have already laid the groundwork for this kind of technology. These devices monitor basic metrics like heart rate, blood oxygen levels, sleep patterns and physical activity, providing a wealth of data to help individuals maintain a healthy lifestyle. But AI is taking this further by integrating data from multiple sources, such as genetic information, medical history and lifestyle factors, to offer real-time, personalized diagnostics. The opportunities from this for the medical profession are endless and exciting. →



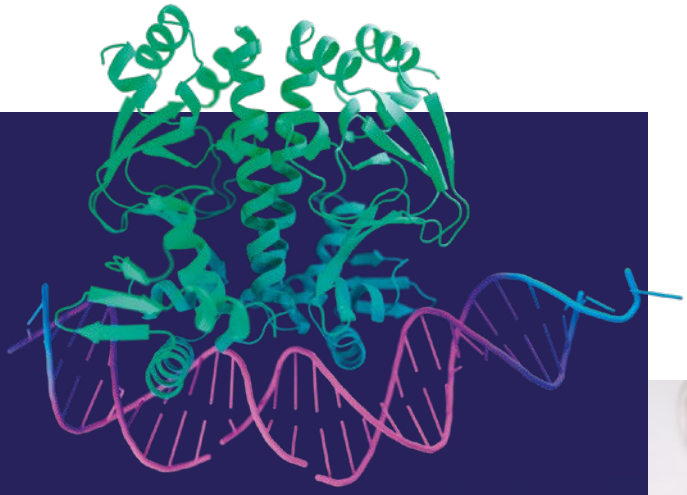
PHOTO: STR/ AFP/GETTY IMAGES

AI can help discover patterns in cells – and therefore anomalies in them – that can help diagnose cancer at early stages.

→ TAKING IT FURTHER

Continuous monitoring has the potential to catch early signs of diseases like diabetes, cardiovascular problems and even cancer. For instance, AI algorithms can detect irregular heart rhythms that might indicate increased risk of stroke long before the patient would notice symptoms. By identifying these patterns early, interventions can be made sooner, reducing the risk of more serious health issues and prolonging a healthy life.

But AI-enhanced continuous diagnosis doesn't stop at wearables. Platforms like IBM's Watson and Google's DeepMind use machine learning to analyze medical data and predict disease progression in patients. AI can even assist in radiology by interpreting imaging data, such as X-rays, MRIs and CT scans, faster and with more accuracy than human physicians. This constant vigilance means a new era in preventative healthcare, where conditions are caught and treated before they ever become life-threatening.



NEXT-GEN TECH

AlphaFold 3 is the next version of Google DeepMind's AI system for protein structure prediction. Building on AlphaFold 2, it aims to further enhance accuracy and reliability in predicting 3D structures of proteins from amino acid sequences.

A COACH IN YOUR POCKET

Alongside continuous monitoring is the development of AI-driven health coaching, which provides individuals with personalized health advice based on their real-time data. Instead of one-size-fits-all health recommendations, AI analyzes an individual's unique genetic makeup, health metrics and lifestyle habits to deliver custom health plans tailored to their specific needs. This can range from dietary advice to exercise regimens, sleep improvement techniques and mental health support.

AI-powered platforms like Lumen and Noom are already offering personalized coaching services that help people lose weight, manage stress and adopt →



PHOTO: OURA; GOOGLE DEEPMIND

Smart wearables, such as the Oura Ring, can help provide useful data about our health 24/7.

→ healthier habits. These platforms use machine learning algorithms to learn from user data, enabling them to offer smarter, more tailored advice over time.

AI health coaches also leverage psychological insights, ensuring that recommendations are not just based on the cold calculus of data, but also tailored to motivate and encourage users. For example, AI can detect when someone is likely to skip a workout and send a timely reminder or motivational message to help them stay on track.

MOLECULAR MODELING

AI can also analyze the molecular level of life itself. One of the most remarkable advancements in this field has been the development of AlphaFold, an AI system created by DeepMind that predicts the 3D structure of proteins. Understanding the structure of these building blocks of life, responsible for countless functions in our bodies, from supporting immune responses to regulating metabolism, is essential for advancing drug discovery, combating diseases, and understanding the underlying mechanics of aging. AlphaFold's algorithms can predict how proteins fold with remarkable accuracy. AlphaFold 3, the latest iteration, takes this ability even further, accelerating research into the molecular underpinnings of life. By accurately modeling protein structures, AI is helping scientists unlock new ways to understand and intervene in the aging process at a cellular level.

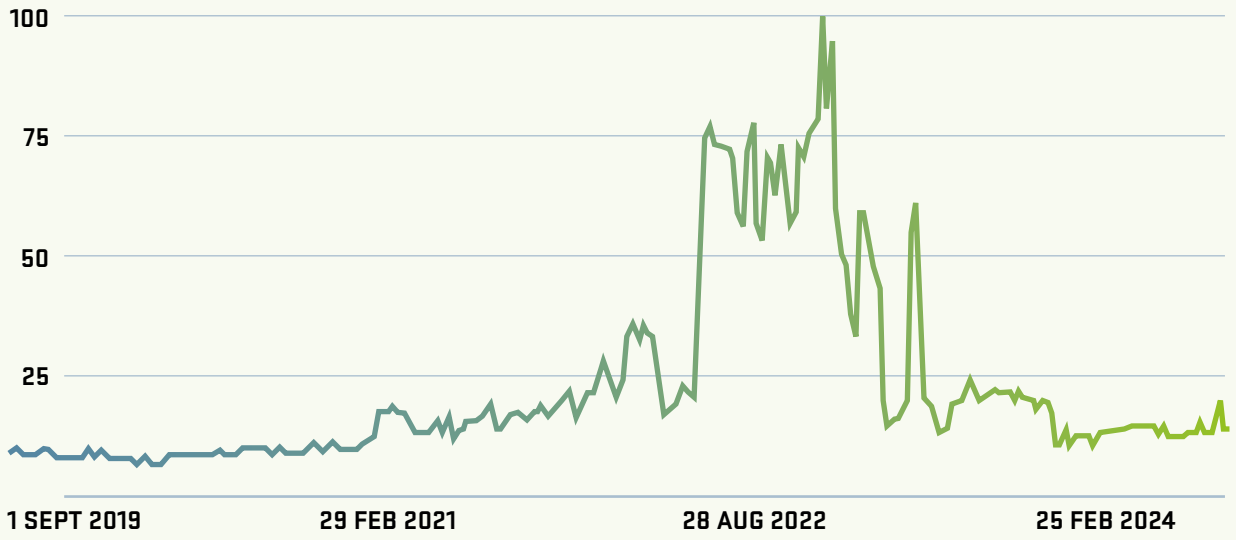
This capability is crucial for longevity research. Misfolded proteins are known to play a role in several age-related diseases, including Alzheimer's, Parkinson's and Huntington's. By predicting how these proteins fold and misfold, AI can guide researchers toward new treatments that could prevent or slow the progression of these debilitating conditions. ■

TRENDING TOPIC

Search engine interest in longevity spiked in 2022, but AI could soon resuscitate it

Numbers represent search interest relative to the highest point on the chart for the given time. A value of 100 is the peak popularity for the term. A value of 50 means that the term is half as popular. A score of 0 means that there was not enough data for this term.

SOURCE: TRENDS.GOOGLE.COM





FROM BENCHTOP TO BEDSIDE

Bringing innovations from the laboratory into the real world can be tricky, but Dr. James Kasuboski and the team at Luma Group are working to do this.

ILLUSTRATION: OLLIE HIRST

THE IDEA THAT TURNING 80 CAN FEEL LIKE 50, and of living in a world where kidney failure is reversible, and the burden of age-related diseases on healthcare systems is dramatically reduced, may still seem outlandish for many. It's a future that seems almost too good to be true, but Dr. James Kasuboski, Head of Research, Luma Group, and his team believe it's within reach, thanks to a slew of new inventions brought about by innovations in longevity through AI.

And Luma Group is willing to put its money where its mouth is.

"We're a biotech venture capital group," Kasuboski explains. "For us, when we look at longevity, we're typically looking at how we develop new therapeutics, diagnostics or bed devices that will eventually be regulated entities to actually give to patients that have gone through clinical trials." Of those three areas, it's therapeutics that Luma Group has focused on the most, seeing the greatest potential.

LENGTHENING LIFE

Luma Group isn't focused on extending life for the sake of longevity alone, but on targeting the root causes of age-related diseases. The organization is looking at well-defined characteristics of aging that convert into diseases, such as fibrosis and neurodegeneration, and funding projects that can tackle them head-on.

"Everyone will eventually have some form of fibrosis in the heart, lung and bone marrow," Kasuboski says. "It will eventually cause them to die or actually move into a well-classified disease, or we think Alzheimer's or neurodegeneration." The issue is that we don't regrow neurons. "We know that over time, either genetics and environment or some combination of both, will eventually impede your neurons' effectiveness to do their job." That is manifested in anything from cognitive decline to dyskinesia, or more terminal issues.

Taking action is therefore imperative. But developing treatments for these age-related diseases comes with challenges. One of the biggest is the nature of aging itself. It's a slow, gradual process that unfolds over decades. And human beings historically have not had time. →



The transformation from youth to old age is increasingly disappearing as we understand more

PHOTO: DANIEL DAY/THE IMAGE BANK RF/GETTY IMAGES

NOBEL THINKING

iPSC technology was developed in Japan by Dr. Shinya Yamanaka and Kazutoshi Takahashi. The principle was simple: introducing four different genes – now known as Yamanaka factors – could convert a cell into a pluripotent stem cell. Pluripotent stem cells are seen as a silver bullet because they can propagate ad infinitum. Work began on the subject in 2006, and by 2012, Yamanaka and Sir John Gurdon won the Nobel Prize for "the discovery that mature cells can be reprogrammed to become pluripotent."

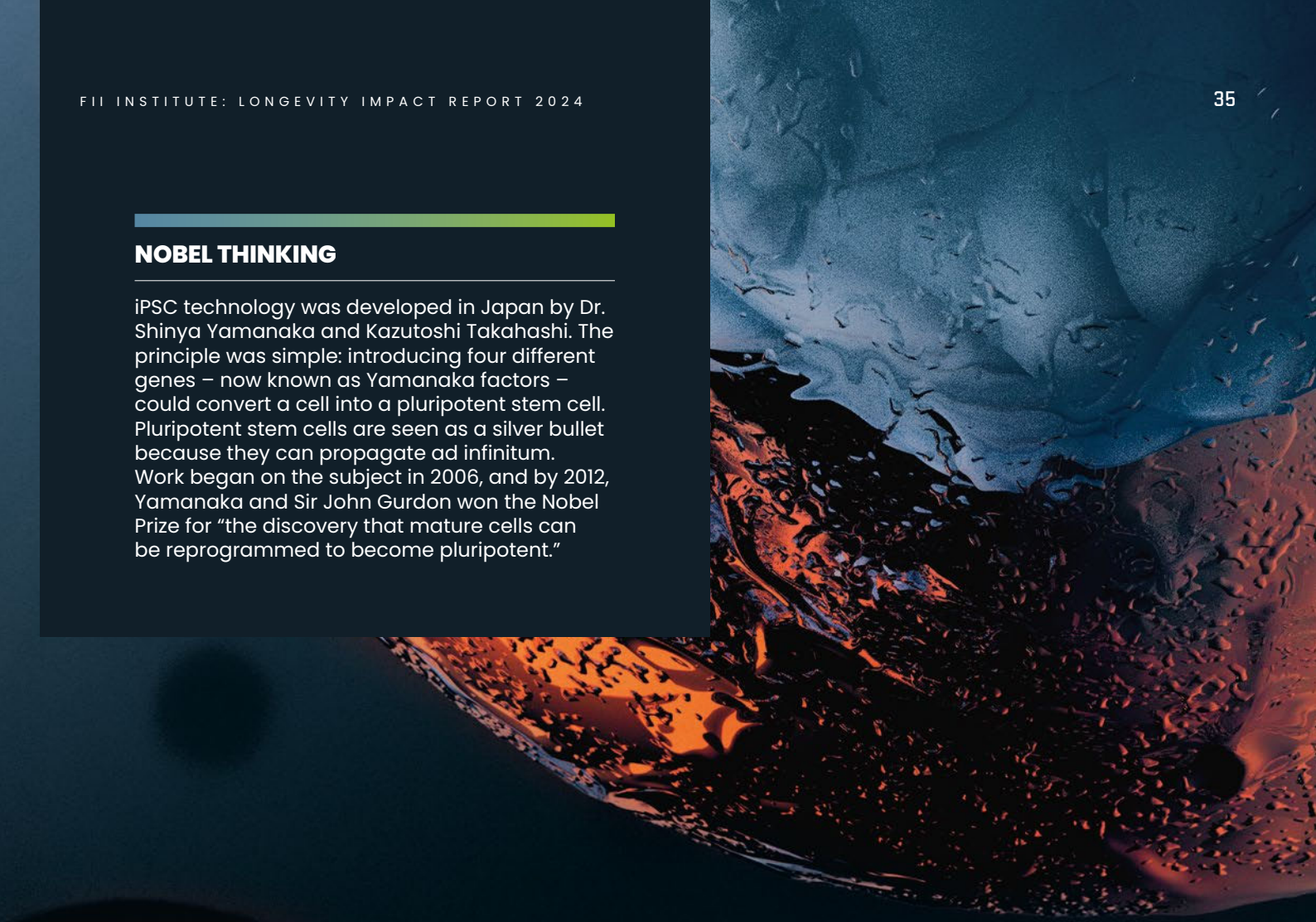


PHOTO: LUISMMOLINA/E+/GETTY IMAGES

→ A RACE AGAINST TIME

"The problem is, how do you test this in a human being?" Kasuboski asks. "Because it's age, these things take years to decades or longer to actually pay attention to." Patients can often die before a study completes, meaning it's difficult to ever know what treatments will work.

This is where the power of artificial intelligence can help. AI can boost longevity research by analyzing large datasets, identifying subtle patterns, and developing early biomarkers for age-related diseases – all without having to race against the clock in reality.

"At the benchtop, it helps us make decisions quicker, or see certain aspects or insights that are too complex, too large for the human brain to stare at the data and pull it out," he says. Luma Group's portfolio includes investment in Altos Therapeutics, which works on reversing aging at the cellular level using technology based on induced pluripotent stem cell (iPSC) research, pioneered by Dr. Shinya Yamanaka, who won the Nobel Prize for his work.

NEW THINKING

"We think we fundamentally understand an underlying base case cause for aging and the reversal of aging across every single cell in your body," Kasuboski said. "And →

→ that comes from the pioneer iPSC work that came from Dr Yamanaka."

What makes Altos' approach particularly promising is that it doesn't require fully reverting cells to stem cells. Instead, it aims to "rewind" them to a younger state. "You don't have to walk it all the way back to a stem cell," Kasuboski explains. "You don't have to make all your liver cells stem cells. You can actually walk them back to a pre-pubescent time."

If successful, this approach could potentially cure or significantly improve treatment for numerous age-related diseases, including kidney failure, liver fibrosis and others. "We'll go in, we'll get a treatment, and we'll either plateau or reverse it, where we no longer have a lot of fibrosis and loss of activity, but we're regaining that within the kidney," Kasuboski predicts. That could have an impact beyond individual health. It could reshape society as we know it, reducing healthcare burdens and increasing productivity.

LIVING TO 100 (AND BEYOND)

"Now we're talking about getting into the hundreds for our healthcare," Kasuboski says. But with these potential breakthroughs come new questions and challenges. What happens when 80 feels like 50? How will this affect retirement age, productivity and our healthcare systems?

"Now we're thinking of people that can extend the most productive years of their life," Kasuboski says. "From an economic point of view, you can extend your highest period of productivity, which is usually somewhere between 40 and 65 right now, even farther out."

Luma Group's recognizes this needs to be grounded in rigorous science and regulatory compliance. They focus on highly regulated interventions that must pass FDA or EMA guidelines, ensuring a scientific and empirical approach. "We essentially know what will work in a clinical trial, or at least what the regulators will consider good enough to keep on progressing it forward," Kasuboski explains. The firm has more than 60 expert advisors to suggest what can and can't work. The company isn't just focused on treatment, but also on early detection. It's invested in innovative diagnostic technologies that can detect diseases much earlier than traditional methods. →



The analysis of how our bodies work at a molecular level has been supercharged by AI, but taking it out of the lab is tricky.

PHOTO: AJ_WATT/E+/GETTY IMAGES



SHINYA YAMANAKA

Japanese stem cell researcher Shinya Yamanaka gained his PhD from Osaka City University. In 2006, he recognized a small number of genes within mice could be reprogrammed to serve other purposes. A TIME 100 finalist in 2008, he was awarded the Nobel Prize in 2012 for his work on iPSC, or induced pluripotent stem cells.

PHOTOS: NIH/IMAGE POINT FR/ BSIP/PICTURE ALLIANCE; KYODO/PICTURE ALLIANCE

→ EARLY INTERVENTION

"We invested in a company that says, 'Okay, I can take a blood sample. I can see minor, minor, very subtle variations within the disease versus healthy patients that strongly correlate to disease progression'," Kasuboski explains. And they're even looking at novel ways to measure cognitive decline, analyzing patterns in language use over time. "There's been interesting work showing that you can actually see word count and diversity within that word count change over time," he says.

The focus is not just on extending lifespan, but on improving the quality of life in later years. This is particularly important for diseases where current treatments are limited or ineffective, such as kidney failure. "The kidney, like the brain, never regrows," Kasuboski says. "From when you hit 18 to where you die, you only lose kidney function, and that is super important for cardiac function, and normal, healthy living." But with new techniques, that could change – taking patients off dialysis, and reversing ageing.

While the potential of these treatments is enormous, he points out there are still challenges to overcome. For Altos Therapeutics, the main hurdle is not the biological concept, but the delivery of the treatment to the right tissues.

CHALLENGING TIMES

Despite these challenges, Kasuboski and his team at Luma Group are optimistic about the future. They expect significant progress in longevity treatments within the next five to ten years.

"With Altos, we'll know within the next five to ten years are they going to start having drugs to get into the clinic to get approved, of what's promising. If they are approved, some of those big age-related diseases could potentially be off the board and completely cured," Kasuboski says.

That would have new, exciting ramifications we can currently only dream of. The potential impact of these treatments could extend beyond individual health to affect societal structures and resource allocation. "Just think about where that goes for a country's GDP, or where we start putting resources, or even socially, where we start putting the value of the extra time we have with increased productivity," Kasuboski says. ■



DR. JAMES KASUBOSKI

Dr. James Kasuboski is Head of Research at Luma Group. Prior to his arrival at Luma Group, he developed deep experience in early-stage biotech investing and company creation while working on the investment team at RA Capital. In that role he served on the board of Enara Bio, Avilar Therapeutics and Endor Therapeutics.

PHOTOS: KOTO_FEJA/E+/GETTY IMAGES; LUMA GROUP

A RACE AGAINST TIME

Ensuring you stay ahead of the curve when it comes to medical innovations can have a compounding effect – and AI can help with that, according to Peter H. Diamandis.



ILLUSTRATION: OLLIE HIRST

PLENTY OF PEOPLE HAVE OPINIONS ON THE potential extension of human lifespan and healthspan. But few people have as much insight as Peter H. Diamandis, M.D. Founder & Executive Chairman, XPRIZE Foundation. The entrepreneur and futurist believes we are on the cusp of a longevity revolution, one that will be driven by the synergy between artificial intelligence and biotechnology.

Diamandis paints a picture of a future where aging is not an inevitability, but a challenge to be overcome. However, his optimism is tempered with pragmatism, acknowledging the hurdles that lie ahead, while recognizing the opportunities tech advancements offer.

"I developed a philosophy," Diamandis explains, "that the biggest impact that's going to be driving healthspan and lifespan, and hopefully the two will eventually come together, are a set of technologies that aren't here yet. We're going to see fundamental breakthroughs in the next decade, or two decades at most, and they're going to be driven by AI."

AN INEVITABLE CHANGE

The unification of AI and longevity research is not just a possibility, but an inevitability in Diamandis's view. He points to the complexity of aging as a biological process, a multifaceted puzzle that has long eluded human comprehension. "It's a massive multi-modal, multi-parameterized set of elements – and AI is going to be our tool to decipher that," he says.

But it will take some time for those breakthroughs to materialize. Diamandis supports Ray Kurzweil's prediction of when the change is likely to take effect. "Understanding the root cause of aging and interventions, and viable interventions for them, will have materialized at or before 2035." As Diamandis points out, that's an "incredibly close" timeframe.

Such an accelerated timeline might seem ambitious, but Diamandis argues that the economic incentives are aligning to accelerate progress. "I think of longevity as a multi-trillion dollar marketplace," he said. "When I ask people of means, 'How much of your wealth would you give for an extra 20 or 30 health years?', in honesty, it's going to be the vast majority of their wealth."



PHOTO: XPRIZE FOUNDATION

BOLD LONGEVITY GROWTH (BLG)

is a new growth-stage fund designed to invest $100+ million into de-risked companies in the longevity sector, focusing on Series B-D rounds. BLG represents a strategic collaboration between BOLD Capital Partners and Longevity Vision Holding (formerly Longevity Vision Fund). Having completed its first close, BLG aims to target companies advancing innovation in the longevity space. Additionally, Peter will be launching Exponential Ventures alongside AI expert David Blundin, an AI-focused fund and incubator. This initiative will rebrand an existing venture firm and focus on fostering AI-driven startups, signaling a broader emphasis on cutting-edge AI technologies and their fundamental ability to uplift humanity and drive innovation in a number of key verticals, including health sciences & longevity.

→ MEETING TECH HALFWAY

However, the path to extended longevity isn't just about waiting for technological breakthroughs. Humans have to play their own part – meeting tech halfway. Diamandis says people need to develop a "longevity mindset": a proactive approach to health that positions individuals to benefit from future advancements. "Longevity mindset is a belief that, in fact, we're going to see breakthroughs, and I want to be in the best health I can to intersect them and live as long as I can to intersect them," he says.

That healthy mindset is crucial because, as Diamandis points out, history hasn't prepared us for extended lifespans. "Evolution never selected for anything beyond reproductive age," he said. "Over the last millions of years as primates, and hundreds of thousands of years as Homo sapiens, there was very little evolutionary value to living beyond 30."

As a result, we're competing against nature to live longer. Overcoming this biological limitation will require a shift from "evolution by natural selection" to "evolution by human direction," says Diamandis. Yet, he sees evidence that such control is possible, pointing to phenomena like the epigenetic reset that occurs in newborns. "A woman who is 30 can give birth to a child who has an epigenetic age of zero, so the ability to reverse the epigenome and start again is there," he explains.

NEW TOOLS AND TECH

The tools to unlock these mysteries are rapidly evolving. Diamandis highlights the progression from gene sequencing to gene editing, and now to AI-driven molecular simulations, as examples of how speedily we are developing. "The next step, and there are companies working on this right now, is: 'Can you simulate in silico an entire human cell?'" Once that happens, it's a shorter step to simulating in silico the entire human body.

"We have 30 trillion human cells, and a billion chemical reactions per second in these cells," he said. "It's complicated, and we have never had the ability to really fully grok it – to understand it. But I think finally, we're there, and on the cusp of that."

While these longer-term goals are exciting, AI is already poised to revolutionize healthcare in the nearer term. Diamandis envisions a future of continuous health monitoring and personalized interventions. "AI will upload all of the data from your body constantly and make sure that you know you're in continuous health," he says. "It might send data to your kitchen robot to say, I need to increase the amount of protein or the amount of vitamin D, or whatever it might be to close the loop." →



PHOTO: CATHERINE LEDNER/STONE/GETTY IMAGES

→ BROAD IMPACTS

A new, AI-driven approach to health could have profound implications for global healthcare delivery, particularly in populous countries like India. "India's got 1.4 billion people. The only way India delivers health to its nation is with AI at scale," Diamandis says. "AI becomes the best diagnostician, free to everybody."

However, realizing this potential will require navigating complex regulatory landscapes. Diamandis foresees a future where companies engage in "regulatory arbitrage," seeking out jurisdictions with more permissive environments for their research and trials. So governments and leaders need to consider the implications of being played off against one another.

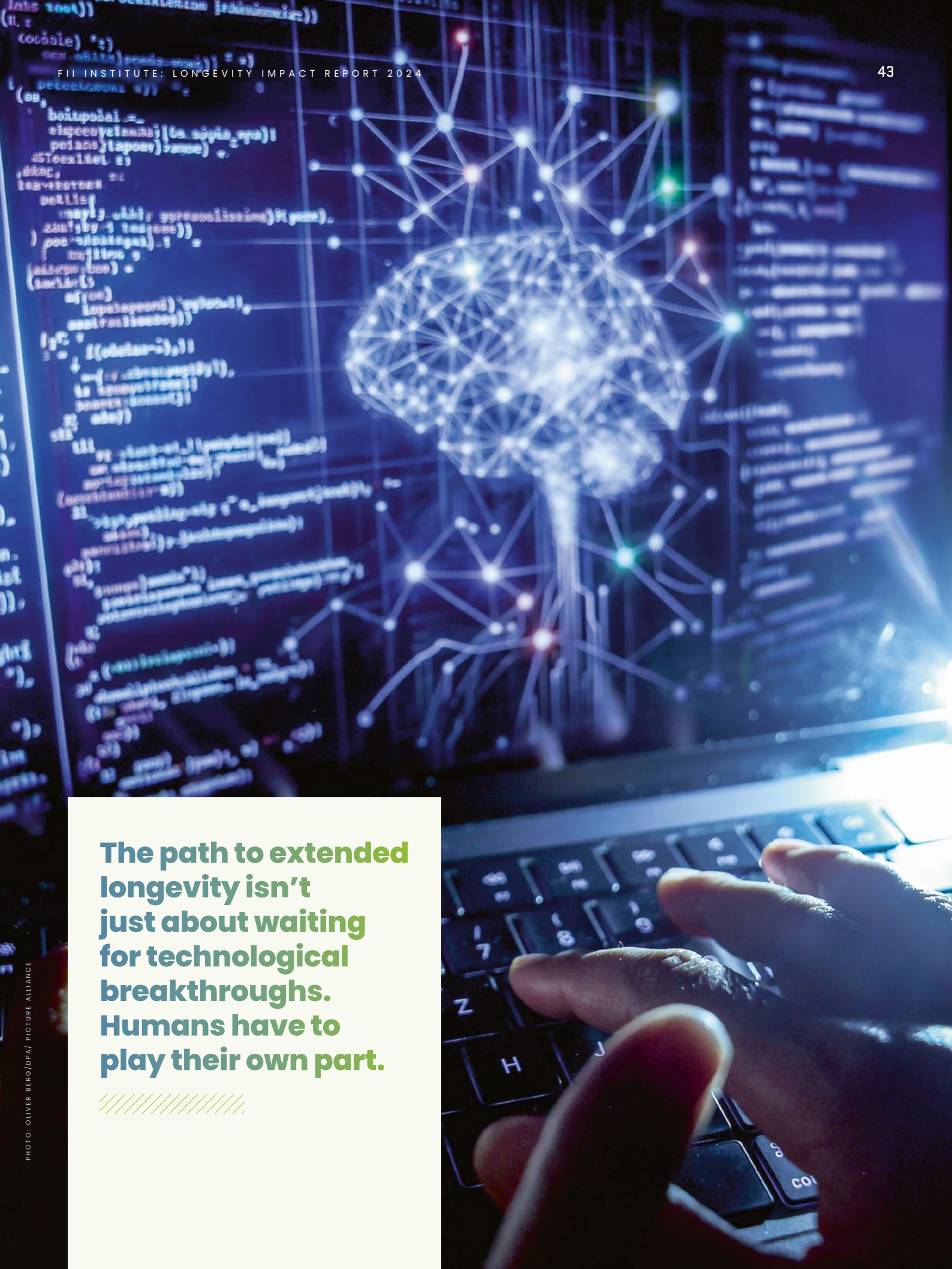
One crucial technology that Diamandis believes could play a crucial role in extending healthspan is gene therapy. While it's currently expensive for rare diseases, he argues that economies of scale could dramatically reduce costs when applied to aging, a condition shared by all humans. "We have a proof example in large volumes that this most advanced technology can become relatively cheap," he says, referencing the rapid development and deployment of mRNA vaccines during the covid-19 pandemic.

Despite his own optimism, Diamandis acknowledges the skepticism that often surrounds longevity research. →



PHOTO: ANDREW BROOKES/IMAGE SOURCE/GETTY IMAGES

Pipette-level analysis of molecular material like DNA can help unlock the secrets of longevity



The path to extended longevity isn't just about waiting for technological breakthroughs. Humans have to play their own part.

PHOTO: OLIVER BERG/DPA/ PICTURE ALLIANCE

→ "It's been talked about for centuries, the fountain of youth. It's been the stuff of snake oil salesmen," he says. And despite all the hope, we've not seen an advancement in lifespan, but a plateauing. And post-covid, healthspan had fallen.

Yet, he remains convinced that we are on the brink of a paradigm shift in how we understand and address aging. The convergence of AI, gene therapies, and a growing understanding of the biology of aging is creating unprecedented opportunities for extending human healthspan and lifespan.

"I'll never forget one of my dearest friends on the planet in the early 1990s came down with AIDS, and he passed away before the current cocktail mix of antivirals was developed," he recalls. "If he had lived an extra two years, he would have gained the ability to have lived indefinitely with the disease."

It's a powerful reminder of the race against time that defines longevity research. Every breakthrough, every year of extended healthspan, could mean the difference between intercepting future advancements or falling just short.

If the world times it right, the reward could be transformative: a future where we not only live longer, but live better, healthier lives. It's a future worth striving for, and one that may be closer than we think. ■

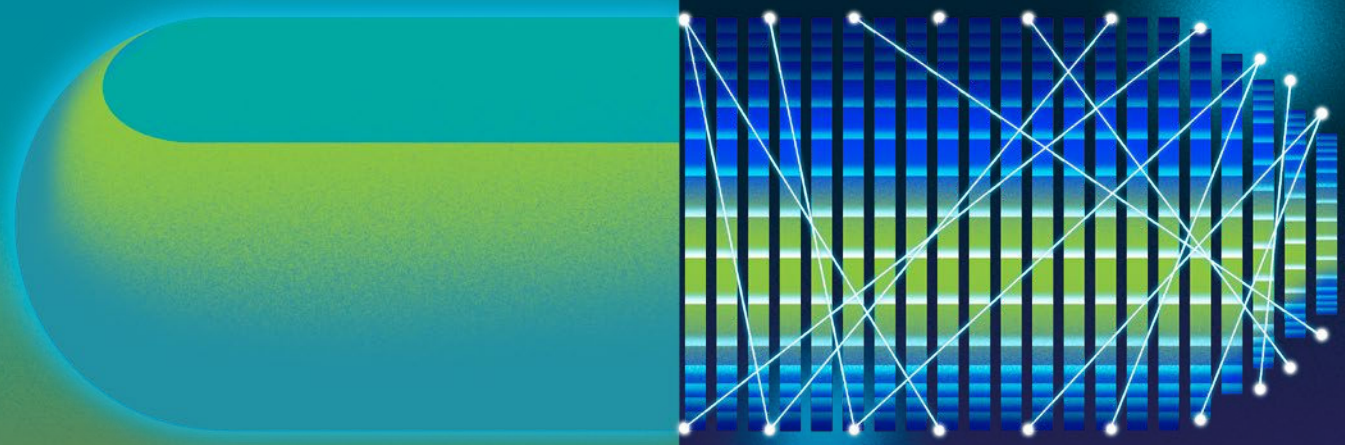


PHOTO: PAUL SMITH; ILLUSTRATION: CARINA DYLUS

PETER H. DIAMANDIS

Named by Fortune as one of the "World's 50 Greatest Leaders," Peter H. Diamandis is the founder and executive chairman of the XPRIZE Foundation, which leads the world in designing and operating large-scale incentive competitions. He is also the executive founder of Singularity University, a graduate-level Silicon Valley institution that counsels the world's leaders on exponentially growing technologies.

"We're going to see fundamental breakthroughs in the next decade, or two decades at most, and they're going to be driven by AI."



MAKING HEALTHCARE CHEAPER AND MORE ACCESSIBLE

AI can help in plenty of ways, including ensuring that good healthcare is available to all, regardless of where they live or how much their income.

ILLUSTRATION: OLLIE HIRST

BRIDGING THE GAP BETWEEN THE HAVES AND the have-nots is a key tenet of discussions among the FII community. And while access to healthcare is currently unequal, AI can help make that less divisive. Marcelo Claure, Founder & CEO, Claure Group; Group Vice Chairman, SHEIN, sees AI as the "great equalizer" that could bridge longstanding divides in global health access and quality. He points out the world's most advanced heath ecosystems operated by health systems such as the Mayo Clinic. "Now imagine if you could open that up to the whole country of Brazil, where 220 million citizens will have access to the same care that people have at the Mayo Clinic," says Claure. "You'd massively revolutionize the entire country."

That vision of AI-powered healthcare equality is not a distant dream. K Health, an AI-driven primary care platform his Claure Group recently invested in, is a leading example of how this transformation is already underway. K Health has developed an AI copilot for doctors that assists with diagnostic and treatment decisions. The system draws on a vast clinical AI model trained on huge volumes of medical records and patient interactions.

BIG DATA, BIG ACTION

AI can help expand doctors' knowledge in an instant, leveraging years of experience from millions of doctors. "Our clinical AI today has about 2 billion records," Claure says. "Would you rather be seen by a doctor who has seen 2 billion cases, which means an incredible amount of experience, or would you rather be seen by your doctor who has potentially seen 600 cases in their entire life?"

This vast knowledge base allows K Health's AI to provide personalized care recommendations tailored to each patient's unique medical history and symptoms. The platform is already integrated with renowned US hospitals like the Mayo Clinic and Cedars-Sinai, demonstrating its potential to enhance care even in advanced health systems.

But the true promise of AI in healthcare lies in its ability to address the most pressing disparities in regions like Latin America and other parts of the Global South. Claure identified three key areas where AI can make a significant impact: access, quality, and cost. →

> "Don't die in an accident in the next 10 years, because then, I think our lifespan breaking 100 years will be the norm."



MARCELO CLAURE

Marcelo Claure is a globally recognized entrepreneur and investor, known for his transformative impact across industries. He is founder and CEO of Claure Group, a multibillion-dollar global investment firm deploying proprietary capital across AI & technology, climate & energy transition, and lifestyle & entertainment. Claure Group invests directly in companies and through leading investment funds.

PHOTO: CLAURE GROUP; ILLUSTRATION: OLLIE HIRST

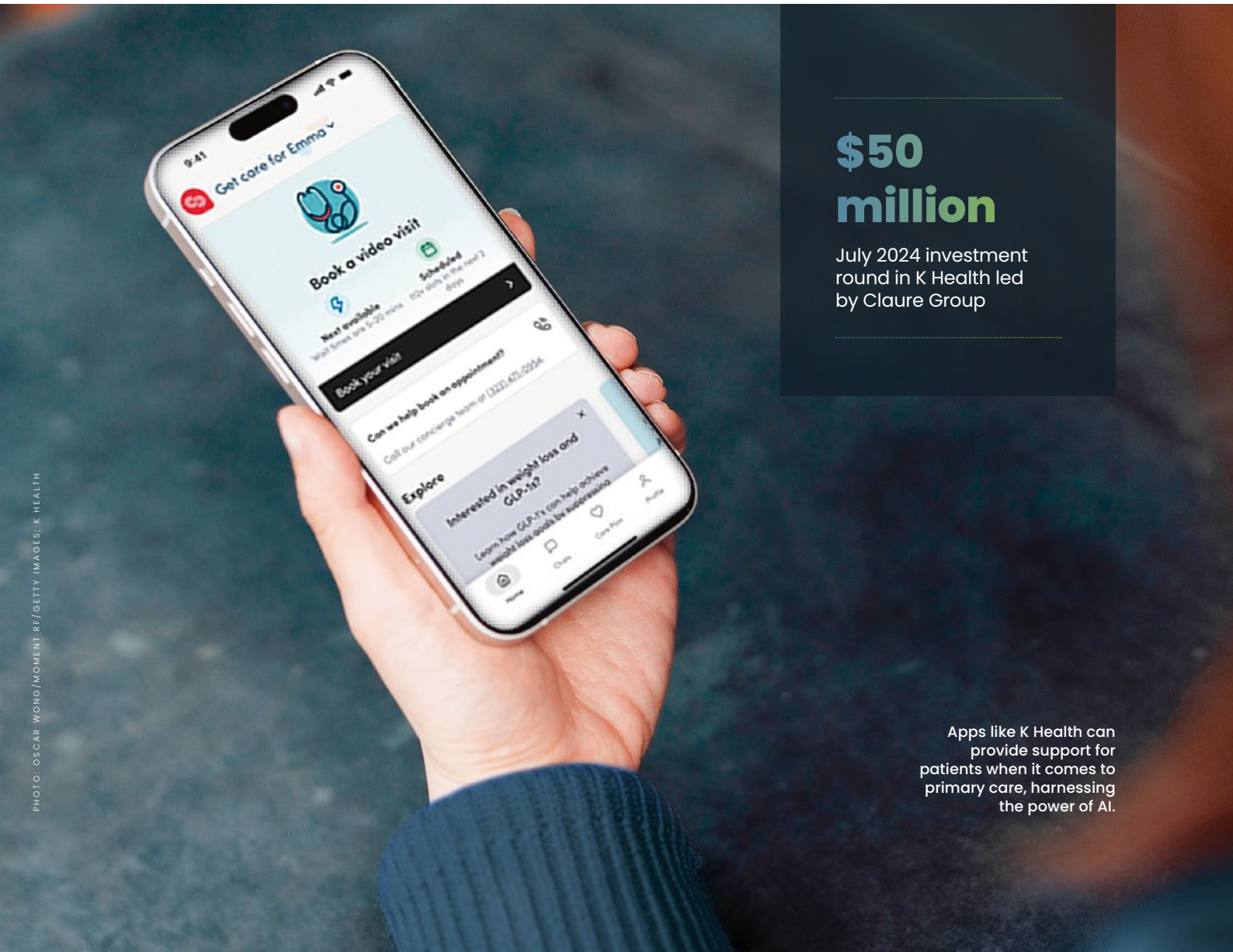
→ EASY AS ONE, TWO, THREE

Access remains a critical issue in many developing regions due to geographic barriers, hospital capacity constraints, workforce shortages, and underdeveloped health system infrastructure. AI-powered platforms like K Health can provide 24/7 virtual care through mobile applications, dramatically expanding access to medical expertise.

"In many of these emerging markets, it takes you six to nine months to get the right visit with a doctor," Claure says. Instead, people feel they have to go to the next-best option: a pharmacist. "That's how people get cured in most emerging markets."

By contrast, AI-enabled healthcare can connect patients in even the most remote areas to high-quality medical advice and triage, potentially saving countless lives. The increased efficiency of AI assistance could also free up capacity at physical healthcare locations by as much as 15%, according to Claure.

Quality of care is another area ripe for improvement thanks to AI. Developing regions struggle with a lack of physician expertise and overrun health systems, leading to cancelled appointments, inadequate follow-ups, and limited access to necessary medications and treatments. AI systems trained on vast amounts of medical data can help bridge this expertise gap, providing local healthcare workers with world-class diagnostic and treatment insights. Initial studies have shown the AI's diagnostic accuracy to exceed 90%, potentially outperforming even highly skilled human doctors in some cases. →



$50 million

July 2024 investment round in K Health led by Claure Group

Apps like K Health can provide support for patients when it comes to primary care, harnessing the power of AI.

PHOTO: OSCAR WONG/MOMENT RF/GETTY IMAGES; K HEALTH



PHOTO: MARCO BELLO/BLOOMBERG/GETTY IMAGES

→ DRIVING DOWN COSTS

Cost remains a significant barrier to healthcare access for many in the Global South. AI-powered systems could help address this by enabling more efficient care delivery and reducing the need for repeated visits. "Care can be managed remotely, and physical visits are more productive, resulting in less repeated and severe visits by the patient," Claure says.

The potential impact of these improvements extends far beyond immediate health outcomes. By providing better preventative care and early interventions, AI-enabled healthcare could significantly help increase lifespans and overall population health. "Better care leads to a healthier, longer life," Claure says. "I always tell people to make sure that we don't die in an accident in the next ten years, because then, I think our lifespan breaking 100 years will become the norm." →

DENSITY OF HEALTHCARE WORKERS

Africa

1.3 per 1,000 people

Europe (average)

More than

10 per 1,000 people

(SOURCE: DR. KIRIMI SINDI)



PHOTO: METAMORWORKS/SHUTTERSTOCK

→ Claure points to emerging technologies that could revolutionize how we approach health and aging. These include the development of detailed "digital twins" of individual patients, allowing for personalized treatment simulations, and advancements in organ regeneration and cellular rejuvenation. "We're getting very close to replicating a digital twin of your body, molecule by molecule, in software," he says. "Rather than doing the traditional trial and error that we use today with medicine, we can do that trial and error at a software level in a digital twin." Initially, that would be at a segmented population level, but with time, thanks to dwindling compute needs for AI models, it could be hyper-personalized. →

→ ENSURING INNOVATION

Ensuring AI reaches its full potential for healthcare will require overcoming challenges. Collaboration between the public and private sectors to provide funding, develop infrastructure, and create appropriate regulatory frameworks will be vital. "Both will need to be willing to provide funding and investment in infrastructure to both private and public health systems in order to implement these technologies effectively and make them available for as many patients as possible," he says.

Investors have a role to play, too. Claure looks for AI healthcare start-ups that can integrate seamlessly with existing health systems, have access to high-quality data, and demonstrate a high degree of accuracy. "In a sector like healthcare, where human lives are at stake, the ability for an AI tool to be accurate is critical," he says.

Worries about data privacy, algorithmic bias and the potential for AI to exacerbate existing inequalities all have to be addressed. But beyond that, changing a human-led sector into a part-automated one could cause friction.

Despite these hurdles, Claure is optimistic about the transformative potential of AI in healthcare. "I truly believe if you are alive in the next ten years, you will be able to live to a hundred due to the acceleration of the current healthcare system and all the advancements that are yet to come from this technology," he says. And that's wherever you are in the world. ■



PHOTO: IGNATIEV/E+/GETTY IMAGES

The potential of AI to improve insights into our bodies and their performance could help unlock a new future of longevity benefits.



GOING GLOBAL FOR FUNDING

Improving outcomes for people worldwide requires new thinking – and a global outlook – as Dr. Mehmood Khan argues.

ILLUSTRATION: OLLIE HURST

TACKLING THE CHALLENGE OF AGING WITH A BOLD vision and global ambition takes big thinking. And it's an important, staggeringly large challenge. "There are 1 billion humans that are 60 or older, and that's going to double to 2 billion," says Dr. Mehmood Khan, CEO, Hevolution. This demographic shift poses significant challenges to healthcare systems, economies and societies worldwide.

But it's a challenge Hevolution, a nonprofit founded by royal order in 2018 and launched in 2021, is taking on. "It was a vision of our board, including our chairman, to take on a global initiative that would have scale impact." Since then, it has emerged as a powerhouse in the field of longevity research, with a founding principle to "extend healthy lifespan for the benefit of all."

Heading up the endeavor is Khan, whose career has spanned academia, medicine and industry – uniquely positioning him to lead what is "the largest nonprofit organization that funds the science, the research, and accelerates the development of the output of the science using capital." The organization has already committed over $400 million to healthspan sciences in its short existence.

"It was a vision of our board, including our chairman, to take on a global initiative that would have scale impact."



PHOTO: LUBAIB QAZIR/MOMENT OPEN/GETTY IMAGES

→ A STRAIGHTFORWARD GOAL

Hevolution's mission is as straightforward as it is urgent. "There are two or three major challenges for humanity," he says, "and one of the top two or three is this huge demographic change that's going on in humanity across the world." Not only are we seeing global age distribution rapidly resettling, but we're facing the knock-on impacts on mobility, costs to individuals and to society, and the wider economic and humanitarian impact of increasingly older, sicker populations with proportionally fewer younger people to take care of them.

Hevolution's approach to tackling this global issue is multifaceted, leveraging Khan's extensive experience across various sectors. "It's really a convergence of scale businesses, healthcare systems, academic medicine, product development and investing behind all of those thinking about it at a global system level," he said.

The organization accelerates scientific research, bridging the gap between academic discoveries and market-ready solutions, and fostering collaboration across borders and disciplines. Cross-sector, and cross-border, collaboration will be key to tackling the longevity issue, says Khan. "No country on its own has the resources to solve such a big problem, and whenever it's happened, such as solving HIV, it took global collaboration." →



The debate around how best to improve healthspan includes world leaders and decision-makers, as at this Hevolution summit.

PHOTO: HEVOLUTION



PHOTO: THOMAS BARWICK/DIGITALVISION/GETTY IMAGES

→ CONVENING COMMUNITIES

Bringing together leading thinkers has been surprisingly successful. One of Hevolution's key initiatives is the Global Health Span Summit, which last year attracted 2,000 attendees from various sectors. "Normally, the largest meeting that had ever happened in this space was about 200-300 people coming together," says Khan. But a larger audience led to better results, with new collaborations and ideas emerging from these cross-sector interactions.

However, collaborations need support, and it's here that the Riyadh-based nonprofit can help. Hevolution's approach goes beyond traditional scientific funding, Khan explains. "We've now invested in half a dozen biotech companies that we're helping accelerate, not just with capital, but by being members of their board, by guiding their science with our scientists, and by guiding their business." This sleeves-up, hands-on approach tries to bridge the gap between scientific discovery and practical, market-ready solutions.

Hevolution's help has brought new voices and perspectives from across science to support the challenge. "We've been funding scientists, many of whom had never actually written a grant for aging, but when they saw the opportunity for funding, and then they saw the links that happened," he says. Hevolution's geographic location helps with this, says Khan. "To quote somebody else, we're in the Middle East. We're in the middle, where the west, the east, and the north and the south meet." →



Projects like this one at the University of Pittsburgh are among those funded by Hevolution, seeking to improve our understanding of our bodies.

→ HEALTHSPAN VERSUS LIFESPAN

Hevolution's vision goes beyond merely extending lifespans. As Khan puts it, "We don't want people to live longer just the way they're doing right now for the sake of living longer. We want them to live health, as healthy as possible, for as long as possible." The focus on healthspan rather than just lifespan guides all Hevolution's efforts. "We want to quantify impact to then enable people to make choices," says Khan. "That's where AI and high performance computing comes in."

To ensure their work aligns with ethical considerations, Hevolution has established a Global Advisory Committee on bioethics. This committee, chaired by Professor Arthur Kaplan of New York University and including experts from around the world, asks critical questions: "Not only can the science be done, but should it be done?" says Khan.

But the work is pressing. Khan is clear about the long-term goals of Hevolution. "We know, on average, every human, no matter where they live, spends about ten years of their life living with the burden of age-related diseases," he says. The aim is to reduce this burden and increase the number of healthy years people can enjoy. →

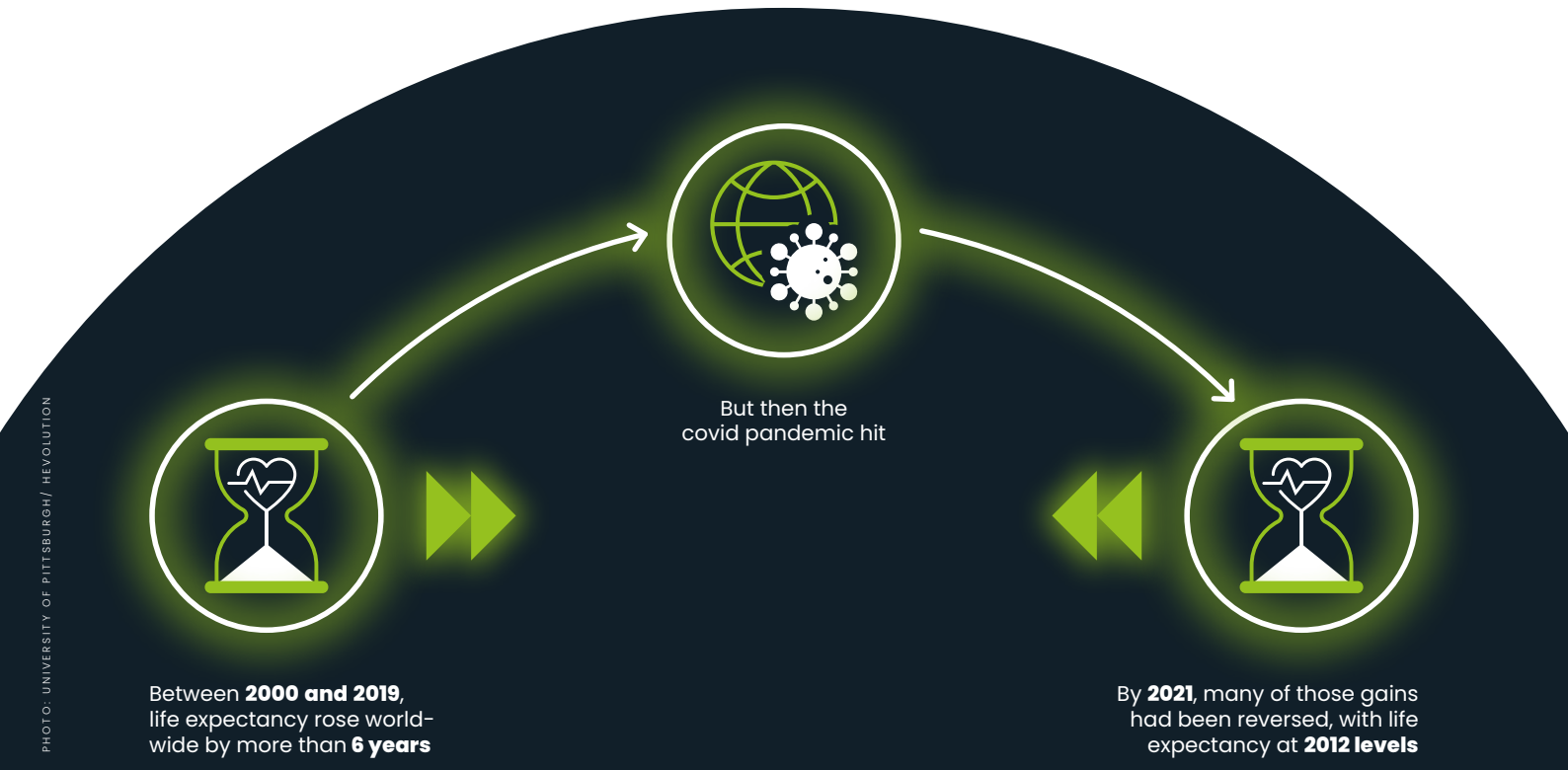
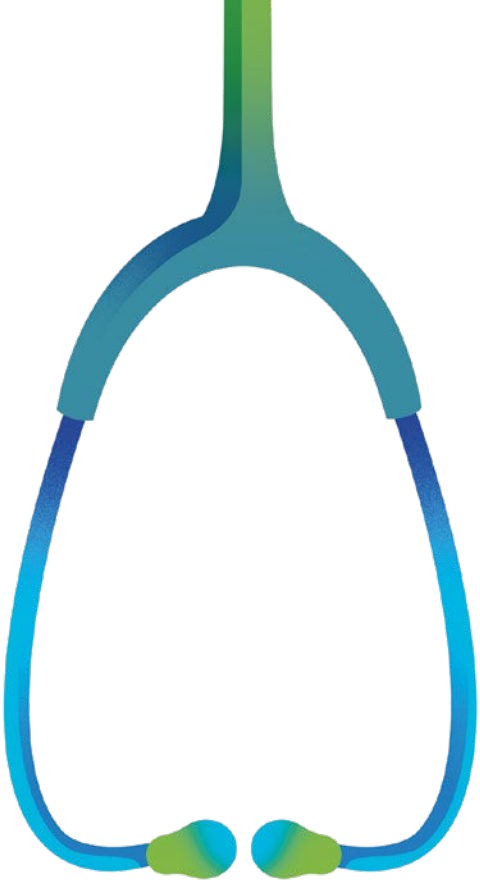


PHOTO: UNIVERSITY OF PITTSBURGH/ HEVOLUTION



→ LONGER, BRIGHTER FUTURES

The path to achieving that goal involves developing better ways to measure aging, validating these measures in clinical trials, and ultimately developing products that not only treat age-related conditions, but also impact the underlying biological process of aging itself.

Khan draws a parallel with the development of statins for heart disease. Initially, these drugs were only given to people who had already suffered a heart attack. But as their efficacy was proven, they began to be prescribed preventatively. Hevolution aims to follow a similar trajectory in aging research, moving from treating conditions to treating patients before they develop age-related diseases.

Hevolution's impact is already being felt across the scientific community and beyond. By bringing together diverse thinkers, funding cutting-edge research, and maintaining a focus on ethical considerations, the organization is poised to play a pivotal role in shaping how we approach aging in the coming decades. "Science is global as a discipline, just like health, but the funding of science has not been global," says Khan. "And health is not something that should divide humans."

PHOTO: FII; ILLUSTRATION: OLLIE HIRST



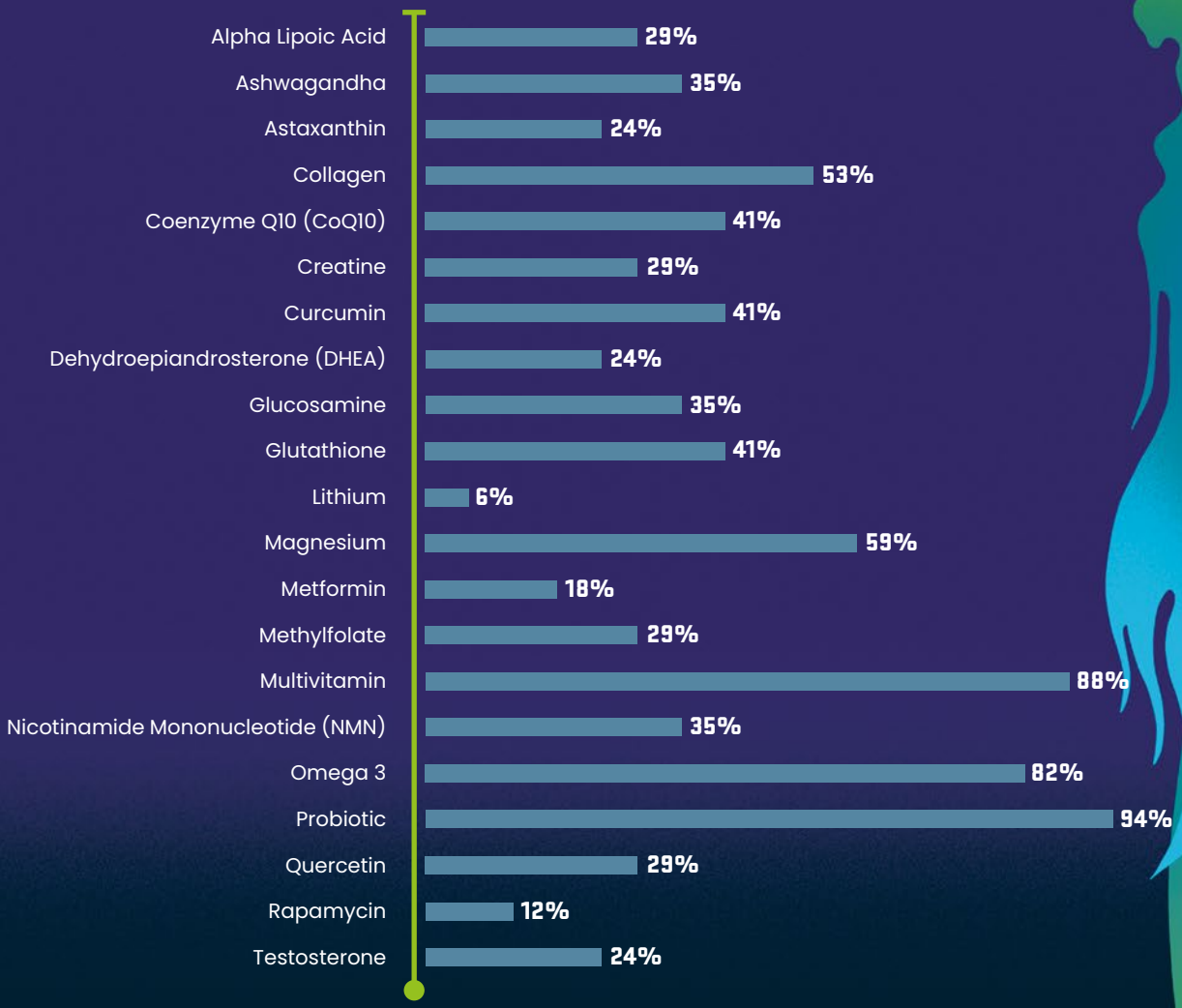
DR. MEHMOOD KHAN

Dr. Mehmood Khan is CEO of Hevolution. His distinguished career has included several senior corporate roles, including Vice Chairman and Chief Scientific Officer of Global Research and Development at PepsiCo, and President of Global R&D at Takeda Pharmaceuticals. Before moving into the private sector Dr. Khan was a faculty member in endocrinology at the Mayo Clinic and Medical School, where he served as Director of the Diabetes, Endocrine and Nutritional Trials Unit.

WE ASK: WHAT'S YOUR REGIMEN?

We asked members of the FII community to share their longevity health habits with us, including which supplements and biohacking techniques they choose to use in their day-to-day lives. Participants were given a survey and asked to provide yes/no answers as to whether they took or did a certain thing. The answers here are aggregated.

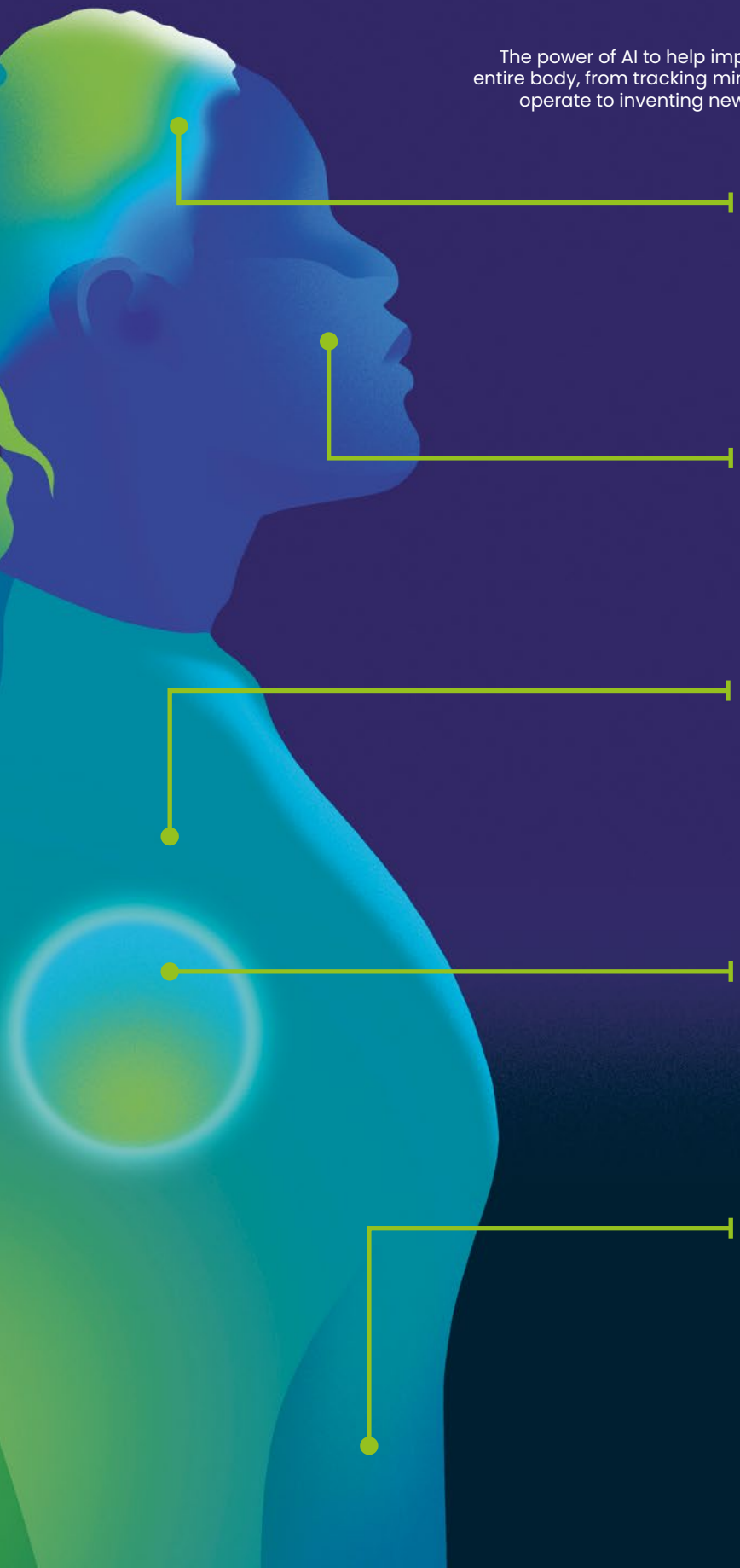
WHICH OF THE FOLLOWING SUPPLEMENTS OR MEDICATIONS DO YOU REGULARLY CONSUME?



IN WHICH OF THESE ACTIVITIES DO YOU REGULARLY PARTAKE?



ILLUSTRATION: OLLIE HIRST



HEAD, SHOULDERS, KNEES AND TOES

The power of AI to help improve longevity and healthspan can be felt across the entire body, from tracking minute changes in how our internal organs and systems operate to inventing new drugs that can tackle the causes of aging at source.

BRAIN HEALTH

AI can help in the early detection and treatment of diseases like Alzheimer's and Parkinson's by analyzing brain scans, speech patterns and cognitive function. The tech can also be used to develop drugs that can slow cognitive decline.

SKIN HEALTH

Computer vision models powered by AI can identify malign and innocuous tumors or spots on the skin and distinguish between them, helping prevent one of the most common forms of cancer worldwide.

CARDIOVASCULAR SUPPORT

AI models can analyze heart rate, blood pressure, and other biomarkers to predict and detect cardiovascular diseases such as hypertension, arrhythmia or heart attacks early. Combined with the power of big data through wearable devices, early interventions can be designed.

CELLULAR HEALTH

AI can analyze genetic and epigenetic data to identify the molecular mechanisms of aging and suggest ways to slow down biological aging – while also identifying senescent cells in the body and designing therapies to rejuvenate them.

METABOLIC SYSTEM

Monitoring glucose levels, predicting insulin needs, and suggesting personalized diets is all made easier with AI in combination with the help of tech like continuous glucose monitors, helping manage conditions like diabetes, which can shorten lifespan if not controlled.

THE GLOBAL DIVIDE IN LONGEVITY

How long you live depends on where you live – so any innovations in longevity need to make up the GDP divide, as well as help Individuals.

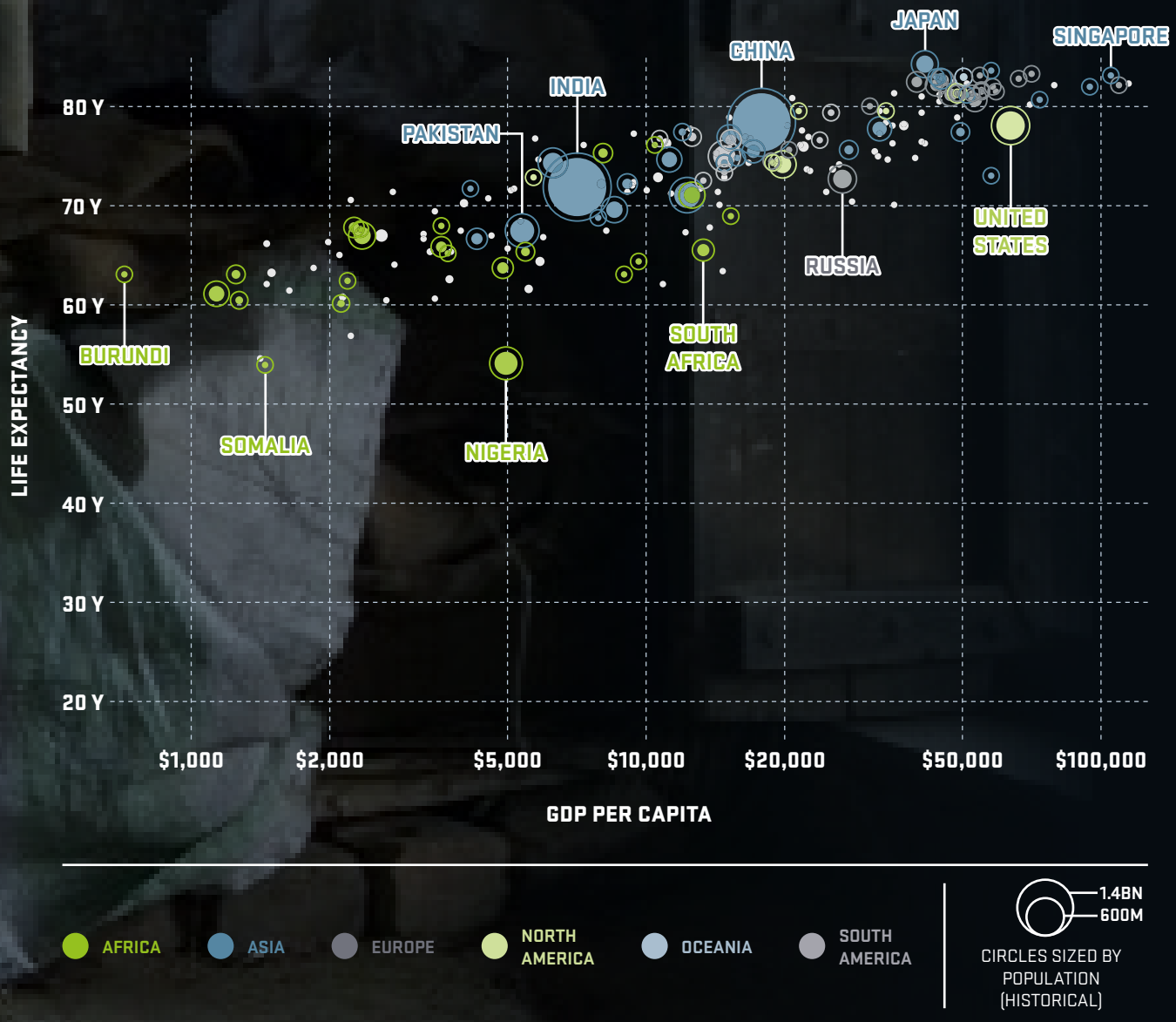


PHOTO: AMY TOENSING/GETTY IMAGES

Soon, the power of technology could bring more granular health details to individuals, wherever they are in the world.

LIFE EXPECTANCY VS. GDP PER CAPITA, 2022

The period life expectancy[1] at birth, in a given year. GDP per capita is measured in 2017 international dollars, which adjusts for inflation and cross-country price differences.



[1]Period life expectancy: Period life expectancy is a metric that summarizes death rates across all age groups in one particular year. For a given year, it represents the average lifespan for a hypothetical group of people, if they experienced the same age-specific death rates throughout their whole lives as the age-specific death rates seen in that particular year.

DATA SOURCE: UN, WORLD POPULATION PROSPECTS (2024); WORLD BANK (2023)

TAKEAWAYS

Key questions to answer when thinking about tackling the challenge of longevity – and how AI and tech can help.

TRYING TO LIVE LONGER, HEALTHIER lives has been the pursuit of humanity for millennia. But actually making it happen is within our grasp for the first time as a practical reality.

But as we've explained throughout this report, there are challenges that come alongside the opportunities. To get this potentially transformative change correct requires asking the right questions – and considering the best answers.

WHAT CAN YOU DO?

1. Don't wait for the tech. Make meaningful changes to your life and habits now to ensure you're as healthy as possible.
2. Support innovation. Ensuring a positive regulatory environment, in which development can take place with little disruption, is vital.
3. Share excellence equally. Big changes are coming, but to improve economies and livelihoods, it's vital the impacts are felt in the Global North and South.
4. Consider all options. AI will help in a number of areas, from drug discovery to providing personalized health advice.
5. Generate data. The true innovation of AI is in its ability to rifle through vast sums of disorganized data – and by creating that content, you can help unlock things.

ILLUSTRATION: OLLIE HIRST

WHAT DO YOU NEED TO BE AWARE OF?

1. Recognize extending lifespans is a global issue, but some countries are starting from a lower baseline.
2. Acknowledge that increases in lifespan and healthspan could have knock-on effects on the wider economy and social systems.
3. Caution is needed at the same time as excitement. Humanity has thought it has cheated ageing before – and turned out to be wrong.
4. Innovations in tech cannot undo the harm humanity can do to its own bodies, so healthy living requires human input, too.
5. Cross-border and cross-sector collaboration is the quickest way to achieve our goals – to the benefit of all.

ILLUSTRATION: OLLIE HIRST

FINDING SOLUTIONS

These are just some of the takeaways from this report. But at FII8 in Riyadh, the FII community will be convened to discuss how we can bring about a longer-lived future by harnessing AI. Join us in person or online for special sessions focused on longevity and healthspan.



HOW AI CAN IMPROVE LONGEVITY

IF THE LAST TWO YEARS HAS shown us one thing, it's the transformative power of AI. The AI wonder tool is also emerging as a powerful tool in the quest to extend human lifespan. Its uncanny ability to analyze vast datasets and identify patterns to accelerate breakthroughs in longevity science make it well-placed to help with many areas.

In drug discovery, AI algorithms can rapidly screen millions of compounds to identify potential anti-aging therapies. What once took years can now be completed in months, and without the expense and struggles of repeated human trials.

AI is also being deployed to parse genetic data and identify longevity-associated genes to discover why some people live longer lives and some people live shorter ones. Sifting through complex genomic information to identify those genetic variants could soon lead to personalized interventions tailored to an individual's genetic profile.

And AI-powered wearables and health monitoring devices are perfect bedfellows. One produces vast volumes of data. The other is a data-munching monster, able to pick out patterns that humans would struggle to identify. Machine learning algorithms can analyze information to detect early signs of age-related diseases and recommend preventive measures.

But there are questions, too. Questions about equitable access to life-extending technologies and the societal implications of dramatically increased lifespans – as well as about the impacts of us all living longer – remain to be addressed.

THE FII INSTITUTE

is guided in all it does by a strong purpose, vision and mission.

PURPOSE
"Enabling a brighter future for humanity"

VISION
"Bringing together the brightest minds and most promising solutions to serve humanity"

MISSION
"Creating a purposeful present, promising future"

PHOTO: ADOBE STOCK

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FII-I has three pillars to deliver its mission: THINK, ACT and XCHANGE

1 FII-I THINK
Identify societal challenges and current inhibitors. Curate the brightest ideas to address societal issues

2 FII-I ACT
Catalyze innovation and initiatives by mobilizing partners and resources

3 FII-I XCHANGE
Create platforms for live discussions on the future of humanity. Share knowledge, stories and publications with different stakeholders

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