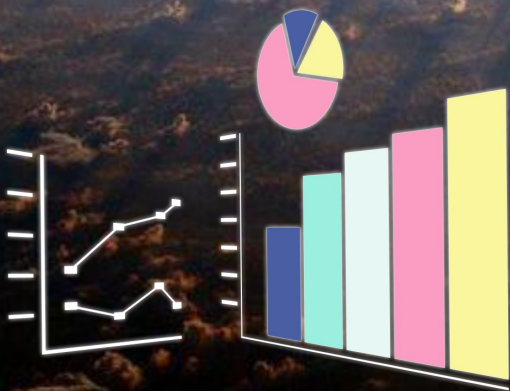


# Longevity Industry Landscape Overview 2019

The Science of Longevity  
The Business of Longevity



100+ Page  
Infographic Summary





# Contents

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Aging Analytics Agency: Scope, History and Agenda for 2019

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Longevity Journalism & Media Landscape

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Investing in Longevity: Series of Thematic Specialized Conferences

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Top Longevity Influencers, Conferences, Books, Journals, Etc.

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Intersection of AI in Drug Discovery and Longevity

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Longevity and Convergence of Technological Megatrends

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P3 Medicine (Personalised, Precision, Preventive)

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Longevity & Advancing Financial Industry

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**Aging Analytics Agency:  
Scope, History and  
Agenda for 2019**

The background of the slide features a blue gradient with various data visualization elements. In the top left, there is a stylized brain with circuit-like patterns. In the center, an hourglass is visible. In the bottom left, there is a pie chart and a bar chart. In the bottom right, there is a stylized globe or network diagram. The text is centered in a white, bold, sans-serif font, enclosed in a white rectangular frame with yellow corner accents.



# Executive Summary

*“With some longer term, moonshot thinking around healthcare and biotechnology, I believe we can improve millions of lives” – Larry Page, CEO of Google.*

*“Death never made any sense to me.” – Larry Ellison, Founder of Oracle.*

*“There will come an age when our average life expectancy will reach 200 years.” – Masayoshi Son, CEO of SoftBank and Vision Fund.*

*“Aging is the ultimate evil. To invest in Anti-Aging technologies is the most ethical business, and to donate to longevity research is the most effective form of altruism.” – Dmitry Kaminskiy, Deep Knowledge Ventures.*

*“Longevity is a blessing. And as an investor, it provides you opportunities to benefit from compounding and to have a longer investment horizon. But if you don’t prepare for it, you are left with two options: Work longer in life, perhaps much longer than you’d like, or hope you’ve been good to your children and that they’ll be willing to care for you in your old age. And, second, I hope you’ll speak out. Longevity is an issue of social justice that will have a more profound impact on your generation than on any generation before. If we don’t start to address it – not just in this country but globally – we’re going to see fewer job prospects for young people, higher unemployment, lower growth and many older people – maybe your parents – left without the means to support themselves.” – Larry Fink, Chairman of Blackrock Capital.*

*“The way we prioritize projects at Insilico Medicine is by looking at the number of quality-adjusted life years (QALY) each project can generate. It is the most altruistic cause and the most effective investment. If you add just one year of life to everyone on the planet, you generate over 7 billion QALY.” – Alex Zhavoronkov, Chief Science Officer of the Biogerontology Research Foundation.*

*“The future of the longevity industry not only has the logical potential to become the wealthiest industry in all of history, but also represents the most ethical way of doing business.” – Dmitry Kaminskiy, Deep Knowledge Ventures.*

## Establishing a Framework for the Longevity industry

At present, there is no consensus on which of the various technologies touched upon in these documents falls under the umbrella of ‘gerontology’, and the more clearly defined terms such as ‘**P3 medicine**’ have not been traditionally been associated with geroscience in general. We propose that they should be classified together, given their increasing relevance to extending healthy longevity. The 4 subdivisions of the industry that we propose are **Geroscience, P3 medicine, AgeTech** and **Novel Financial System**.

**Geroscience** (the science of aging) describes all areas of research and technology that directly recognize and address the issues of the ageing process. This includes both basic research into the biology of aging, as well as interventions designed to directly address the hallmarks of aging, and by virtue thereof the majority of chronic diseases that stem from the root causes of aging. **P3 medicine** describes the shift in medicine towards precision, personalisation and preventive rather than reactionary treatment. This report argues that it should be classified as cornerstone of the Longevity industry due to its focus on preventive treatment and maintenance of health via early diagnostics and the application of interventions as early as possible. **AgeTech** includes all non-biomedical technologies which help to preserve the quality of life, wellbeing and functional capacities of elderly demographics. While not traditionally considered as a part of the Longevity industry, this report argues that it is one of the industry’s main four pillars because it can help preserve function and wellbeing up to the point where more advanced therapies reach practical application in the clinic. Chapter 7 of the report considers the creation of a **Novel Financial System** to simultaneously avoid economic stagnation in the face of demographic aging, while creating an infrastructure whereby governments and financial institutions can reap gains from maximizing not just population lifespan, but healthspan as well. Given the significant impact that societal ageing and Longevity have upon economies, pension funds and insurance companies have the potential to tie financial performance to quantitative measures of healthy longevity like HALY (health-adjusted life years) and QALY (quality-adjusted life years) in order to help economies thrive due to an increase in its citizens healthy longevity.

The Longevity report, the first of its kind, outlines the vast and multifarious Longevity industry, and formulates a preliminary foundation for classifying and systematizing the various strands of the industry into one coherent landscape, and establishing a standardized framework to unite the fragmented stakeholders of the industry, and to provide better tools and leverages for analyzing the vast and complex landscape of this emerging Longevity mega-industry.

## GEROSCIENCE R&D

Rejuvenation  
Biotechnology

Gene Therapy

Geroprotectors

Regenerative Medicine

Nutraceuticals

Basic Research on  
Biology of Aging

## P3 MEDICINE

Personalized Diagnostics

Personalized Biomarker  
Analysis

Personalized Prognostics

Personalized in vivo & in  
silico drug testing

Personalized QALY &  
HALE Estimation

Preventive Therapies

## AGETECH

Novel Retirement Plans

Cognitive Enhancement

FinTech for the Elderly

NextGen Mobile Apps for  
the Elderly

Continuing Education

Entertainment for the  
Elderly

## NOVEL FINANCIAL SYSTEM

Longevity Index Fund

Longevity Hedge Fund

Longevity Stock  
Exchange

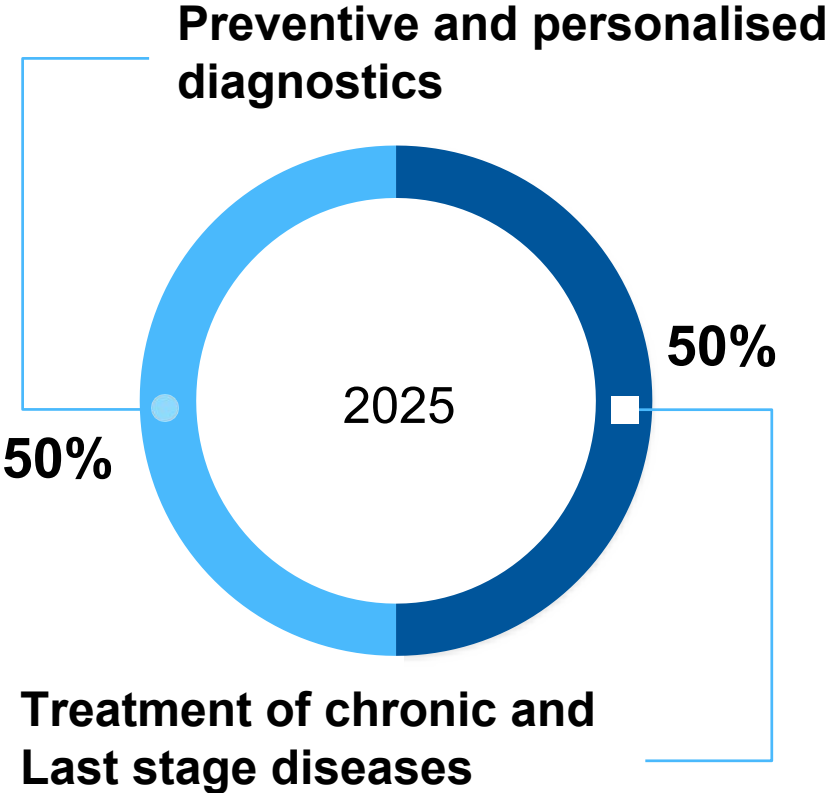
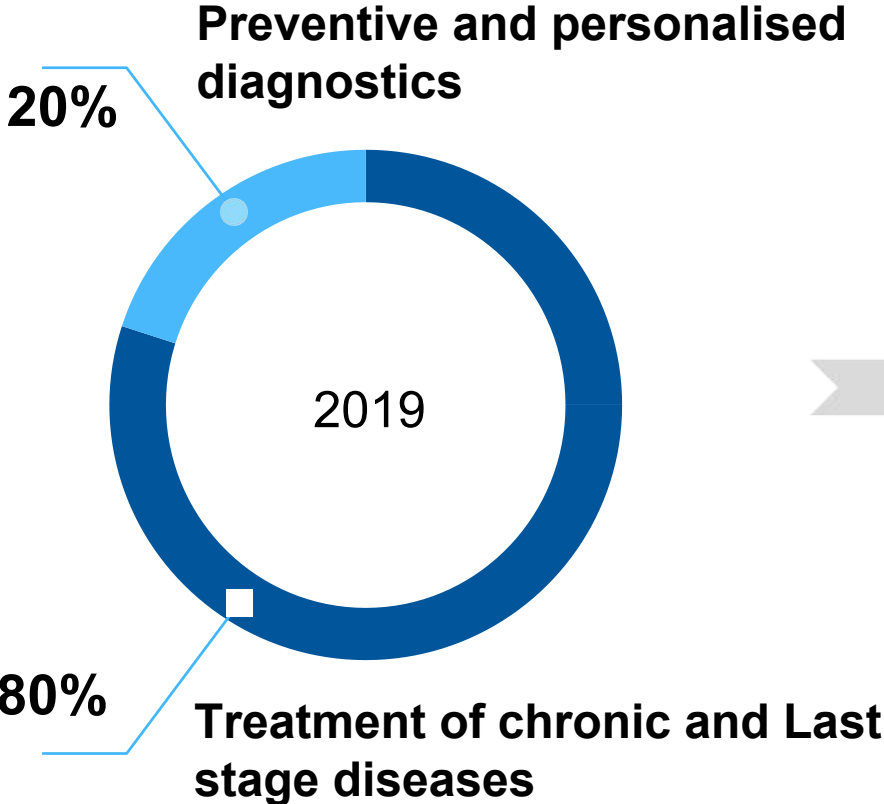
AgeTech Bank

Longevity Derivatives

Longevity Trust



# Paradigm Shift from Treatment to Prevention



# THE BUSINESS of LONGEVITY GLOBAL INDUSTRY LANDSCAPE 2018

## Geroscience

## P3 Medicine

# THE BUSINESS OF LONGEVITY

- COMPANIES
- INVESTORS
- SCIENCE HUBS



## Top 10 Longevity Companies

## Top 10 Longevity Investors

## Top 5 Countries

AGING ANALYTICS AGENCY

DEEP KNOWLEDGE ANALYTICS

LONGEVITY INTERNATIONAL

UK

Switzerland

US

Kazakhstan

Israel



# THE SCIENCE of LONGEVITY GLOBAL LANDSCAPE 2018

# THE SCIENCE OF LONGEVITY

- Science Labs
- Non-Profit
- Geroscience Hubs



## Top 10 Geroscience Books



## Top 10 Geroscience Journals



## United Kingdom

## Top 10 Online Resources



## Top 10 Geroscience Conferences



## Other



# AGING ANALYTICS AGENCY



The World's Premier Longevity Analytics Company

## Aging Analytics Agency Predicted the Rise of the Longevity Industry 3 Years in Advance

We are the only specialized analytics agency in the world that focuses exclusively on the emerging Longevity Industry, and has come to be recognized internationally as the premier analytics agency for advanced data analysis, industry reports and next-generation infographics on the topics of Aging and Longevity.

*Now 5 years old, our agency has been on the frontlines of Longevity Analytics since the beginning of the industry.*



Dmitry Kaminskiy, co-founder of Aging Analytics Agency, boldly predicted in 2014 that the Longevity Industry would see an inflection point in its development in 2017, becoming a legitimate industry in the eyes of conservative investors, business analysts and top business media. This was at a time when investors and geoscientists alike were highly skeptical of the industry's emergence within the next decade.

This prediction turned out to be true. 2017 witnessed an unprecedented rise in the number of Longevity-focused companies and investment deals, the emergence of half a dozen geroscience-focused VC firms, and widespread coverage of Longevity as a topic by mainstream media including The Economist, Financial Times and Bloomberg.

## Uniquely Positioned to Provide World-Class Longevity Analytics Services

Our agency not only forecasted the true dawn of the Longevity Industry years before its mainstream acceptance, but was willing to stake our very reputation on a bold yet precise prediction when no one else saw it coming. Our confidence stems from our reliance on tangible and quantitative predictive metrics, including the use of cross-disciplinary and synergetic analytical tools and frameworks to tame the enormous diversity and complexity of the Longevity Industry.

Today, the fruits of our labor are present in the exponential growth of Longevity as a topic in the mainstream, including its acceptance by business experts, media and even governments. The UK, for example, has listed Aging Population as one of their four grand challenges and launched a government-backed Healthy Aging Industrial Strategy Challenge Fund, and other governments have launched similar strategic national development plans devoted to Longevity. Leading media brands, including TIME, Forbes, Bloomberg and others regularly run Longevity-oriented cover stories. High-profile conferences on the subject of Longevity are more numerous than ever before.

We have been involved in charting the rise of the Longevity sphere since its very beginning and remained at the forefront throughout the past half decade. Thus, we are uniquely positioned to produce both broadly-accessible reports and specialized case studies for specific clientele including companies, investment firms, family offices and government agencies.



# Aging Analytics Agency Reports: 2013 - 2015

## Specialized Longevity Industry Reports

Organ	Cell	Stem	Protein	Gene	Small Molecule	Large Molecule	Gene Therapy	Cell Therapy	Gene Editing	CRISPR	Protein and Antisense	Small Molecule
Brain	Neuron	Stem Cell	Protein	Gene	Small Molecule	Large Molecule	Gene Therapy	Cell Therapy	Gene Editing	CRISPR	Protein and Antisense	Small Molecule
Heart	Cardiomyocyte	Stem Cell	Protein	Gene	Small Molecule	Large Molecule	Gene Therapy	Cell Therapy	Gene Editing	CRISPR	Protein and Antisense	Small Molecule
Liver	Hepatocyte	Stem Cell	Protein	Gene	Small Molecule	Large Molecule	Gene Therapy	Cell Therapy	Gene Editing	CRISPR	Protein and Antisense	Small Molecule
Stomach	Gastric Cell	Stem Cell	Protein	Gene	Small Molecule	Large Molecule	Gene Therapy	Cell Therapy	Gene Editing	CRISPR	Protein and Antisense	Small Molecule
Intestine	Enterocyte	Stem Cell	Protein	Gene	Small Molecule	Large Molecule	Gene Therapy	Cell Therapy	Gene Editing	CRISPR	Protein and Antisense	Small Molecule
Bladder	Urothelial Cell	Stem Cell	Protein	Gene	Small Molecule	Large Molecule	Gene Therapy	Cell Therapy	Gene Editing	CRISPR	Protein and Antisense	Small Molecule
Uterus	Endometrial Cell	Stem Cell	Protein	Gene	Small Molecule	Large Molecule	Gene Therapy	Cell Therapy	Gene Editing	CRISPR	Protein and Antisense	Small Molecule
Testis	Sperm Cell	Stem Cell	Protein	Gene	Small Molecule	Large Molecule	Gene Therapy	Cell Therapy	Gene Editing	CRISPR	Protein and Antisense	Small Molecule
Ovary	Oocyte	Stem Cell	Protein	Gene	Small Molecule	Large Molecule	Gene Therapy	Cell Therapy	Gene Editing	CRISPR	Protein and Antisense	Small Molecule
Adipose	Adipocyte	Stem Cell	Protein	Gene	Small Molecule	Large Molecule	Gene Therapy	Cell Therapy	Gene Editing	CRISPR	Protein and Antisense	Small Molecule
Muscle	Myocyte	Stem Cell	Protein	Gene	Small Molecule	Large Molecule	Gene Therapy	Cell Therapy	Gene Editing	CRISPR	Protein and Antisense	Small Molecule
Bone	Osteocyte	Stem Cell	Protein	Gene	Small Molecule	Large Molecule	Gene Therapy	Cell Therapy	Gene Editing	CRISPR	Protein and Antisense	Small Molecule
Cartilage	Chondrocyte	Stem Cell	Protein	Gene	Small Molecule	Large Molecule	Gene Therapy	Cell Therapy	Gene Editing	CRISPR	Protein and Antisense	Small Molecule
Skin	Keratinocyte	Stem Cell	Protein	Gene	Small Molecule	Large Molecule	Gene Therapy	Cell Therapy	Gene Editing	CRISPR	Protein and Antisense	Small Molecule
Hair	Hair Cell	Stem Cell	Protein	Gene	Small Molecule	Large Molecule	Gene Therapy	Cell Therapy	Gene Editing	CRISPR	Protein and Antisense	Small Molecule
Nerve	Neuron	Stem Cell	Protein	Gene	Small Molecule	Large Molecule	Gene Therapy	Cell Therapy	Gene Editing	CRISPR	Protein and Antisense	Small Molecule
Immune	Immune Cell	Stem Cell	Protein	Gene	Small Molecule	Large Molecule	Gene Therapy	Cell Therapy	Gene Editing	CRISPR	Protein and Antisense	Small Molecule
Stem Cell	Stem Cell	Stem Cell	Protein	Gene	Small Molecule	Large Molecule	Gene Therapy	Cell Therapy	Gene Editing	CRISPR	Protein and Antisense	Small Molecule

**Analytical Regenerative Medicine Industry Framework**

2013

**Investing in Regenerative Medicine: Technology Analysis and Market Outlook**  
2014 Report #1

AGING ANALYTICS AGENCY  
leave it for life

LRMN

ISBN # 978-0-9912902-1-5  
May 2014

2014

Commercializing Aging Research Series

Industry Overview

**BIG DATA IN AGING AND AGE-RELATED DISEASES**

AGING ANALYTICS AGENCY  
leave it for life

aginganalytics.com

Biogerontology  
research foundation  
bg-rf.org.uk

VITAL  
biotech.ai

2015

# Aging Analytics Agency Reports 2017 - 2018



**Longevity Industry Landscape Overview 2018**



**Longevity Industry Landscape Overview 2018 Volume I**



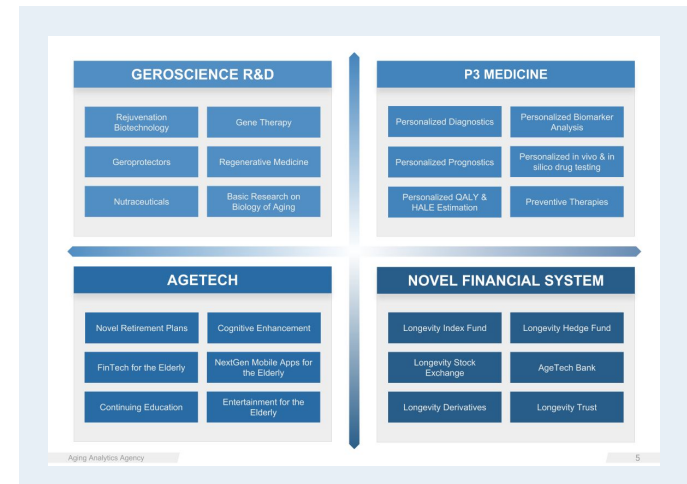
**Longevity Industry Landscape Overview 2018 Volume II**



**Longevity Industry in UK Landscape Overview 2018**



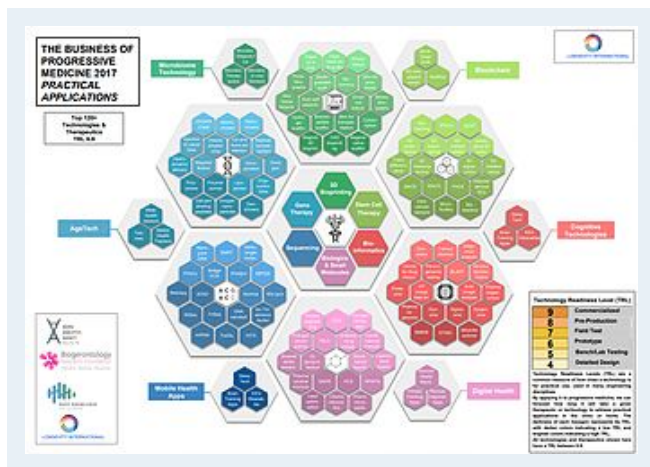
**AI for Drug Discovery Landscape Overview Q2/2018**



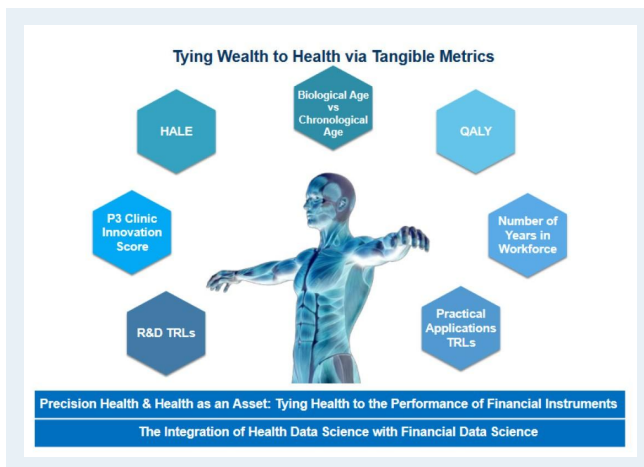
**Longevity Industry Classification Framework**



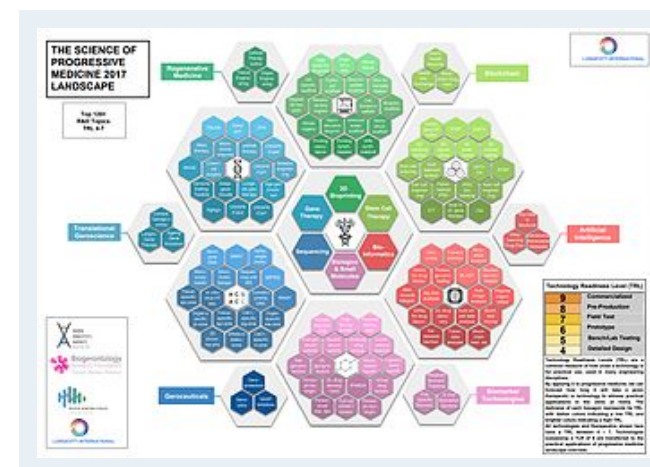
# Aging Analytics Agency Industry Intelligence: Big Data Meets Advanced Infographics



The Business of Progressive Medicine 2018



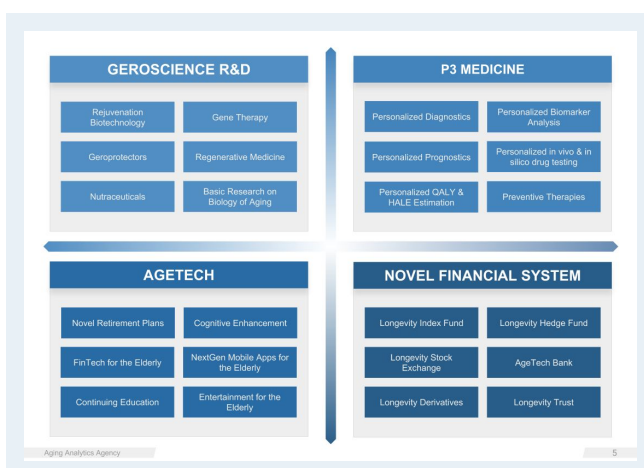
The Optimal P3 Medicine Clinic Pipeline



The Science of Progressive Medicine 2018



Global Longevity Industry Landscape 2018



Longevity Industry Classification Framework



Longevity Science Global Landscape 2018

# Longevity Industry in UK Landscape Q4 2018

Companies - 260  
Investors - 250  
Non-Profits - 10  
Research Labs - 10

Personalized Medicine

AgeTech

Investors  
Companies  
Non-Profits

Research Labs



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**DEEP KNOWLEDGE ANALYTICS**

**Longevityuk**

**Biogerontology Research Foundation**  
Prevent. Restore. Preserve.

# Longevity Industry Reports Q1 2019: UK, Israel, Singapore



## Longevity Industry in Israel

### Longevity industry, profiling:

- 160 Longevity companies;
- 180 Longevity investors;
- 10 Longevity non-profit organizations;
- 60 Longevity influencers in Israel;
- 10 Longevity university labs and research labs;
- 10 Longevity conferences.



## Longevity in Singapore

### Longevity industry, profiling:

- 100 Longevity companies;
- 80 Longevity investors;
- 10 Longevity Non-Governmental organizations;
- 30 Longevity influencers in Singapore;
- 15 Longevity R&D centers;
- 15 Longevity conferences.



## Longevity in UK

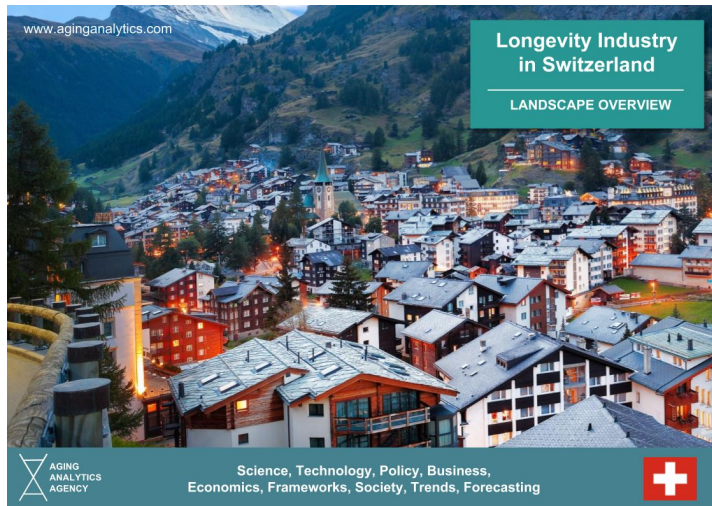
### Longevity industry, profiling:

- 260 Longevity companies;
- 250 Longevity investors;
- 50 Longevity articles published by UK geroscientists;
- 50 Longevity books published by UK geroscientists;
- 25 Longevity scientific journals published by UK geroscientists;
- 50 Longevity non-profit organizations;
- 55 Longevity influencers in the UK;
- 25 Longevity university labs and research labs.





# Aging Analytics Agency: Upcoming Open-Access Reports Q2-Q3 2019



Longevity Industry in Switzerland



Longevity Industry in Japan

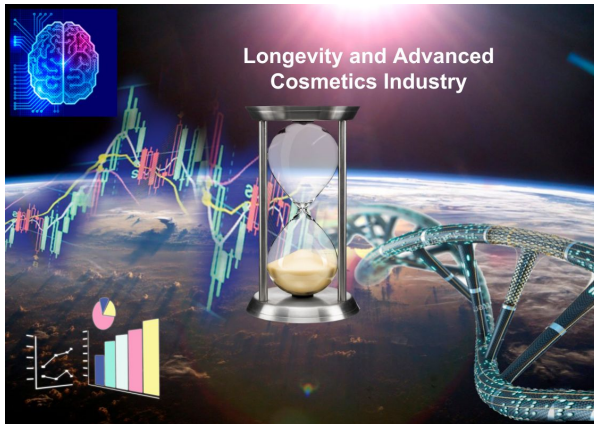


Longevity Industry in Hong Kong



Longevity Industry in California

# Aging Analytics Agency: Upcoming Q2-Q3 2019



Longevity and Advanced Cosmetics Industry



Precision Medicine Clinics Landscape Overview



Advancing Financial Industry AgeTech / WealthTech / Longevity



Longevity Industry and Microbiome



Global Longevity Industry Landscape Overview Second Edition

GEROSCIENCE R&D		P3 MEDICINE	
Rejuvenation Biotechnology	Gene Therapy	Personalized Diagnostics	Personalized Biomarker Analysis
Geroprotectors	Regenerative Medicine	Personalized Prognostics	Personalized in vivo & in silico drug testing
Nutraceuticals	Basic Research on Biology of Aging	Personalized QALY & HALE Estimation	Preventive Therapies
AGETECH		NOVEL FINANCIAL SYSTEM	
Novel Retirement Plans	Cognitive Enhancement	Longevity Index Fund	Longevity Hedge Fund
FinTech for the Elderly	NextGen Mobile Apps for the Elderly	Longevity Stock Exchange	AgeTech Bank
Continuing Education	Entertainment for the Elderly	Longevity Derivatives	Longevity Trust

Proprietary Longevity Industry Analytics: Comparative Classification Framework

# Longevity Industry in Singapore Landscape 2019

Companies - 100  
Investors - 80  
Non-governmental organisations - 10  
Research Centres - 15

## Personalized Medicine

## AgeTech

## Progressive clinics

## Research Labs

## Preventive Medicine

## Progressive wellness

## Regenerative Medicine

### Companies

### Investors

### Non-Profits



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100 Companies

Drug Discovery

AgeTech

Other

Progressive Wellness

Longevity Industry in Singapore 2019

Stem cells/ Regenerative

Progressive Clinics

Neurological

Diagnostics

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DEEP KNOWLEDGE ANALYTICS

LONGEVITY INTERNATIONAL

# Longevity Industry in Israel Landscape 2019

Companies - 160  
Investors - 180  
Non-Profits - 10  
R&D Centers - 10

## Personalized Medicine



Investors

Companies

Non-Profits

Progressive Wellness

R&D Centers

Preventive Medicine

Regenerative Medicine

AgeTech

**AGING ANALYTICS AGENCY**

**ISRAELI LONGEVITY ALLIANCE**  
ותק - התנועה לאיכות ואריכות חיים (ע"מ)  
Vetek (Seniority) - the Movement for Longevity and Quality of Life

**DEEP KNOWLEDGE ANALYTICS**

**LONGEVITY INTERNATIONAL**

# Longevity Industry in Israel 2019 - 160 COMPANIES



AGING ANALYTICS AGENCY



ISRAELI LONGEVITY ALLIANCE



התנועה לשינוי תודעת הציבור (Vetok) - the Movement for Longevity and Quality of Life

## Drug Development



## Progressive wellness



## Gene therapies



## AgeTech



## Neurotech



## Others



## Progressive R&D



## Implant & Prosthetics



## Cell therapy



## Diagnostic



## Scientifically-Validated Lifestyle Recommendation



## Prosthetics



## Nutraceuticals



## Biomarkers



## Progressive Wellness



## Gene therapy



## Research



## Regenerative Medicine



## AgeTech



## Other



260 Companies

## Microbiome



## Neurotech



# Longevity Industry in UK Q4 2018

## Personalised Medicine



## Preventive medicine



## Diagnostics



## Drug Discovery



## Geroprotectors



## Cell Therapies



## JOURNALS



## RESEARCH LABS



**Non-Profits - 50**  
**Journals - 25**  
**Research Labs - 25**  
**Conferences - 20**  
**Media entities - 10**

## MEDIA ENTITIES



**The Science  
of Longevity in UK  
Landscape Overview  
Q4 2018**

## CONFERENCES



## NON-PROFITS





# LONGEVITY LABS

## Palliative & Policy

## Direct Research

## Advanced Solutions

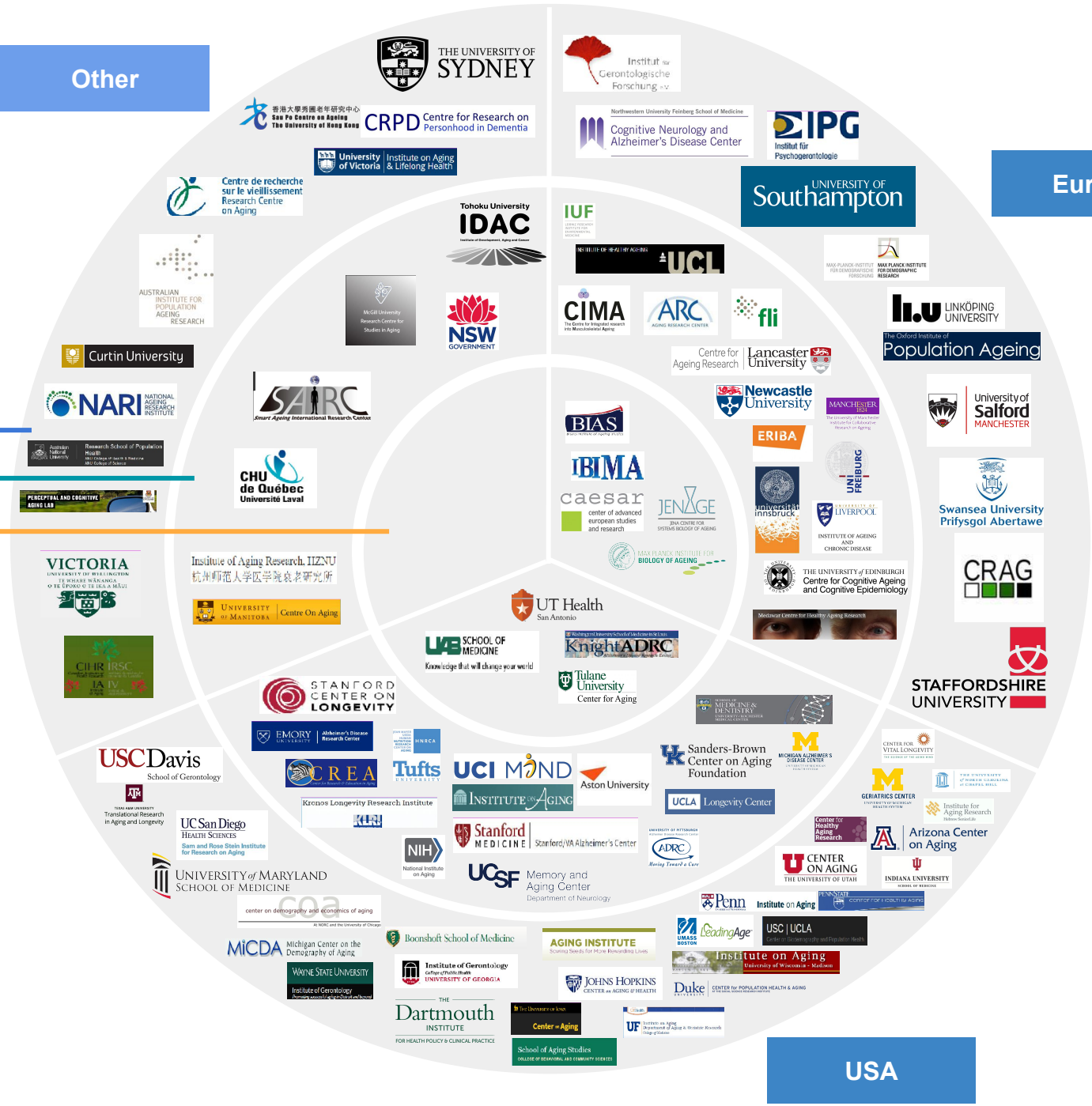
## Other

## Europe

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**DEEP KNOWLEDGE ANALYTICS**

**LONGEVITY INTERNATIONAL**



**TOP LONGEVITY  
NON-PROFITS**

- Palliative & Policy**
- Direct Research**
- Advanced Solutions**

**Other**

**Europe**

**USA**



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**DEEP KNOWLEDGE ANALYTICS**

**LONGEVITY INTERNATIONAL**

# Longevity Databases By Category

## Metadata

The Silver Book  
From the Alliance for Aging Research

OMIC TOOLS

ALZFORUM  
NETWORKING FOR A CURE

THE MICHAEL J. FOX FOUNDATION  
FOR PARKINSON'S RESEARCH

IADRP International Alzheimer's  
Disease Research Portfolio

Atlas  
Genetics - Cytogenetics  
Oncology - Haematology

## Biological Data

TMIG-2DPAGE  
Age-related Proteome Database  
TMIG Proteomics Collaboration Center  
Tokyo Metropolitan Institute of Gerontology

PhenomicDB

NIA 한국장寿연구원  
kobio Korean Bioinformatics Center  
JENAGE  
AgeFactDB

FOSWIKI

PRID

GEROPROTECTORS

Mouse Phenome Database  
at The Jackson Laboratory

DrugAge

CISBAN  
in silico

iPAD SYSTEM  
INTERNET PRIMATE AGING DATABASE

DAA  
Digital Ageing Atlas

GenAge: The Ageing Gene  
Database

GenDR

INTERNATIONAL INSTITUTE OF MOLECULAR AND CELL BIOLOGY

CTAGTCTATTGA  
CTAGTCGATTGA

## Demographic Data

DZA German Centre of Gerontology

GGP

HFD

IDL

NIA NATIONAL INSTITUTE ON AGEING

United States<sup>TM</sup>  
Census Bureau

NATIONAL ARCHIVE OF  
COMPUTERIZED  
DATA ON  
AGING

World Health Organization

EMBL-EBI

ACL Administration for Community Living  
AGing Integrated Database (AGID)

## Diseases

EBSCO Health  
NDAR

CDC AGE info  
CENTERS FOR DISEASE CONTROL AND PREVENTION

AARP<sup>®</sup>

ERA AGE 2  
European Research Area in Ageing

MRC Medical Research Council

AgingPortfolio.org  
Tracking International Progress in Aging Research

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DEEP KNOWLEDGE ANALYTICS

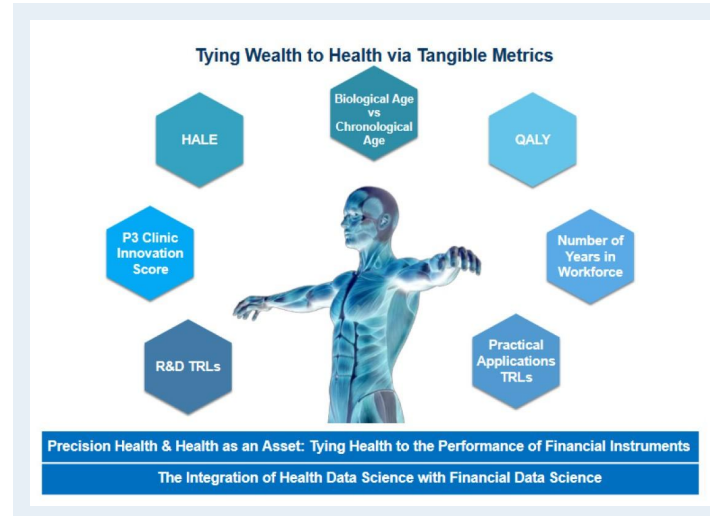
LONGEVITY INTERNATIONAL

# Technology Readiness Levels for Tangible & Quantitative Industry Forecasting

## Applying Technology Readiness Levels for Forecasting the BioTech and BioMedicine Industries



Pipeline for the Progressive Model of P3 Medicine Platform



Pipeline for the Progressive Model of P3 Medicine Platform

TRL use a ranking of 1-9, with 9 being the most mature technology. Specific levels are assigned to specific technologies by a group of relevant scientific experts. The use of TRLs provides a uniform metric, enabling consistent discussions of maturity across different types of technologies. In the coming years, TRLs can underpin efforts to shed light on the most important technologies and reveal those currently furthest away from practical applications. Therefore, TRLs enable the right timing and focus to ensure each emerging technology accomplishes its specific endpoints, and highlights the interactions that are possible between technologies.

## TRLs Give Us Advanced Capabilities for Tangible Industry Forecasts

The unique value of Aging Analytics Agency is deeply connected to our use of tangible and quantifiable metrics to perform near-future industry forecasting, giving weight and substance to the projections, insights and conclusions presented in our analytical reports. TRLs enable us to gauge the maturity of Critical Technology Elements determined during a Technology Readiness Assessment that examines program concepts, technological requirements, and demonstrated technology capabilities.

Specifically, we employ Technology Readiness Levels (TRLs), a proven quantifiable framework used in aerospace and other technological industries, to estimate the market readiness of a given technology in the Longevity, Personalized and Preventive Medicine, and Advanced Biomedicine fields. For the first time, we have established the use of TRL in the life sciences industry, creating a scientific framework that allows us to quantifiably project when a given technology will mature for practical application in the clinic.

We envision using TRLs to expedite progress by providing an objective lens through which various technologies are judged. Similar to how TRLs have benefited the aerospace industry, it can bolster the efforts of the life sciences industry in the coming five years.

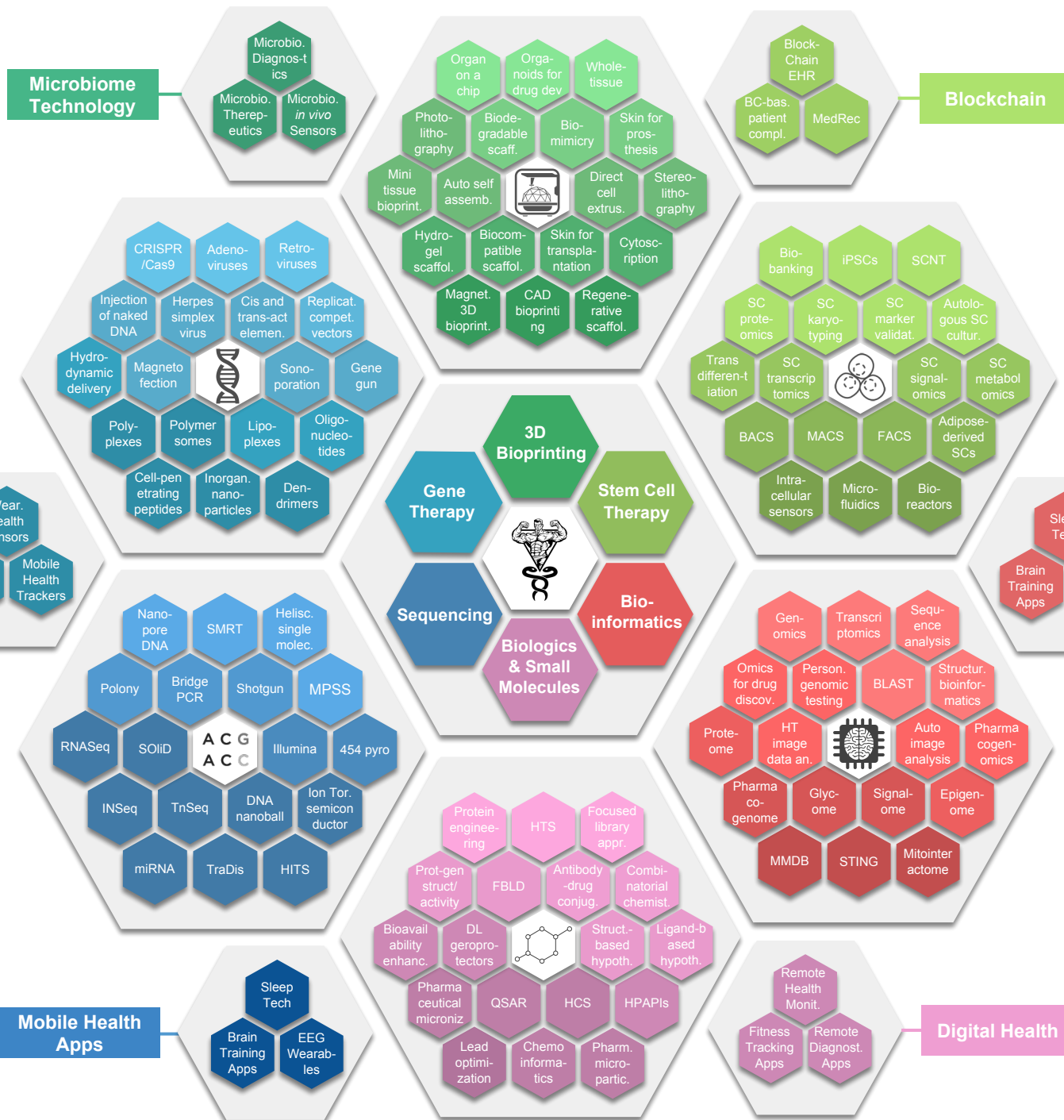
## What are TRLs, and Why are They Important?

TRLs denotes whether a given technology is ready for practical implementation in real-world products and services. In the context of the Longevity Industry, a TRL ranking measures how close a therapy, diagnostic, prognostic technology or other product is from reaching the hands of actual patients in the clinic.

The use of TRLs provides a uniform metric, enabling consistent discussions of maturity across different types of technologies. In the coming years, TRLs can underpin efforts to shed light on the most important technologies and reveal those currently furthest away from practical applications. Therefore, TRLs enable the right timing and focus to ensure each emerging technology accomplishes its specific endpoints, and highlights the interactions that are possible between technologies.

# THE BUSINESS OF PROGRESSIVE MEDICINE 2018 PRACTICAL APPLICATIONS

Top 120+ Technologies & Therapeutics TRL 8-9



## Technology Readiness Level (TRL)

9	Commercialized
8	Pre-Production
7	Field Test
6	Prototype
5	Bench/Lab Testing
4	Detailed Design

Technology Readiness Levels (TRL) are a common measure of how close a technology is for practical use, used in many engineering disciplines.

By applying it to progressive medicine, we can forecast how long it will take a given therapeutic or technology to witness practical applications in the clinic or home. The darkness of each hexagon represents its TRL, with darker colors indicating a low TRL and brighter colors indicating a high TRL. All technologies and therapeutics shown here have a TRL between 8-9.



# THE SCIENCE OF PROGRESSIVE MEDICINE 2018 LANDSCAPE

Top 120+ R&D Topics TRL 4-7

Translational Geroscience

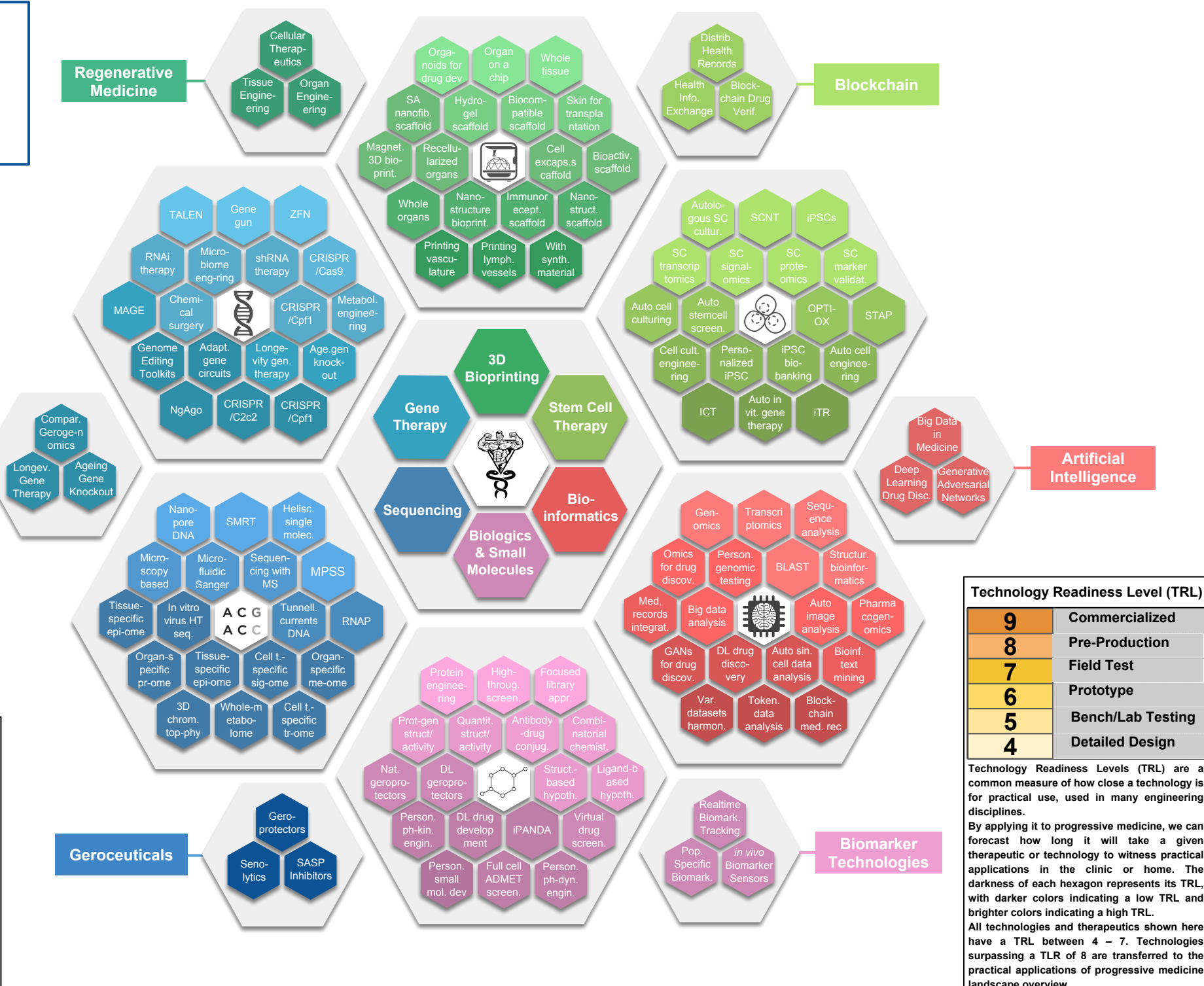
Regenerative Medicine

Blockchain

Artificial Intelligence

Biomarker Technologies

Gerocuticals



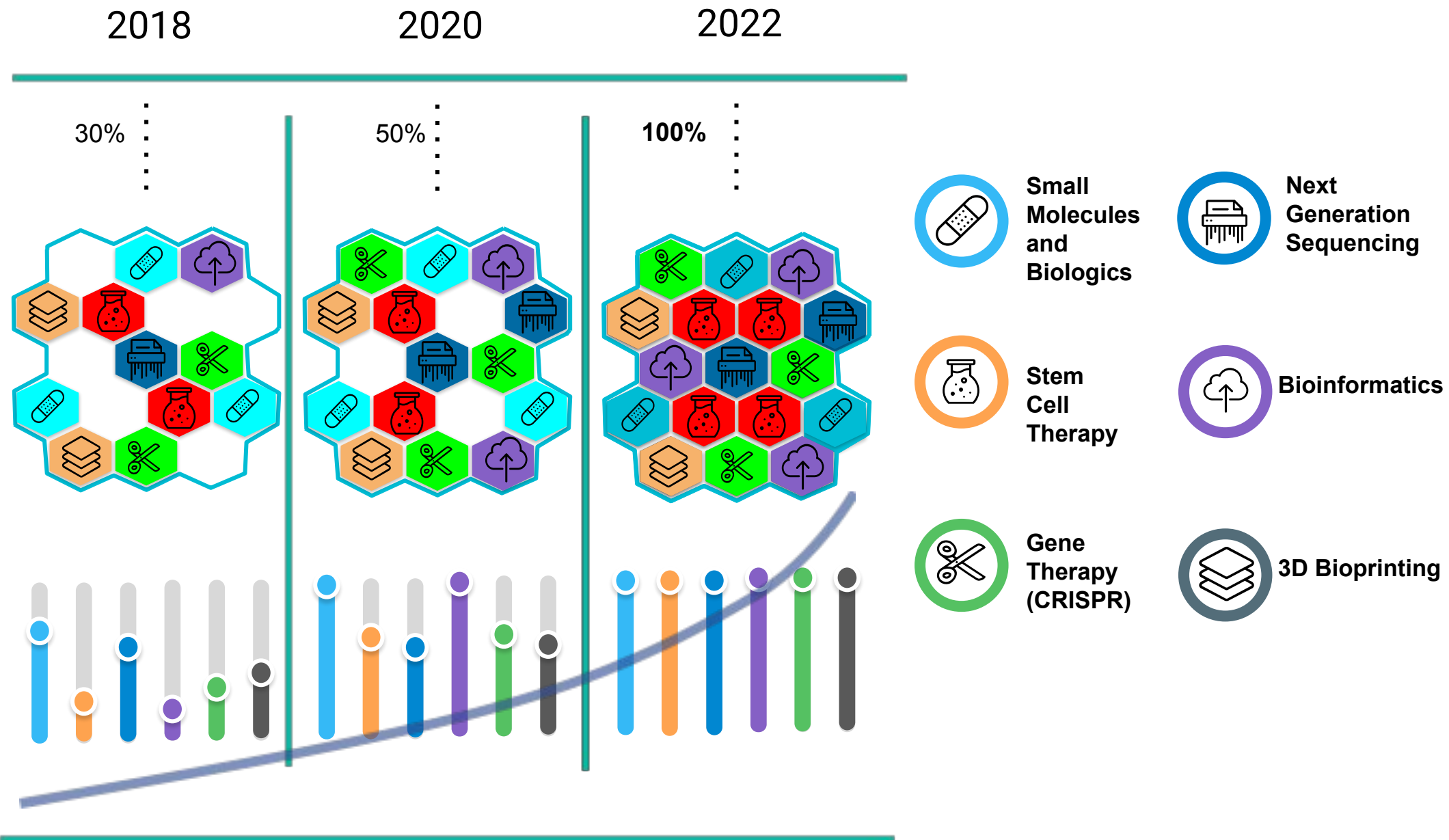
## Technology Readiness Level (TRL)

9	Commercialized
8	Pre-Production
7	Field Test
6	Prototype
5	Bench/Lab Testing
4	Detailed Design

Technology Readiness Levels (TRL) are a common measure of how close a technology is for practical use, used in many engineering disciplines. By applying it to progressive medicine, we can forecast how long it will take a given therapeutic or technology to witness practical applications in the clinic or home. The darkness of each hexagon represents its TRL, with darker colors indicating a low TRL and brighter colors indicating a high TRL. All technologies and therapeutics shown here have a TRL between 4 - 7. Technologies surpassing a TRL of 8 are transferred to the practical applications of progressive medicine landscape overview.



# Timeline for Completion of Technologies for P3 Medicine Clinic Technology Readiness Level (TRL)

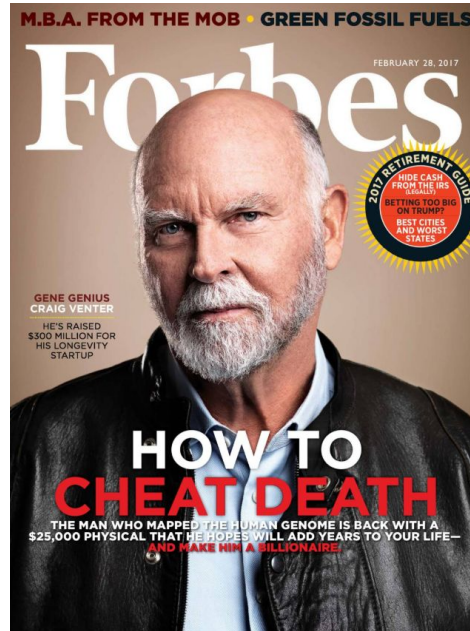
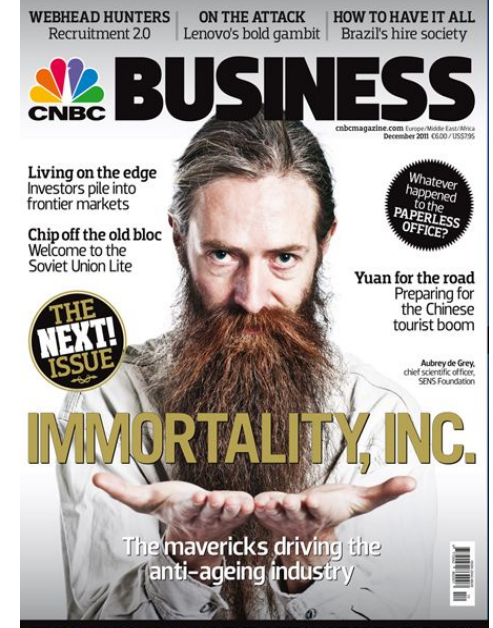
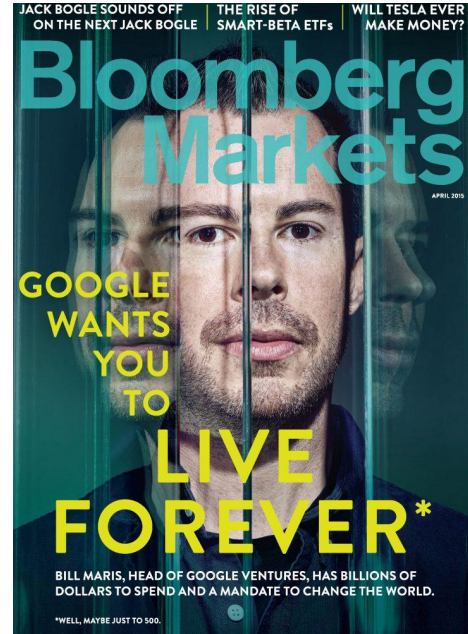
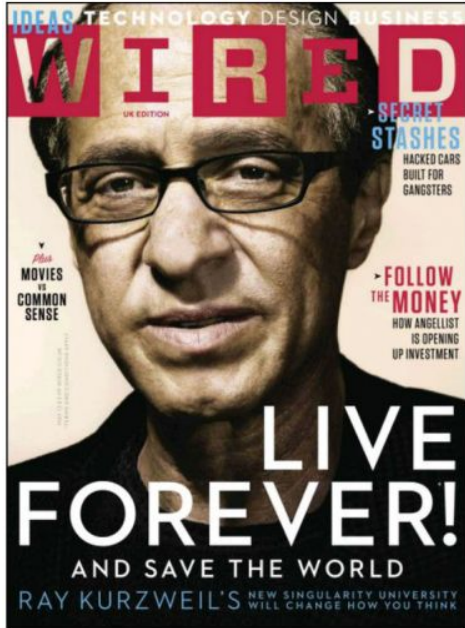






# Longevity Journalism & Media Landscape

# Top Media in Support of Longevity





# Rising Longevity Industry Megatrend

## Anti-Aging Therapies and Longevity Market: Industry Trends and Growth Opportunities Forecast 2022

The past five years witnessed a surge of interest in the topic of Longevity. In 2013 the idea of increasing the average life expectancy in developed nations to over 100 years and beyond hardly touched the mainstream zeitgeist. Today the same idea—though still exciting—has become commonplace in the eyes of the general public.

Investors, business analysts, and reputable, conservative business media brands are among those who have come to understand the credibility and feasibility of extending healthy longevity. Longevity is recognized and regularly discussed by financial entities and investment funds.

Back in 2013 TIME magazine presciently featured several cover stories highlighting Longevity at a time when it was still rather controversial. Their efforts, along those from other leading media brands, gradually created an ecosystem in which other media players felt safe to explore Longevity as a legitimate topic. As a result, advanced biomedicine and longevity is now regularly discussed in the mainstream press.

These advancements have made the topic of Longevity an obvious megatrend gaining widespread acceptance at a rapid pace.



# Leading Media Brands Publishing Articles and Launching Systematic Conferences on Longevity



Longevity and the challenges posed by an aging population are becoming increasingly **prevalent themes** at a growing number of **economic, financial and technological conferences** worldwide. These themes are also gaining increasing interest among multiple financial and governmental organizations and their clients.

Recognising a blossoming need for Longevity-oriented education, the Deep Knowledge consortium is **initiating discussions** with a number of **leading financial institutions** to foster quality **networking opportunities** between **investors** and **HNWIs** by providing optimal **format** and **agendas**, and guaranteeing **expertise** at every juncture. Our efforts at cultivating a long-term conference tradition will hopefully build a space in which a true international **Longevity business community** takes root.



Leading business media brands have embraced Longevity. **The Economist** has held several prominent events on the topic, including its 2016 Aging Societies conference in London (in which Longevity.Capital founder Dmitry Kaminskiy presented), 2017 Business of Longevity conference in Hong Kong, and 2018 Business of Longevity conference in Singapore. Longevity was further featured at the 2016 **World Economic Forum** Davos Summit, and the most recent **Financial Times** BioTech conference held a panel titled “The Business of Longevity.”

Other leading financial players, including **Julius Baer**, **Credit Suisse** and **UBC**, have recently followed suite, organising Longevity-focused conferences, forums and summits for their executives and clientele. With the Longevity sector booming we can expect this trend to grow in the near future.



# Longevity at the Landmark Conferences

## The Economist: *The Business of Longevity and Ageing Societies*



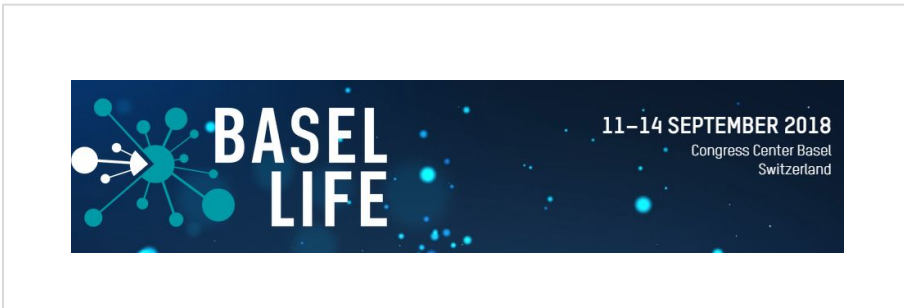
## World Economic Forum





# Leading Longevity Conferences

## Basel Life Sciences Week Aging Forum AI and Blockchain for Healthcare



## Master Investor Conference 2017 Organized by Jim Mellon & Mann Bioinvest in London



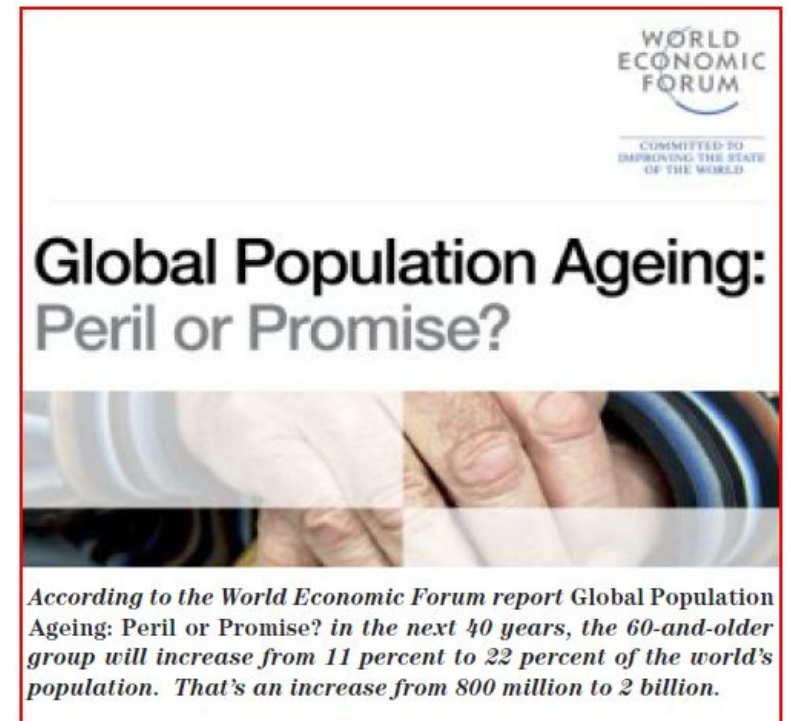
**AGEING IS VERY COMPLEX**

Follow me on [twitter!](#) JIMMHK



*“We must develop a comprehensive and globally shared view of how technology is affecting our lives and reshaping our economic, social, cultural, and human environments. There has never been a time of greater promise, or greater peril.”*

– Klaus Schwab, Founder and Executive Chairman, World Economic Forum



Here the history of the longevity industry is described as consisting of increasingly frequent paradigm shifts, each as disruptive as the last.

The overall direction of travel for longevity industry has been from techniques for treatment toward technologies for prevention. A set of contingencies is described: cards that must fall in order for the next shift toward greater prevention to take place.



# Investing in Longevity: Series of Thematic Specialized Conferences



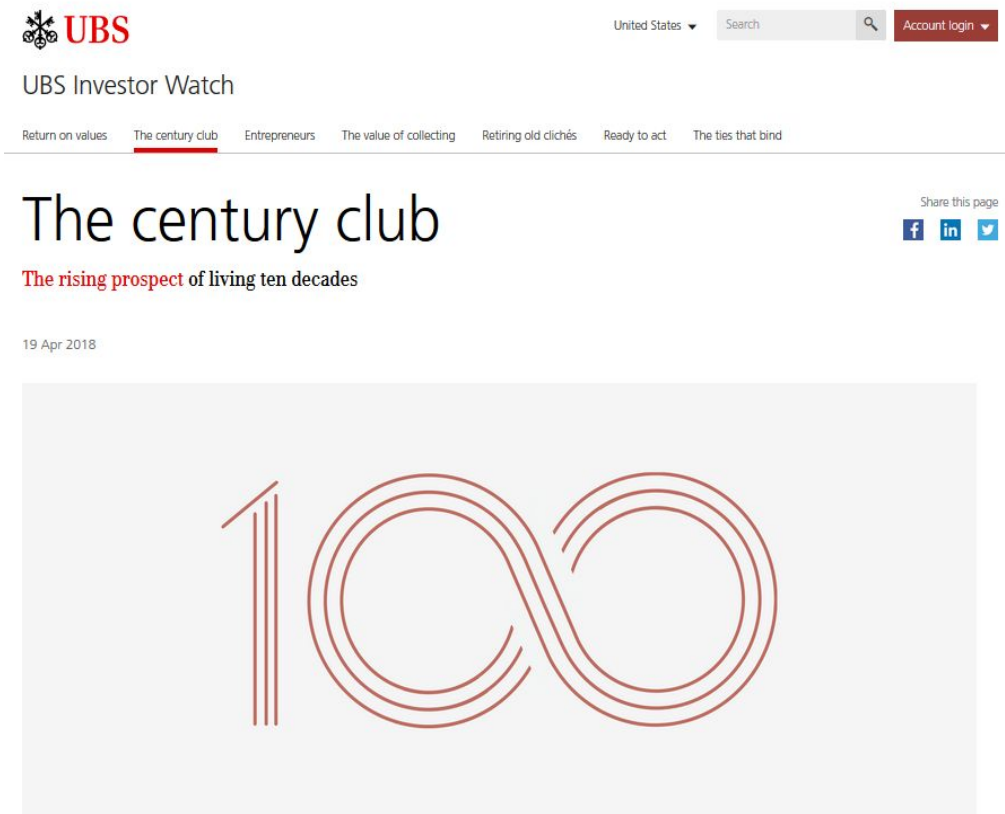
# Leading Investment Banks Starting to Regularly Publish Analytical Reports on Longevity

- Longevity is a recurring topic of analytical market reports from leading financial/analytical institutions such as CitiBank, Frost and Sullivan & UBS Group.
- Many of these documents offer “landscape overviews,” which attempts to illustrate and systematise the industries in their present state of development and determine the key components.
- They describe the coming demographic crisis, outline certain solutions, and finally lead to the dividends that can be enjoyed by a society with an increased healthspan.
- This signals the initiation of Longevity as a mainstream topic, and particularly illustrates its increasing acceptance among the world’s leading business, finance, economic and investment thought leaders.





# UBS Centenarians Club Expect to Live Past 100



In April 2018, UBS Investor Watch, the world’s largest surveyor of wealthy investors, documented the general state of individual investor optimism regarding longevity globally. It found that:

- Nine out of 10 believe their health to be more important than their wealth;
- Many investors are anxious about the financial implications of old age, with healthcare costs being a top concern;
- Investors also worry about having less wealth to pass on to successors.

UBS Investor Watch concludes:

**“Don’t let skepticism about living to 100 keep you from planning for it. Life expectancies are rising, and it’s a real possibility. In fact globally, nine in 10 investors are already adjusting how they are planning for their life and their legacy.”**

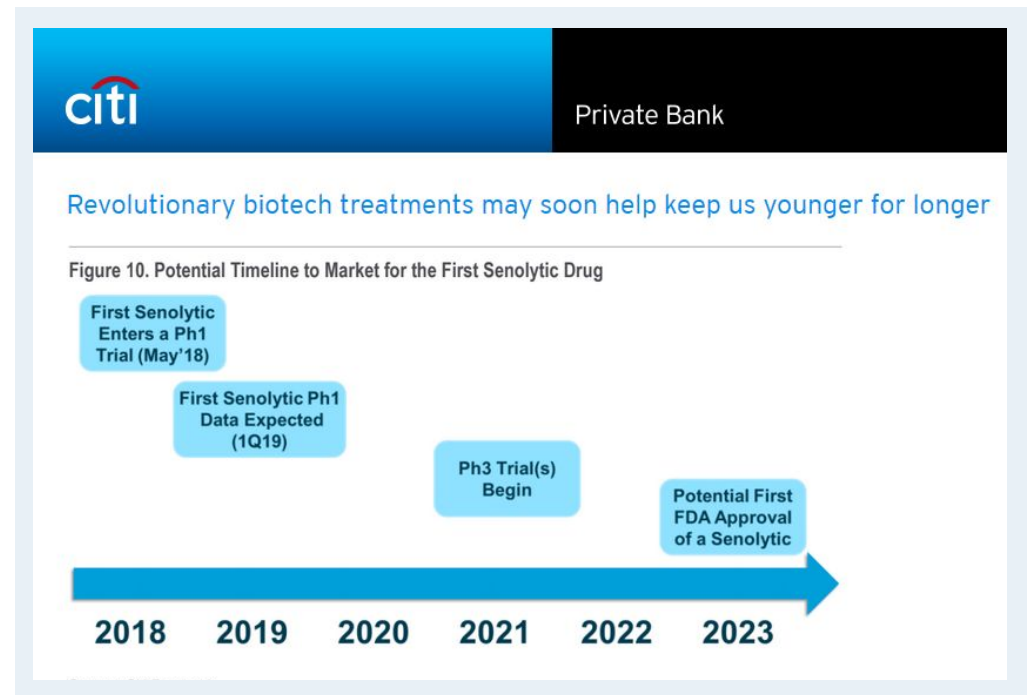


# CitiBank Features a Chapter on Longevity in their 2018 Annual Report

CitiBank cited anti-aging drugs as one of 10 disruptive innovations in a recent report that listed for their clients investible technologies to reap long-term economic gains.

The chapter's main author noted that recent advancements in rapidly-maturing longevity science “could spawn FDA-approved therapeutics potentially in the next decade, with the primary goal of keeping us younger and alive for longer. With scientific breakthroughs emerging this decade on the cellular origins of why the tissues in our bodies age, novel anti-aging medicines may become one of the next big disruptions in the healthcare market.”

Senolytics was the most prominent Longevity technology highlighted in the report, which projects that the first drug of this class could enter the market as early as 2023.





# Frost & Sullivan Releases Longevity Reports and Webinars

Perhaps most illustrative of this new wave of Longevity-themed reports from leading analytical firms, the Frost & Sullivan industry reports have been using a unique style of stark, eye-catching diagrams and illustrations offering at-a-glance overviews of key future trends, forecasts and opportunities.

They recently prominently covered Longevity through their “Anti-Aging Therapies and Service Market” analytical report, with simple illustrations that made the demographic challenges and opportunities for industry growth abundantly clear.

Longevity was also spotlighted in Frost & Sullivan’s “Conquering Aging: Novel Technology Disruptions in the Anti-Aging Industry” webinar, featuring an overview of recent developments from Longevity companies Insilico Medicine, ChromaDex and Dthera Sciences.

**ANTI-AGING THERAPIES AND SERVICES MARKET - TRENDS AND GROWTH OPPORTUNITIES, FORECAST TO 2022**

**INSTANT DOWNLOAD**

FROST & SULLIVAN Market Engineering

**Anti-Aging Therapies and Services Market—Trends and Growth Opportunities, Forecast to 2022**

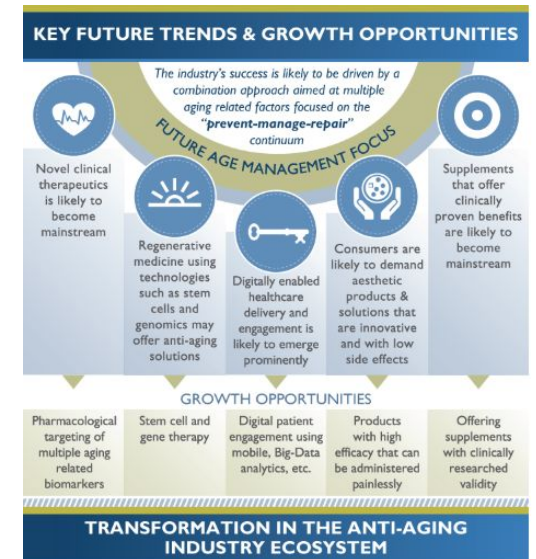
Focus on Integrative Solutions Combining Dietary Supplements and Aesthetic Solutions with Clinical Therapeutics as the Market Moves Toward a “Prevent-Manage-Repair” Continuum

Global Transformational Health Research Team at Frost & Sullivan

Research in Collaboration with A4M

AM MMI REDEFINING MEDICINE

MDB7-52 June 2018



Frost & Sullivan use striking artwork to map the Longevity industry.



# Leading Private Wealth Banks Beginning to Organize Conferences on Longevity and Anti-Aging

2016 - 2018 saw a number of prominent business and financial media brands embrace the topic of Longevity by organizing a series of landmark conferences.

In 2018, leading financial players including **Julius Baer**, **UBC** and **Credit Suisse** followed suit, holding a series of summits and forums focusing on Longevity investment and finance for their executives and clientele.

This trend will not only continue but accelerate in the future, with an increasing number of investment and financial institutions holding similarly themed events for their professional networks and high net-worth clients. These heavily-networked events will no doubt serve as an ideal space for both experts and investors, coalescing into a mutual community that will allow the Longevity business to take root and grow.



As published in  
*Your Wealth & Life: Navigating longevity*

## Longevity planning

for retirees

CREDIT SUISSE

### How Increasing Longevity Affects Us All?: Market, Economic & Social Implications

Global Demographics and Pensions Research

## Julius Bär

### EXTENDED LONGEVITY



SHIFTING LIFESTYLES

4 min

Do we really want to live forever?



SHIFTING LIFESTYLES

3 min

Longevity: How to make the most of the extra years



# Health and Aging Featured as Key Topic at Credit Suisse Global Megatrends Conference

# CREDIT SUISSE

## Credit Suisse Global Megatrends Conference

April 18, 2018, Fairmont Singapore

The Global Megatrends Conference, hosted by Credit Suisse, brings together experts and thought leaders in business and politics to meet and share their insights into the latest megatrends poised to shape the future of investments, which includes demographic challenges. This was broken down into:

- Urbanization
- **Health and aging**
- Knowledge economy
- Crowded world

In his keynote speech, Dr. Alex Zhavoronkov, co-founder of Insilico Medicine, which brings genomics, big data analysis, and deep learning to drug discovery, described the impact of technology on healthcare to answer the “health and aging” aspect of the challenge.

**Date:** Thursday, 30 October, 2018

**Venue:** Soho Hotel, 4 Richmond Mews, London W1D 3DH

**17:30 Guest Registration Welcome**

**18:00** Christian Berchem, CEO Credit Suisse (UK) Ltd

**Keynote**

**18:10** Pierre Bose, Head of European Strategy, Credit Suisse

**How technology is revolutionizing health care**

Dr Alex Zhavoronkov, CEO

**18:30** Insilico Medicine

Jason C. Foster, Managing Director, Health Equity Consulting Pascal Mercier, Product Specialist Thematic Equity Funds, Credit Suisse

**19:00** Q&A

**19:30** Drinks reception



# Several Keynote Presentations on Longevity Featured at 2018 UBS Healthcare Summit Singapore



Key themes including transformative trends and enabling innovations in the healthcare industry took center stage at last year's UBS Healthcare Summit. By providing an exceptional platform to deepen networks in the industry, the summit brought together forward-thinking leaders, industry captains and renowned speakers at the forefront of transformative trends in healthcare, life science and technologies.

Thematic topics included:

- The future of healthcare
- Singapore's biotech inflexion
- Living to 150
- Big data and AI
- Disruptive healthcare business models
- Investment opportunities in healthcare

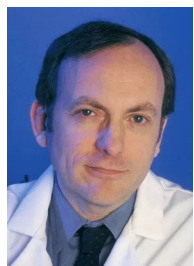
Dr. Alex Zhavoronkov, CEO of Deep Knowledge Ventures' portfolio company Insilico Medicine, delivered a keynote presentation on the topic of "Living to 150" at the summit.

14:10-14:30	<b>Living to 150</b> Dr. Alex Zhavoronkov, Founder and Chief Executive Officer, Insilico Medicine Inc.
14:30-14:50	<b>Managing digitized life</b> Ying Rui LI, Co-founder and Chief Scientist, iCarbonX

# Key Longevity Industry Influencers



## Longevity Scientists



Michael West



Eric Verdin



Cynthia Kenyon



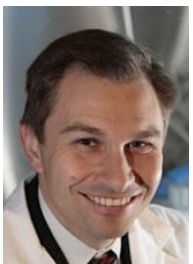
Aubrey de Grey



Steve Horvath



Joao Pedro de Magalhães



David Sinclair



Nir Barzilai

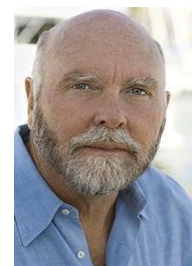


George Church



Brian Kennedy

## Longevity Influencers



J. Craig Venter



Larry Page



Sergey Brin



Ray Kurzweil



Alex Zhavoronkov



Nathaniel David



Larry Ellison



Martine Rothblatt

## Longevity Investors



Dmitry Kaminskiy



Bryan Johnson



Finian Tan



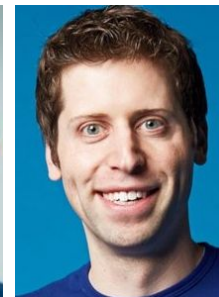
Jeff Bezos



Jim Mellon



Peter Thiel



Sam Altman



Sergey Young



James Peyer





# Julius Baer Bank Holds “Investing in Longevity” Forum in London

**Program of the Forum “Investing in Longevity”**

Julius Bär

**KEY SPEAKER:**  
Mark Winterburn, Senior Investment Adviser, Julius Baer International Limited

Julius Bär

**Guest speaker:** “5 myths of longevity interventions”  
by James Peyer, PhD, Apollo Ventures, Hamburg, Germany

**“The Business of Longevity: Landscape, Investment and Financial Projections”**  
by Dmitry Kaminskiy, Deep Knowledge Ventures

Julius Baer, the Swiss multinational private bank headquartered in Zürich, recently held a forum entitled “Investing in Longevity”. At the forum, Dmitry Kaminskiy participated in the investor’s panel and delivered a keynote presentation on “The Business of Longevity: Landscape and Financial Projections” on behalf of Deep Knowledge Ventures and Aging Analytics Agency.

**Julius Baer Bank Forum  
“Investing in Longevity”**

**The Business of Longevity:  
Industry Landscape  
Investment and Financial Projections**

**Dmitry Kaminskiy**  
**Deep Knowledge Ventures  
Aging Analytics Agency**

**6th December 2018, London**




During the presentation, he spoke about the current Longevity Industry landscape, projections for the next several years, and gave an overview of Aging Analytics Agency’s classification framework. This proprietary framework categorizes Longevity companies and formulates optimal investment targets by identifying over- under-evaluated companies, and thus helps avoid common mistakes made by traditional VC funds operating in this sphere.

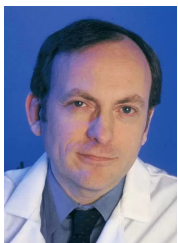
He also spoke on the rising sub-sector of Longevity Finance, describing how institutions in the finance sector, from pension funds to insurance companies and investment banks, are taking an interest in Longevity.



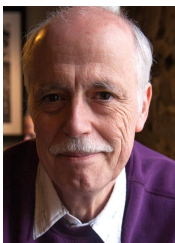
# Top Longevity Influencers, Conferences, Books, Journals, Etc.

# Top 10 Lists

## Top 10 Longevity Scientists



Michael West



Dr. Felipe Sierra



Cynthia Kenyon



Aubrey de Grey



Alex Zhavoronkov



Joao Pedro de Magalhaeres



David Sinclair



Nir Barzilai



George Church



Brian Kennedy

## Top Longevity Investors



Dmitry Kaminskiy



Bryan Johnson



Finian Tan



Jeff Bezos



Peter Thiel



Jim Mellon



## Top 10 Longevity Companies



## Top 10 Longevity Venture Funds



## Top 10 Research Institutions



PAUL F. GLENN CENTER FOR THE BIOLOGY OF AGING AT STANFORD UNIVERSITY



MAX PLANCK INSTITUTE FOR BIOLOGY OF AGEING



# Top 10 Lists

## Top 10 Reg Med Companies



## Top Gene 10 Therapy Companies



## Top 10 P3 Medicine Companies



## Top Longevity Influencers



Larry Page



Sergey Brin



Ray Kurzweil



Martine Rothblatt



Larry Ellison



Nathaniel David



Bill Maris



J. Craig Venter

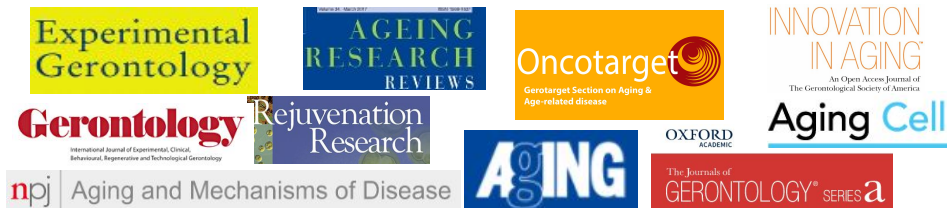


Alex Zhavoronkov



# Academic Writings & Meetings

## Top Scientific Journals in Geroscience



## Top Longevity Conferences



## Top Academic Books in Geroscience



## Top Longevity Books



## Top Scientific Meetings & Symposia



## Top Longevity Online Resources



# Company Landscape

## Regenerative Medicine



## P3 Medicine



## Gene Therapy



## Geroscience



# Venture Firm Landscape

## Regenerative Medicine



## Geroscience



## P3 Medicine



# Geroscience Institutes by Region

## USA



## UK



## EU



## Other





# Longevity Influencers

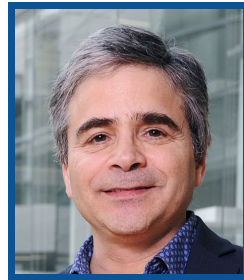
Top Longevity Scientists and Influencers



**Anthony Atala**



**Joon Yun**



**Adam Antebi**



**Elizabeth  
Blackburn**



**Nursultan  
Nazarbayev**



**Bill Faloon**



**Peter Diamandis**



**Sally Greengross**



**Michael Kope**



**Stephen  
Johnson**



**Maria Blasco**



**Andy Conrad**



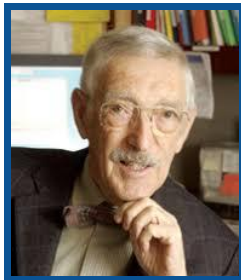
**David  
Finkelstein**



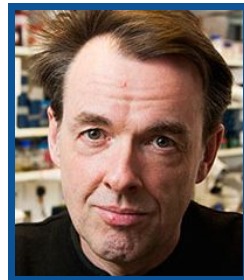
**David Botstein**



**John D. Furber**



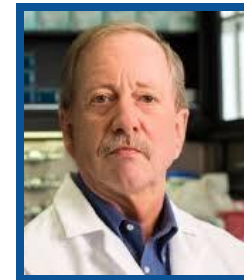
**Bruce Ames**



**David Gems**



**Tina Woods**



**Steven Austad**



**Finian Tan**



**Eric Kihlstrom**

# Longevity Influencers

Top Longevity Scientists and Influencers



**Vitalik Buterin**



**Alexey Moskalev**



**Ilia Stambler**



**Edwina Rogers**



**Robin Farmanfarmaian**



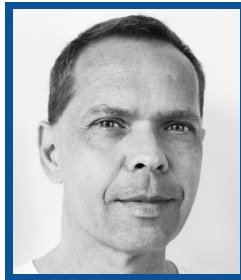
**Christine Peterson**



**Linda Partridge**



**Bill Maris**



**Michael Greve**



**Maria Konovalenko**



**Calvin Harley**



**Leonard Guarente**



**Thomas Langer**



**Nils-Göran Larsson**



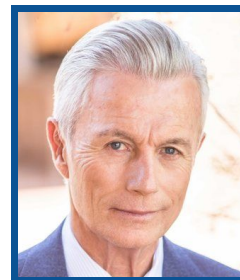
**Jose Cordeiro**



**Dmitry Itskov**



**Zoltan Istvan**



**James Strole**



**Bernadeane**



**Robert Young**



**Kevin Perrott**

# Longevity Influencers

Top Longevity Scientists and Influencers



**Arthur Bilger**



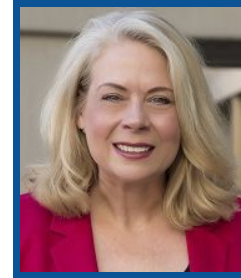
**Laura Carstensen**



**Henry Cisneros**



**Pinchas Cohen**



**Catherine Collinson**



**Joseph Coughlin**



**Fernando Torres-Gil**



**William Dow**



**Ken Dychtwald**



**Marc Freedman**



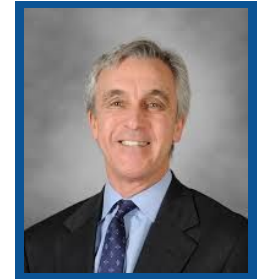
**Linda Fried**



**Lynn Goldman**



**Christopher Herbert**



**Michael Hodin**



**Jo Ann Jenkins**



**Yves Joannette**



**Becca Levy**



**Freda Lewis-Hall**



**Robin Mockenhaupt**



**Philip Pizzo**



**Andy Sieg**

# Longevity Influencers

Top Longevity Scientists and Influencers



**Youngsook Park**



**Keith Comito**



**Alexey Turchin**



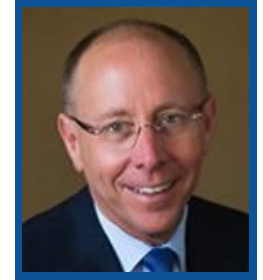
**David Wood**



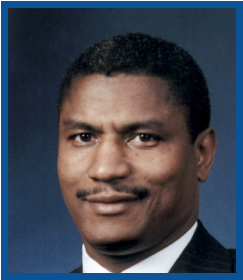
**Arielle Burstein**



**Rita Beamish**



**Paul Irving**



**Rodney Slater**



**Trent Stamp**



**Dana Ardi**



**Errol Barnett**



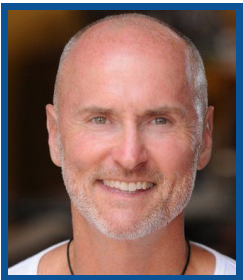
**Arthur Bilger**



**Fred Jonske**



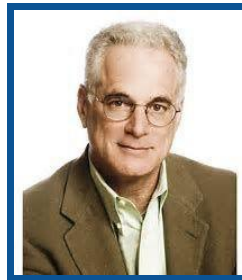
**Alexander Klabin**



**Chip Conley**



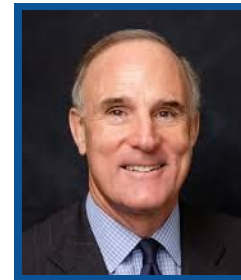
**Richard Eisenberg**



**Chris Farrell**



**Sherry Lansing**



**Campbell Gerrish**



**Taimur Hyat**



**Robert Johnson**

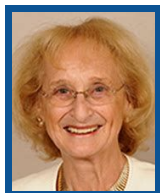
# United Kingdom Longevity Influencers



## Top Longevity Scientists and Influencers



David Sinclair



Baroness Sally Greengross OBE



Eric Kihlstrom



Helen Whately



John Bell



Matt Hancock



Charles Alessi



Aubrey de Grey



Jim Mellon



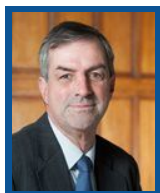
Tina Woods



Dmitry Kaminskiy



Narendra Patel



Malcolm Jackson



Tom Kirkwood



George P. Willis



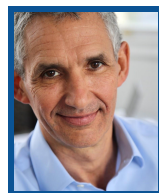
Helen R. Griffiths



Martin Green



Anders Sandberg



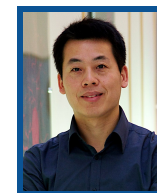
Tim Spector



Ben Franklin



Andrew Scott



Qing-Jun Meng



Ilora Gillian Finlay



Leslie Arnold Turnberg



Dame Denise Platt



Philippa Whitford



Linda Partridge



David Kipling



Paul Keith Potter



Julia Neuberger



John Speakman



Suzanne Wait



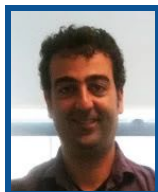
Jon Date



Paul Thornalley



Janet Thornton



Manlio Vinciguerra



Thomas von Zglinicki



William Bains



Richard Barker



Richard Faragher



Robert Freitas



David Gems



Andrew Krentz



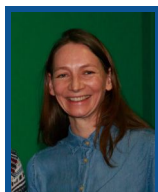
Aisling Burnand



J. P. de Magalhaes



Anne McArdle



Cleo Bishop



Dr Richard Siow



John Pattison



Maggie Throup



Peter Adams



Janet M. Lord



Colin Blakemore



Sally-Marie Bamford

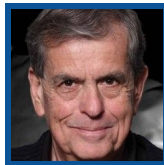


David Amess

# Israel Longevity Influencers



## Top Longevity Scientists and Influencers



Aaron Ciechanover



Alex Friedman



Anat Ben-Zvi



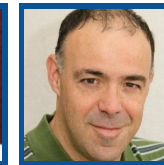
Assaf Sella



Benjamin Sredni



Boaz Misholi



Dan Peer



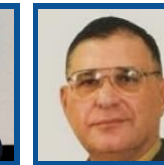
Doron Garfinkel



Doron Melamed



Dov Chernichovsky



Dov Shmotkin



Ehud Cohen



Eitan Okun



Eldad Tzahor



Eli Mizrahi



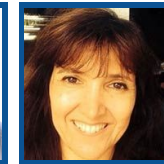
Eyal Banin



Gabriel Barbash



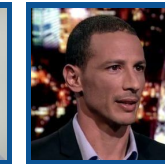
Gil Atzmon



Hadas Lewy



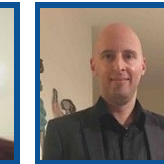
Haim Cohen



Hanan Tal



Howard Litwin



Idan Papier



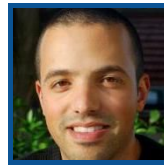
Idan Segev



Ilia Stambler



Israel Doron



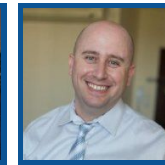
Itamar Harel



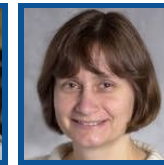
Itamar Raz



Joe van Zwaren



Jonathan Mandelbaum-Shor



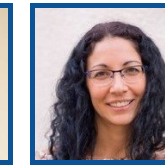
Michal Neeman



Michal Schwartz



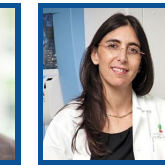
Mooly Eden



Natalie Yivgi Ohana



Nir Barzilai



Nirit Lev



Rafi Eitan



Ran Balicer



Raphael Gorodetsky



Ruth Arnon



Sami Sagol



Sara Carmel



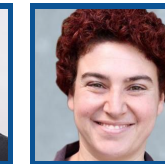
Shai Brill



Shai Efrati



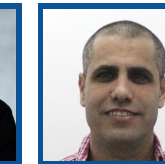
Shai Shen-Orr



Sivan Henis-Korenblit



Sol Efroni



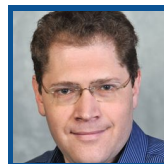
Tal Dvir



Tzvi Dwolatzky



Uri Alon



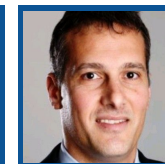
Valery Krizhanovsky



Yael Benvenisti



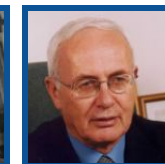
Yakir Kaufman



Yaky Yanay



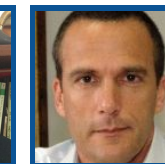
Yechezkel Barenholz



Yitzhak Brick



Yosef Gruenbaum



Yossi Heymann



Zorian Radomyslsky



Zvi Lanir

# Singapore Longevity Influencers

## Top Longevity Scientists and Influencers



Finian Tan



Danny Soon



Gary Khoo



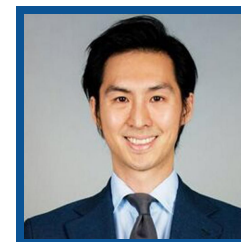
Bussarawan (Puk)  
Teerawichitchainan



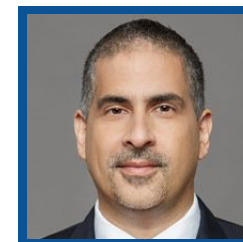
Chong Hock Sia



Janice Chia



Jeffrey Lu



Carl Firth



Kanwaljit Soin



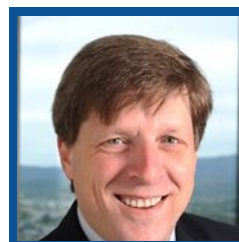
Christiani  
Jeyakumar Henry



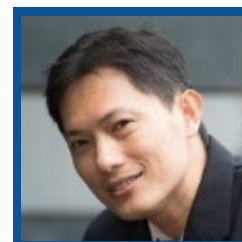
Colin Stewart



Birgit Lane



Brian Kennedy



Hwee-Pink  
Tan



Kenneth  
Noonan



Lim Chwee  
Teck



Lok Shee-Mei



Melis Tay



Neo Kah Yean



Ng Huck Hui



Paolo  
Rampichini



Paul Si



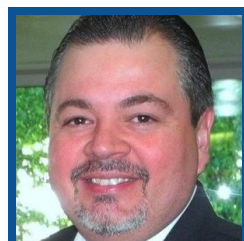
Penny Wan



Judith Swain



Vishal Doshi



Wallace I.  
Torres



Wanjin Hong



Wilf Blackburn



Yu Cai

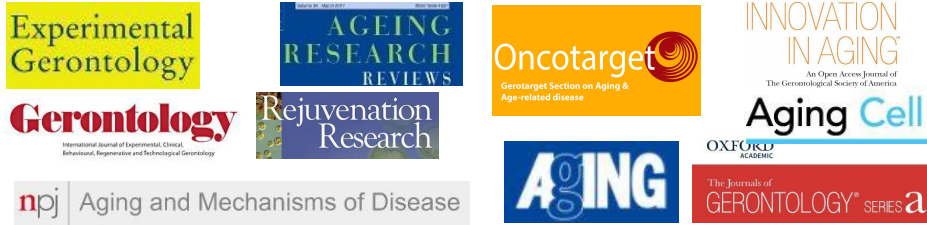


Lim Xinhong

# Leading Publications & Conferences



## Top Scientific Journals in Geroscience



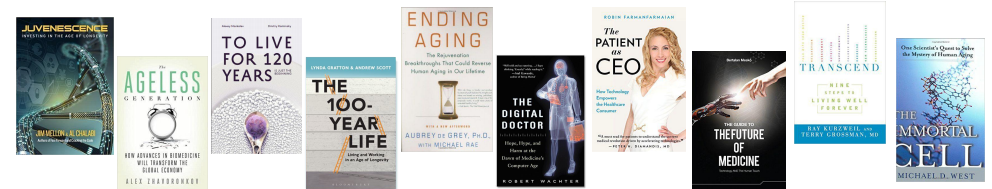
## Top Longevity Conferences



## Top Academic Books in Geroscience



## Top Longevity Books



## Top Scientific Meetings & Symposia



## Top Longevity Online Resources





# Leading Publications & Conferences



## Europe

### Palliative & Policy

**23rd Clinical Applications for Age Management Medicine**  
November 2-5, 2017  
JW Marriott Star Pass Resort & Spa, Tucson, Arizona  
This activity has been approved for 26 AMA PRA Credits

**4th International Conference on Ageing in a Foreign Land**  
21-22 April 2017, Adelaide, Australia

**Aging & Society: Seventh Interdisciplinary Conference 2017**  
November 3-4, 2017 University of California, Berkeley, Berkeley, CA, United States (Past)

### Advanced Solutions

**KEYSTONE SYMPOSIA**

**Eukaryotic DNA Replication & Genome Maintenance**  
September 8 - 9, 2017  
Abstract Deadline: June 14, 2017

**Telomeres & Telomerase**  
May 2 - 6, 2017  
Abstract Deadline: February 27, 2017

**GENE THERAPY SYMPOSIUM**  
FOR HEART, LUNG, AND BLOOD DISEASES

**Genome Engineering: The CRISPR-Cas Revolution**  
July 21 - 24, 2017  
Abstract Deadline: May 25, 2017

**SEE YOU IN WASHINGTON, DC**  
November 1-13, 2017

### Basic Research

**Mitochondria in Health and Disease**

**Cell Growth and Proliferation**  
Gordon Research Conference  
**Mechanisms of Cell Division with Special Emphasis on Cancer**  
July 9-14, 2017

**Gordon Research Conferences**  
By connecting discussions and the free exchange of ideas at the frontiers of the biological, chemical, and physical sciences.

**Annual UCLA Research Conference On Aging**  
Gordon Research Conference  
Los Angeles  
Tuesday, May 2, 2017  
Start: 08:00  
End: 12:00

**AGE American Aging Association**  
Research to Advance Healthy Aging

**IAGG 2017**  
The 11th International Congress of Gerontology and Geriatrics  
July 19-25, 2017

## USA

**CPPEI 2017**  
2nd Congress of Geriatric Practice in Primary and Allied Health  
Victoria, Australia, July 14, 2017

**ICT4AWE 2017**  
3rd International Conference on Information and Communication Technologies for Ageing Well and e-Health

**Aging & Cognition 2017**  
24th April 2017 - 25, 2017

**IFA INTERNATIONAL FEDERATION ON AGEING**  
Global Connections

**5th Helmholtz-Nature Medicine Diabetes Conference**  
Helmholtz Zentrum München - German Research Center for Environmental Health GmbH - Nature Medicine

**Ring Discovery 2017**  
1-2 March 2017

**IBIMA**

**Stem Cells and Cancer**  
Global Health Conference  
**Mechanisms of Stem Cell Aging, Cancer Initiator Progression**  
February 12 - 13, 2017

**4th International Symposium on Peripheral Nerve Regeneration**  
July 06th - 08th, 2017 - Barcelona, Spain

**3rd Annual Cell & Gene Therapy Congress**  
8-7 November 2017 London, UK

**FUTURE INVESTIGATORS OF REGENERATIVE MEDICINE**  
19th - 20th September, 2017, Hotel Cap Ring, Canary Islands

**Big Data in Biology and Health**  
20-27 September 2017  
Wellcome Genome Campus, Hinxton, Cambridge, UK

**2nd Zing Zeng Integrity Conference**  
1-2 July 2017, 15-16 July 2017, Dublin, Ireland

**Cardiovascular Phenotype**  
27-28 November 2017, London, UK

**Mitochondrialogenesis and Aging**  
27-28 November 2017, London, UK

**17th International Congress of Gerontology & Geriatrics**  
19-25 July 2017, Vienna, Austria

**13th World Congress of Geriatrics**  
14-18 September 2017, Seoul, Korea

**AAIC 17**  
10-14 November 2017, Washington, DC

**Endocytosis and signaling in health and disease**

**Neuro-Immune Axis: Neutrophil Regulation in Development, Health, and Disease**  
September 17-18, 2017 - Spain

**EMBO**

**Mediating Ageing / Antiaeging: from Molecular Biology to Clinical Perspectives**  
The workshop will be held from September 15th - 16th 2017 at the Maribor University  
Halo-Wittenberg, Germany

**2017 FERS CONGRESS**  
17-19 February 2017, London, UK

**BIO-RUNNING**

**The Ageing Cell**  
27-28 March 2017

**CC Congress Annual FERS 8**  
17-19 February 2017, London, UK

## Other

**2nd Interventions in Aging Conference**  
Understanding Mechanisms & Compressing Morbidity in Aging Humans

**11th Annual ASM Conference**  
GUT HEALTH: THE CORNERSTONE OF WELLBEING  
4-8 AUGUST 2017, SOFITEL MELBOURNE ON COLLINS

**ACNM17**  
Aged Care Nurse Managers Conference

**MENA GERIATRICS SUMMIT**  
2-3 November 2017, Dubai - UAE

**Stress Proteins in Growth, Development and Disease**  
Gordon Research Conference  
**From Protein Folding to Misfolding Disorders: The Importance of Maintaining Proteostasis over a Lifetime**  
July 9-14, 2017

**FUTURE OF ELDERCARE OPERATIONS SEMINAR 2017**  
25-29 April 2017 - Level 3, Micaosa Building 3002, Marina Bay Sands Convention Centre, Singapore

**PRECISION CANCER BIOLOGY FROM TARGETED TO IMMUNE THERAPIES**

**CINA 2017**  
International Symposium  
Nov 6-8, Kyoto

**SYMPOSIUM REGENERATIVE**  
November 10, 2017 - Pittsburgh, PA

**CSH Asia**

**JSGCT**  
Japan Society of Gene and Cell Therapy

**Mitochondrial quality control**

**EACR**

**INNOVATIONS IN CANCER RESEARCH AND REGENERATIVE MEDICINE**

**EMERGING RESEARCHERS IN AGEING AUSTRALIA**

**2017 World Congress of Neurology**  
16-20 September 2017, Melbourne, Australia

**Germans and Geriatrics - SHI**

**FLUORO**

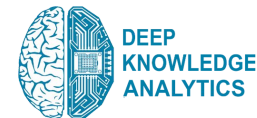
**27th International Congress of Gerontology**

**AGING THE GOLDEN OPPORTUNITY**  
50th Anniversary

**ABAC 2017**  
AUSTRALIAN BIOLOGY OF AGEING CONFERENCE

**KEYSTONE SYMPOSIA**  
ON NEUROLOGICAL AND DEGENERATIVE DISEASES  
Accelerating Life Science Discovery

# Top Longevity Journals



## Palliative & Policy

## Advanced Solutions

## Basic Research

Europe



USA



Other



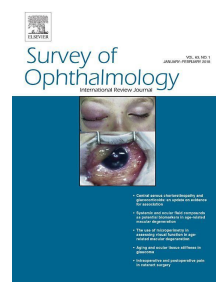
# Longevity Scientific Articles



The diagnosis of mild cognitive impairment due to Alzheimer's disease



The age distribution of cancer and a multi-stage theory of carcinogenesis



The role of oxidative stress



The association between quantitative measures



Interactions between glutamatergic and monoaminergic systems



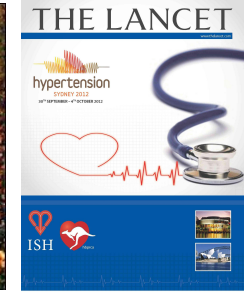
Early-onset Alzheimer's disease



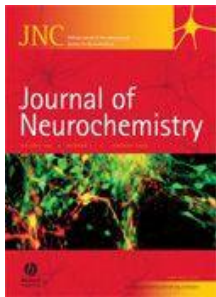
Folate, vitamin B12, and serum total homocysteine levels



A DNA damage checkpoint response in telomere-initiated senescence



Selective loss of central cholinergic neurons in Alzheimer's disease



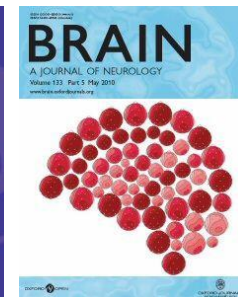
Basal lipid peroxidation in substantia nigra is increased in Parkinson's disease



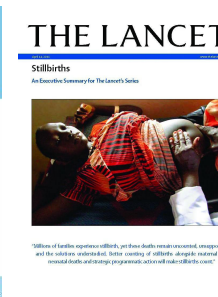
Research criteria for the diagnosis of Alzheimer's disease



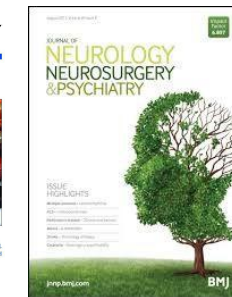
Body fat assessed from total body density and its estimation from skinfold thickness



Ageing and Parkinson's disease



Global prevalence of dementia



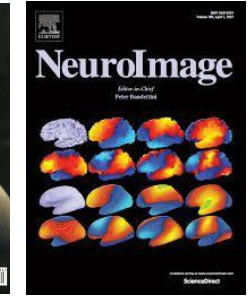
The relevance of the Lewy body



Segregation of a missense mutation



Multiple isoforms of human microtubule-associated protein tau



A voxel-based morphometric study of ageing in 465 normal adult human brains



Effect of age and high blood pressure on baroreflex sensitivity in man



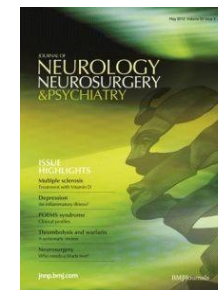
Cerebral blood flow in dementia



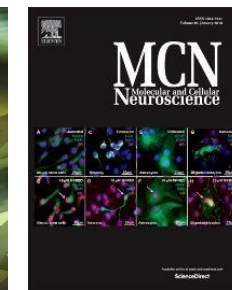
The moulding of senescence by natural selection



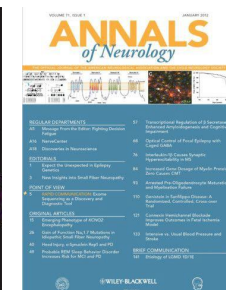
Telomere reduction in human colorectal carcinoma and with ageing



Accuracy of clinical diagnosis of idiopathic Parkinson's disease



Identification of a novel aspartic protease (Asp 2) as beta-secretase



Oxidative stress in Parkinson's disease

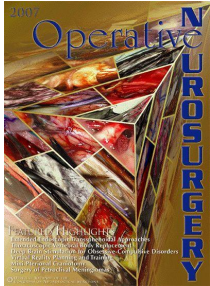


Why do we age?



Age-specific relevance of usual blood pressure to vascular mortality

# Longevity Scientific Articles



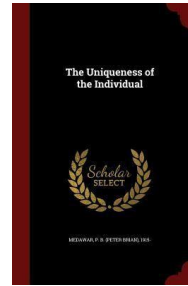
Electrical stimulation of the subthalamic nucleus in advanced Parkinson's disease.



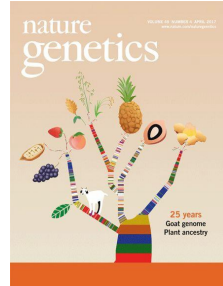
Instability and decay of the primary structure of DNA



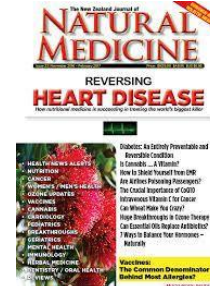
Consensus guidelines for the clinical and pathologic diagnosis



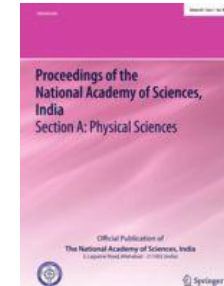
An unsolved problem of biology



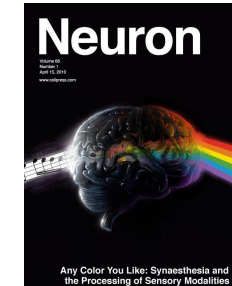
A pathogenic mutation for probable Alzheimer's disease



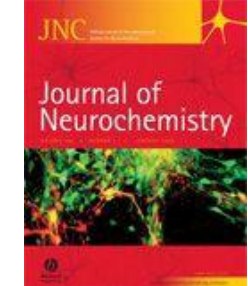
Neuropathology of human Alzheimer disease



The maintenance of the accuracy of protein synthesis and its relevance to ageing



Cloning of the gene containing mutations



Selective loss of central cholinergic neurons in Alzheimer's disease



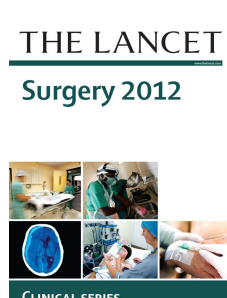
Macrophage phagocytosis of aging neutrophils in inflammation



Mitochondrial complex I deficiency in Parkinson's disease



Increased amyloid beta-peptide deposition



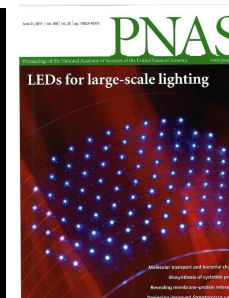
Pravastatin in elderly individuals at risk of vascular disease



alpha-Synuclein in filamentous inclusions



Alpha-synuclein in Lewy bodies



Binding of human apolipoprotein E to synthetic amyloid beta peptide



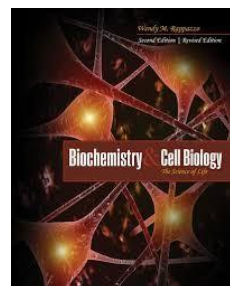
Observations on the brains of demented old people



p53 mutant mice that display early ageing-associated phenotypes



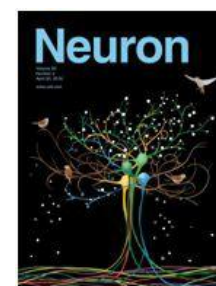
Hereditary early-onset Parkinson's disease caused by mutations in PINK1



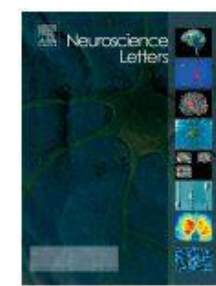
Free radicals and antioxidants in normal physiological functions and human disease



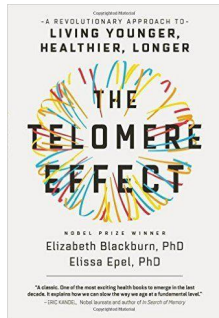
Questioning Macular Pigment Measurement Methods and Genetic Risk of Age-Related Macular Degeneration.



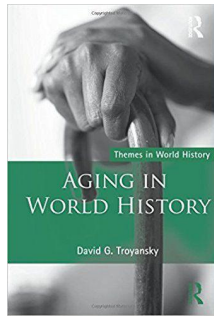
Tau proteins of Alzheimer paired helical filaments: abnormal phosphorylation of all six brain isoforms



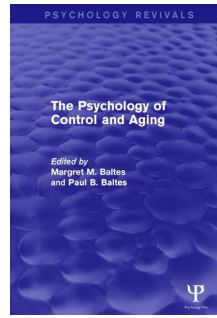
Sequencing of exons 16 and 17 of the beta-amyloid precursor protein gene in 14 families with early onset Alzheimer's disease fails to reveal mutations in the beta-amyloid sequence.



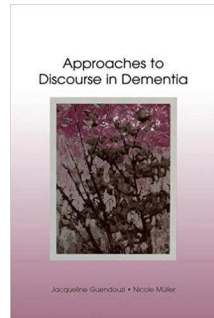
**The Telomere Effect**



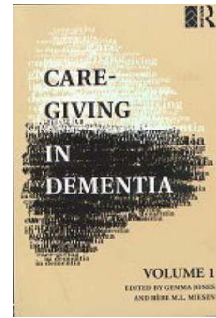
**Aging in World History**



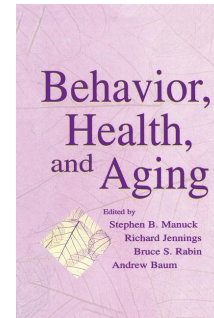
**The Psychology of Control and Aging**



**Approaches to Discourse in Dementia**



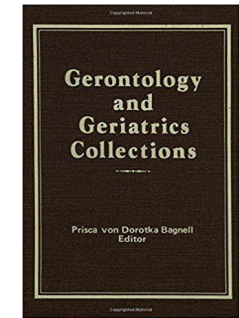
**Care-Giving in Dementia**



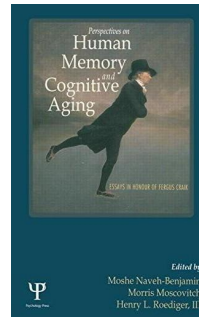
**Behavior, Health, and Aging**



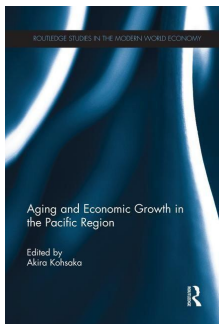
**Ageing Populations in Post-Industrial Democracies**



**Gerontology and Geriatrics Collections**



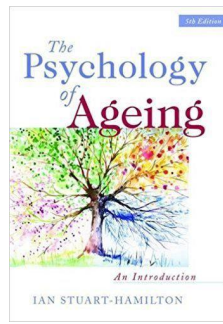
**Perspectives on Human Memory and Cognitive Aging**



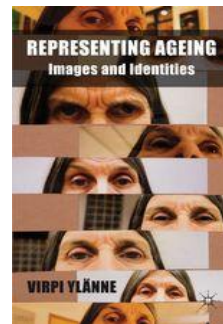
**Aging and economic growth in the pacific region**



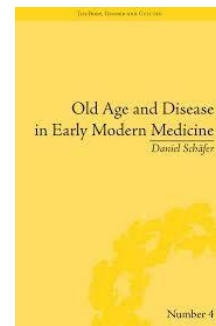
**Researching later life and ageing**



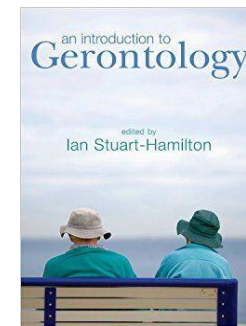
**The psychology of ageing: an introduction**



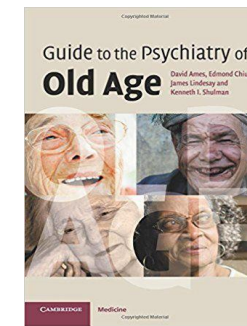
**Representing ageing: images and identities**



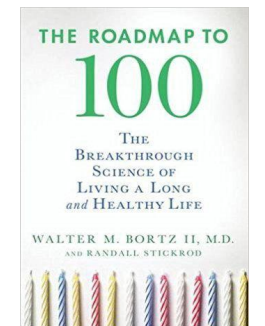
**Old age and disease in early modern medicine**



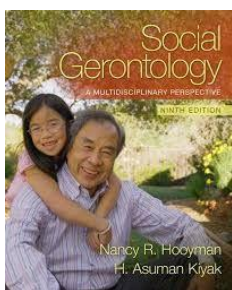
**An introduction to gerontology**



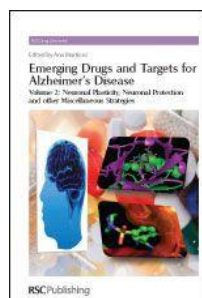
**Guide to the psychiatry of old age**



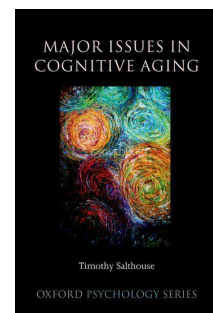
**The roadmap to 100**



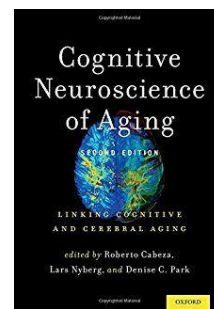
**Social Gerontology**



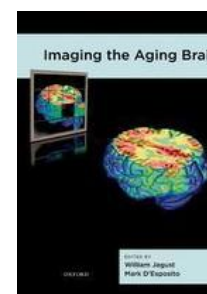
**Emerging drugs and targets for Alzheimer's disease**



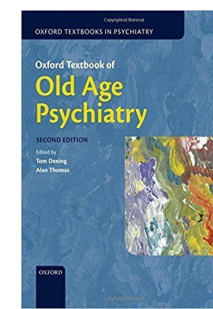
**Major issues in cognitive aging**



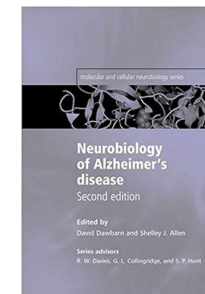
**Cognitive Neuroscience of Aging**



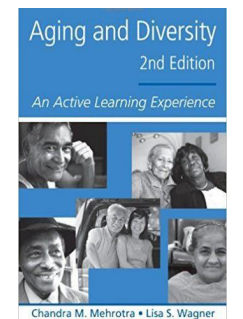
**Imaging the Aging Brain**



**Oxford textbook of old age psychiatry**

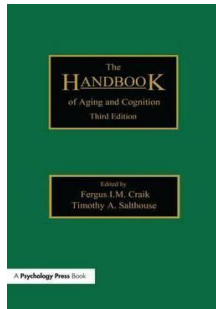


**Neurobiology of Alzheimer's disease**



**Aging and Diversity**

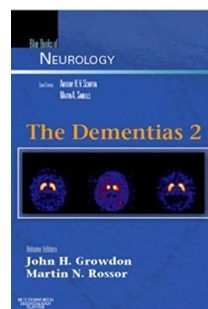
# Longevity Books



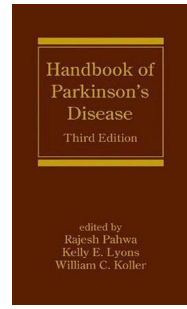
**The Handbook of Aging and Cognition**



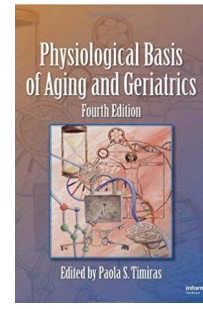
**Ageing in Asia**



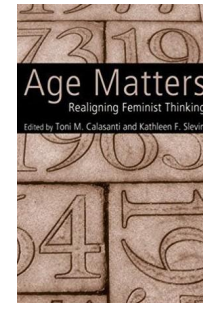
**Blue Books of Neurology Series**



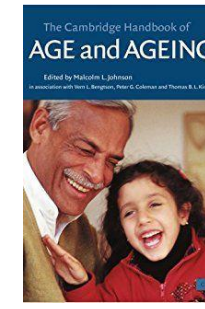
**Handbook of Parkinson's disease**



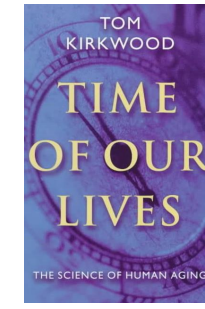
**Physiological basis of aging and geriatrics**



**Re-Aligning Feminist Thinking**



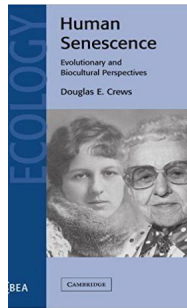
**The Cambridge handbook of age and ageing**



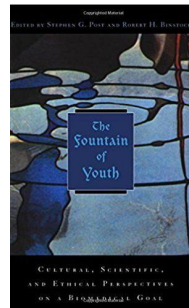
**Time of our lives: the science of human aging**



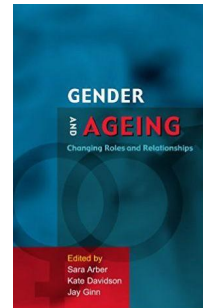
**Successful Aging**



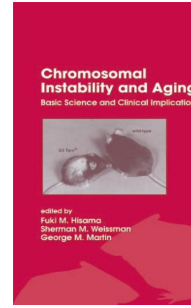
**Human senescence**



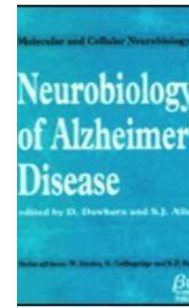
**The fountain of youth**



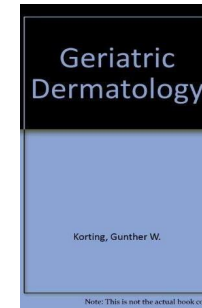
**Gender and Ageing**



**Chromosomal instability and aging**



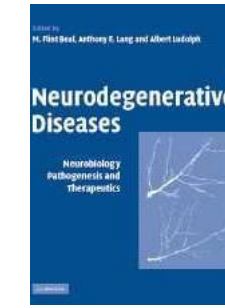
**Neurobiology of Alzheimer's disease**



**Geriatric dermatology**



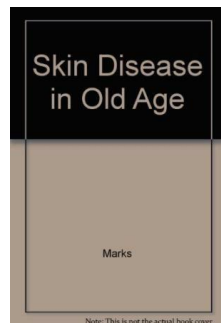
**Aging in a Changing Society**



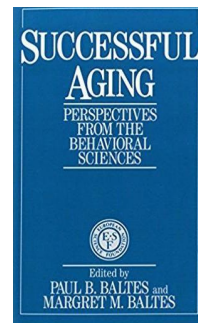
**Neurodegenerative diseases**



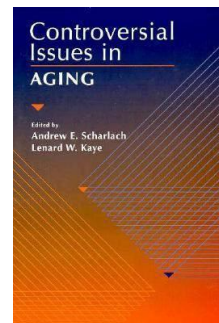
**Cognitive Aging: A Primer**



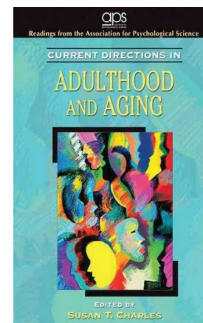
**Skin disease in old age**



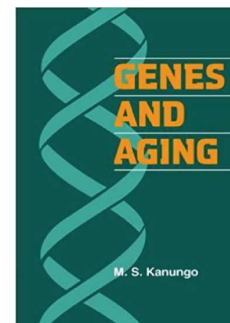
**Successful Aging**



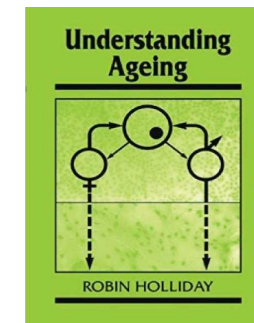
**Controversial issues in Aging**



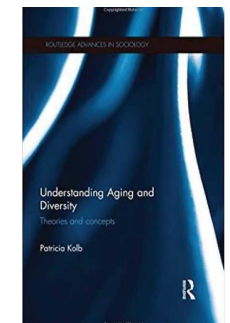
**Current Directions in Adulthood and Aging**



**Genes and aging**



**Understanding ageing**



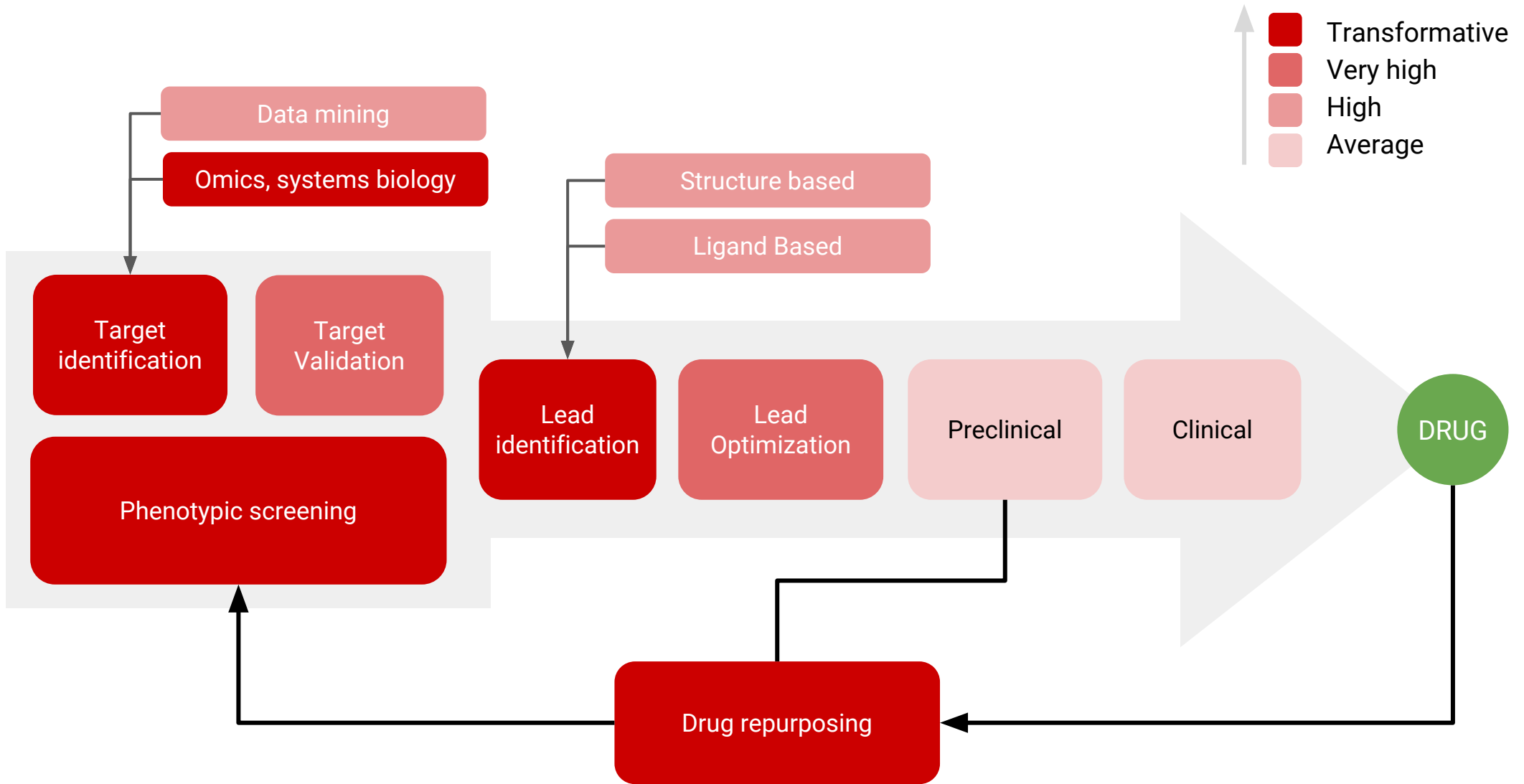
**Understanding aging and diversity**



# Intersection of AI in Drug Discovery and Longevity



# The "heat map" of AI potential value for various R&D areas







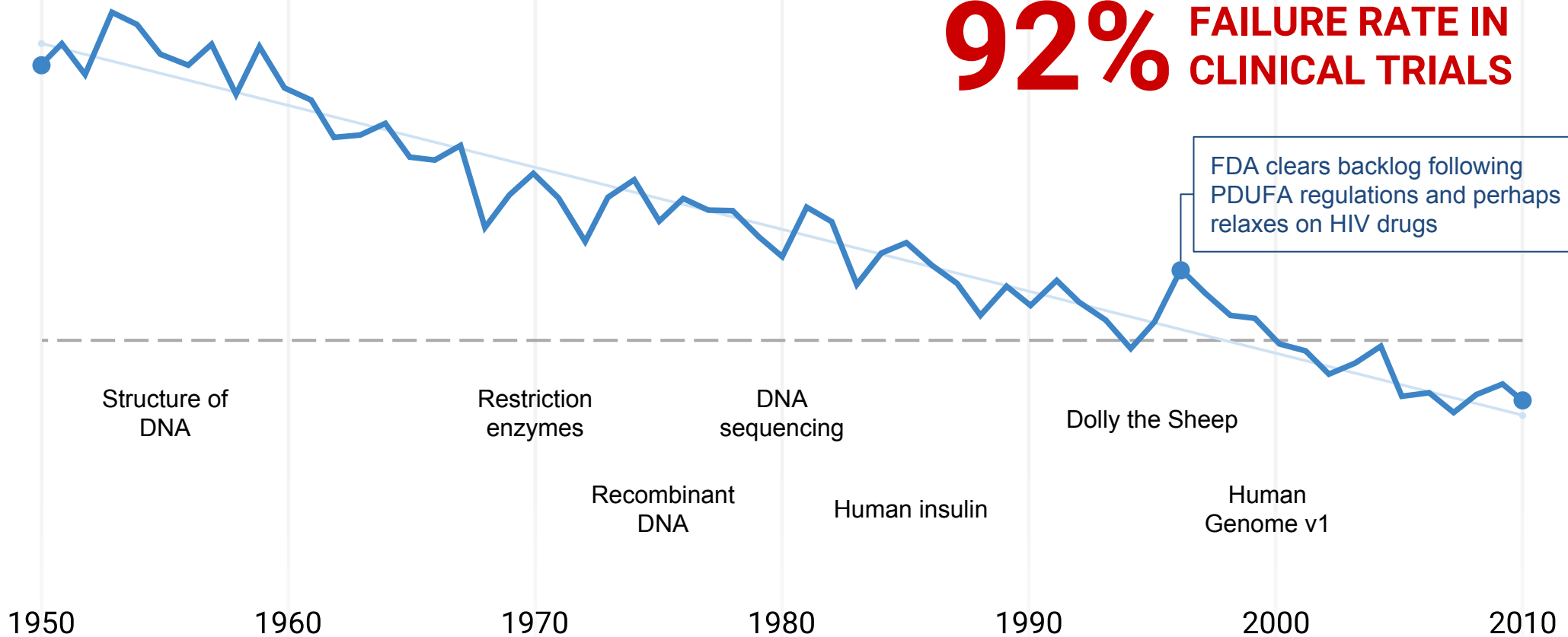
# Pharma Efficiency is Declining Steadily

NMEs per \$B R&D spent (inflation adjusted)

**FDA tightens regulation post thalidomide**

**>\$2.6B TO DEVELOP ONE DRUG**

**92% FAILURE RATE IN CLINICAL TRIALS**



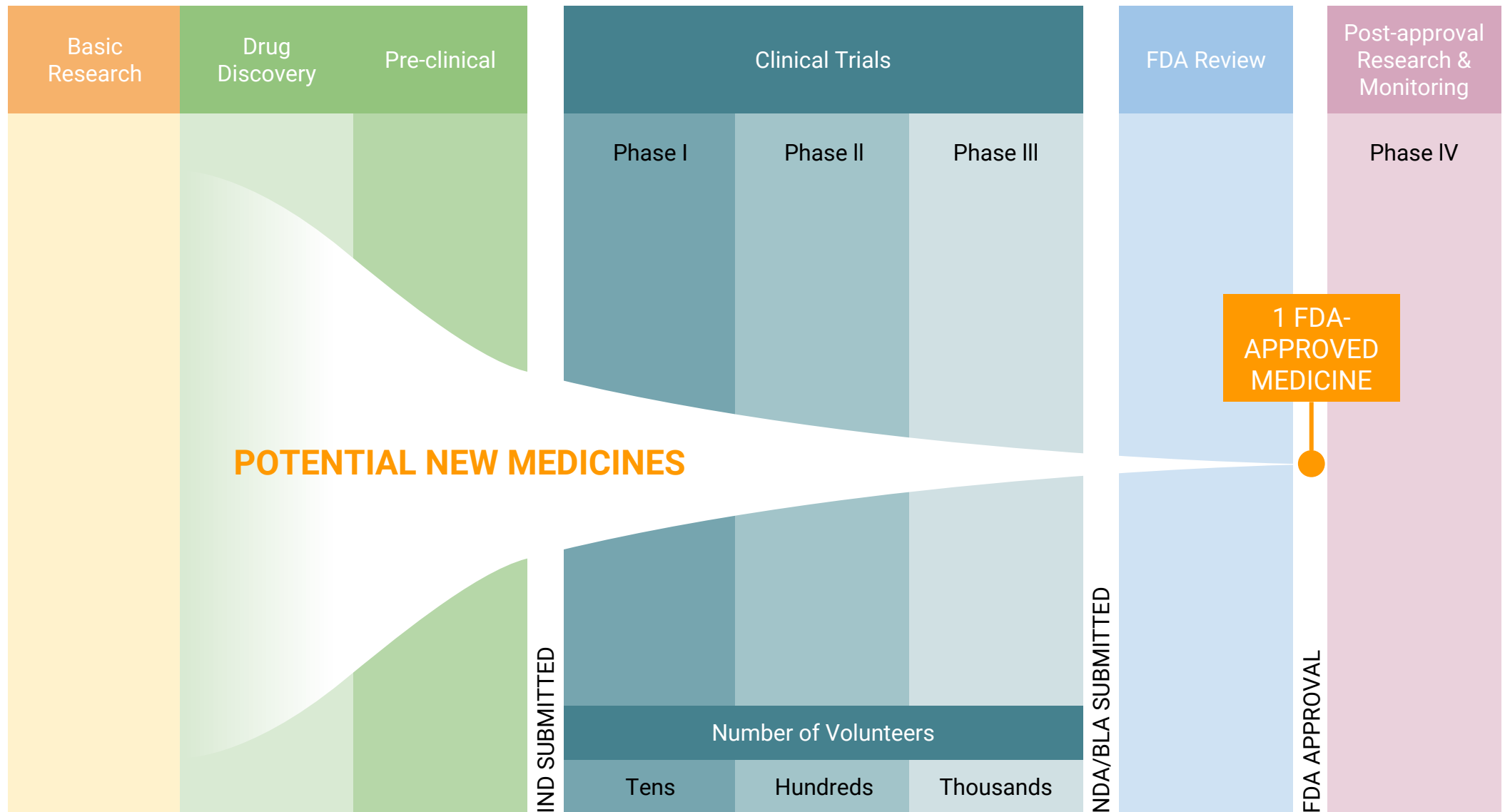
FDA clears backlog following PDUFA regulations and perhaps relaxes on HIV drugs

Bernstein Research: The Long View - R&D Productivity, 2010

**46 NEW DRUGS** launched in 2014



# Biopharmaceutical R&D Process / Low efficiency



Sources Biopharmaceutical Research & Development, PRMA

[phrma-docs.phrma.org](http://phrma-docs.phrma.org) pdf

# AI for Drug Discovery, Biomarker Development and Advanced R&D Landscape / 2018 Q4

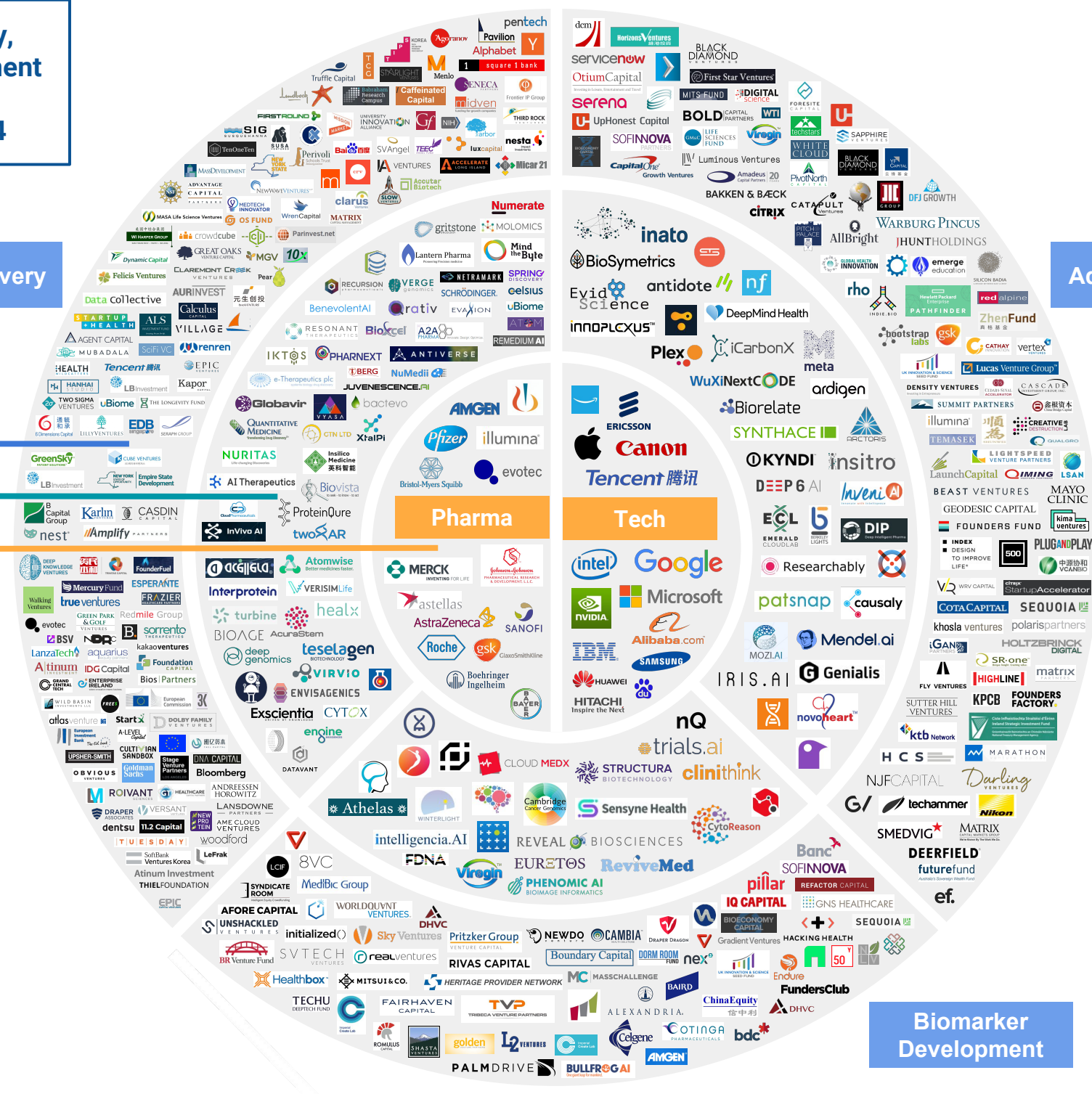
Companies - 130  
Investors - 320  
Corporations - 30

Drug Discovery

Advanced R&D

Investors  
AI Companies  
Corporations

AGING ANALYTICS AGENCY  
DEEP KNOWLEDGE ANALYTICS  
LONGEVITY INTERNATIONAL



Biomarker Development

# AI for Drug Discovery, Biomarker Development and Advanced R&D Landscape / 2018 Q4

Companies - 130  
Investors - 320  
Corporations - 30

## Regional Position

Investors  
AI Companies  
Corporations



Canada

UK

Other Regions

EU

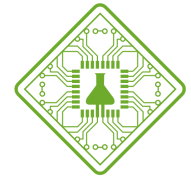
Asia

AGING ANALYTICS AGENCY

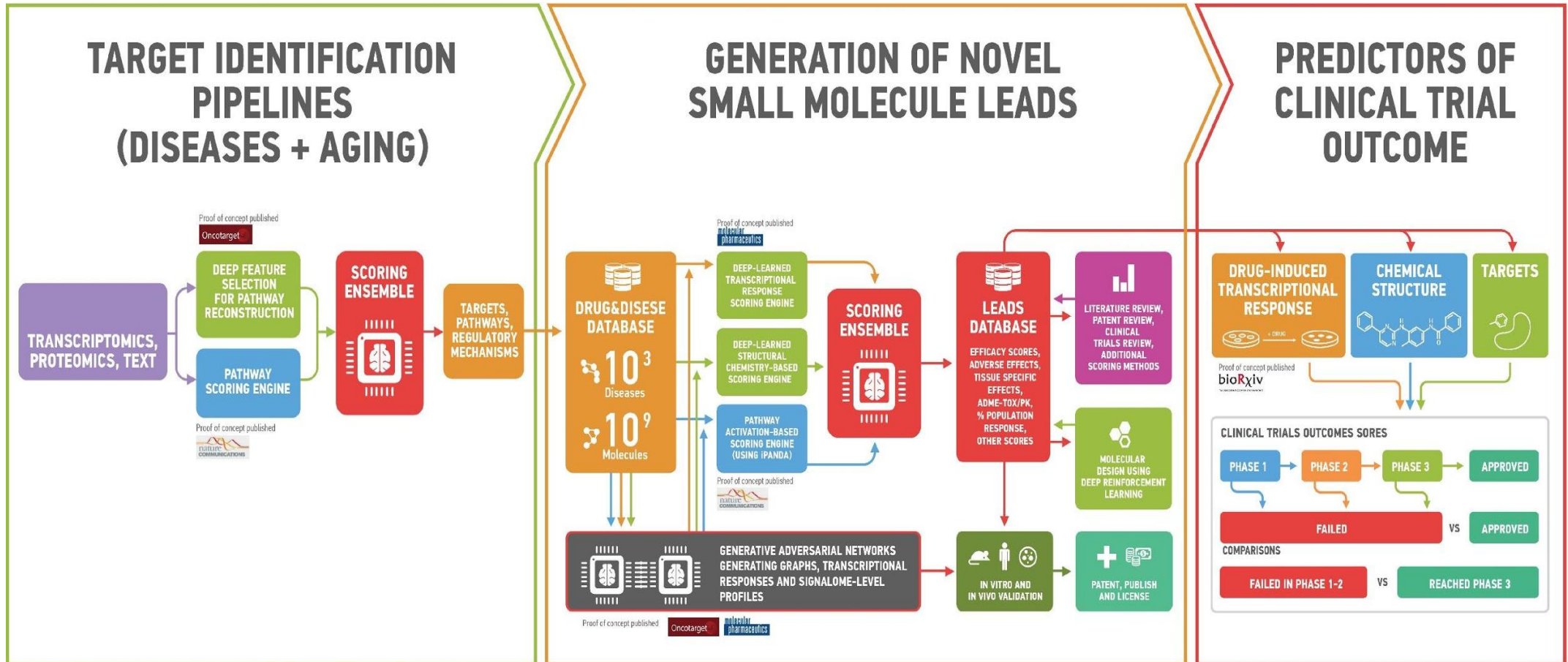
DEEP KNOWLEDGE ANALYTICS

LONGEVITY INTERNATIONAL

# End-to-end drug discovery pipeline in the industry utilizing next-generation artificial intelligence



英科智能  
Insilico Medicine



# INSILICO MEDICINE / DRUG DISCOVERY ENGINE

## DRUG & DISEASE DATABASE



PROOF OF CONCEPT  
PUBLISHED



DEEP LEARNED  
STRUCTURAL CHEMISTRY-BASED  
SCORING ENGINE



UNPUBLISHED

PATHWAY SCORING ENGINE  
PROOF OF CONCEPT PUBLISHED



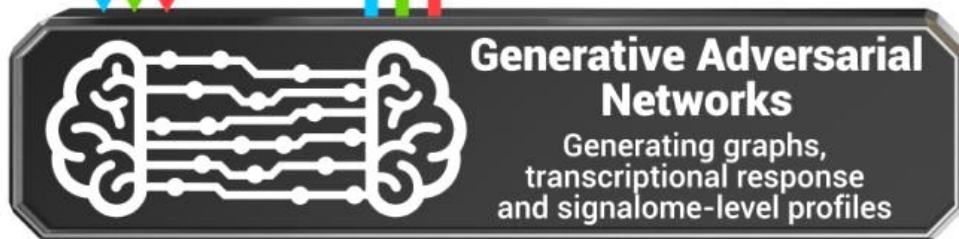
## LEADS DATABASE



Literature Review,  
Patent Review,  
Clinical Trials Review,  
Additional Scoring Methods

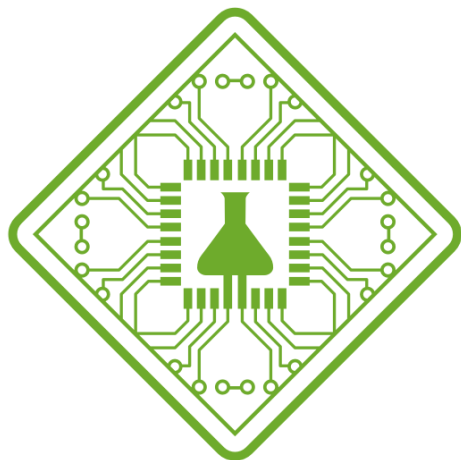


Molecular Design Using  
Deep Reinforcement  
Learning





# AI Companies in Longevity



英科智能  
Insilico Medicine

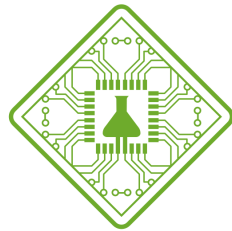


**Atomwise**  
Better medicines faster.

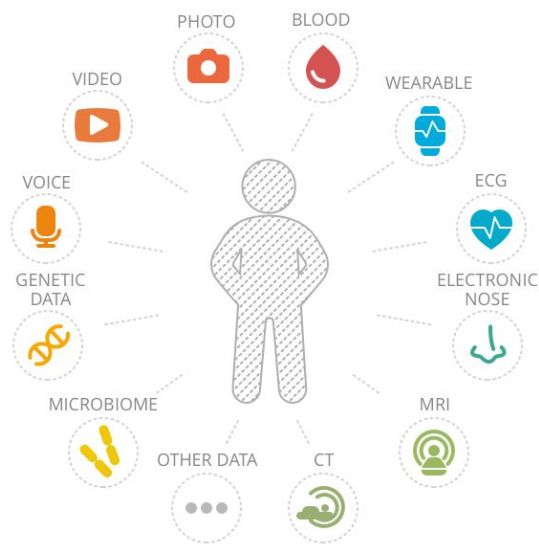




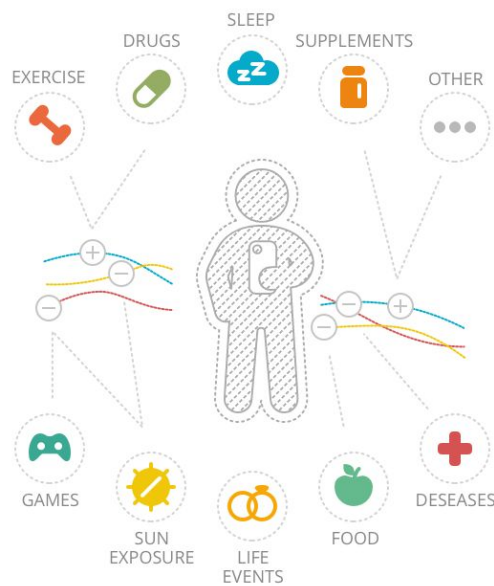
# Insilico Medicine Aging.AI 2.0



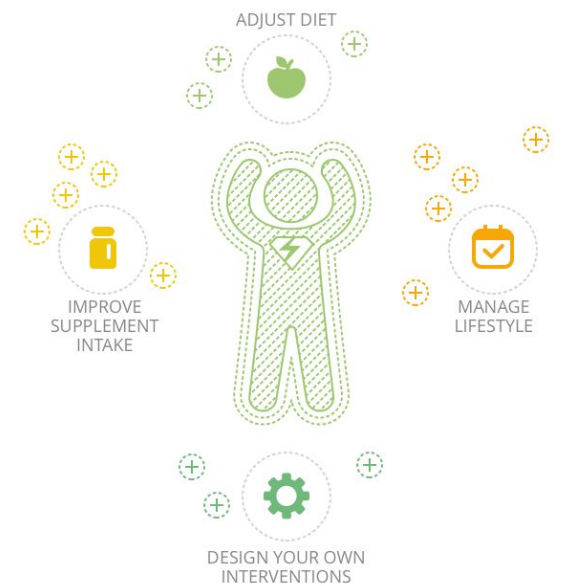
英科智能  
Insilico Medicine



Track your age  
at every level!



See what makes you  
younger or older!

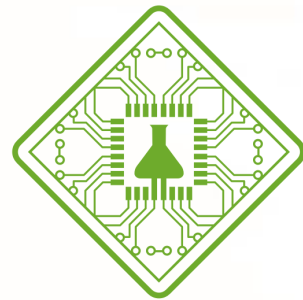


Stay young!



# Insilico Medicine Earns Accolades from Frost & Sullivan

F R O S T & S U L L I V A N



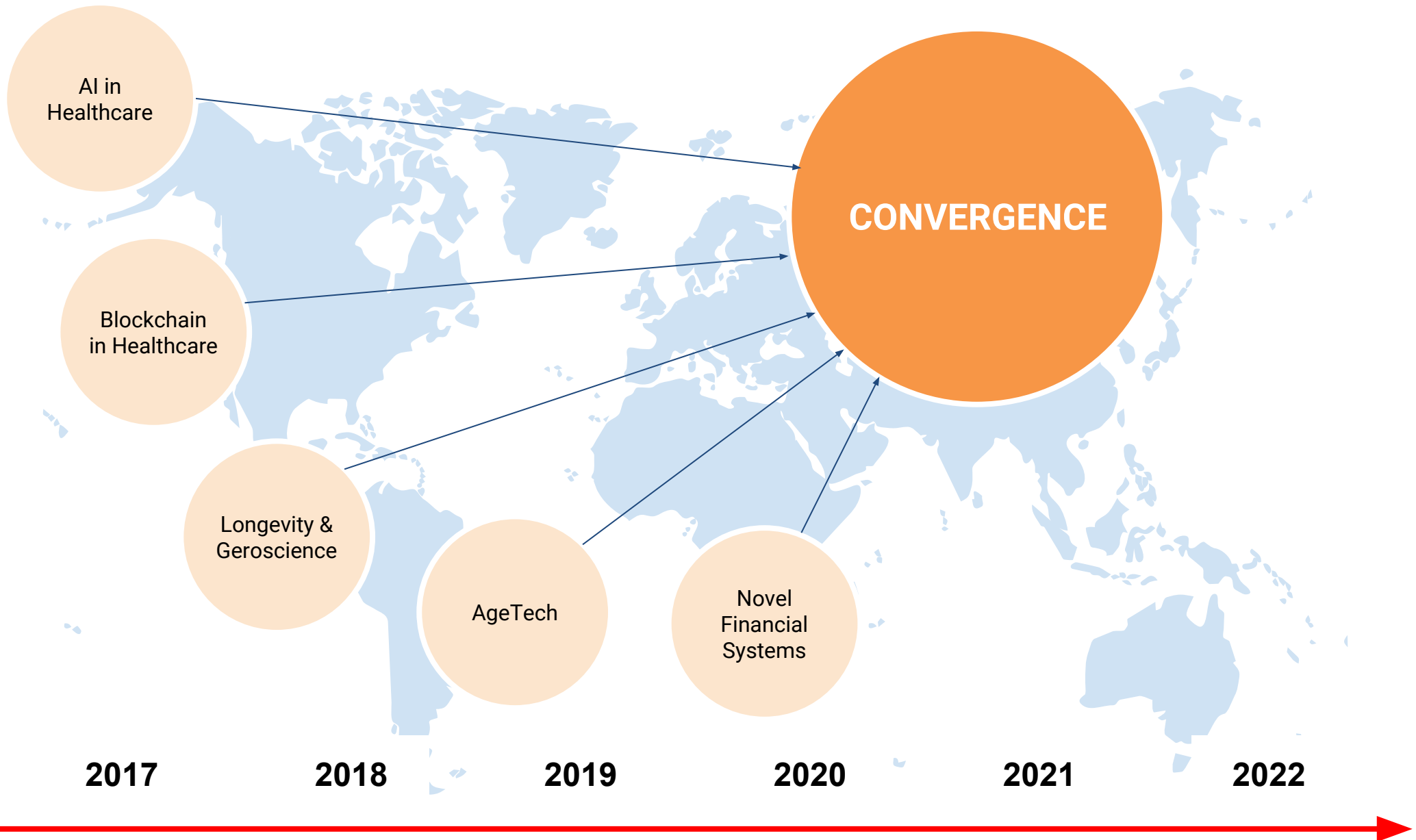
英科智能  
Insilico Medicine

2018 North American Artificial Intelligence for Aging Research  
and Drug Development Technology Innovation Award



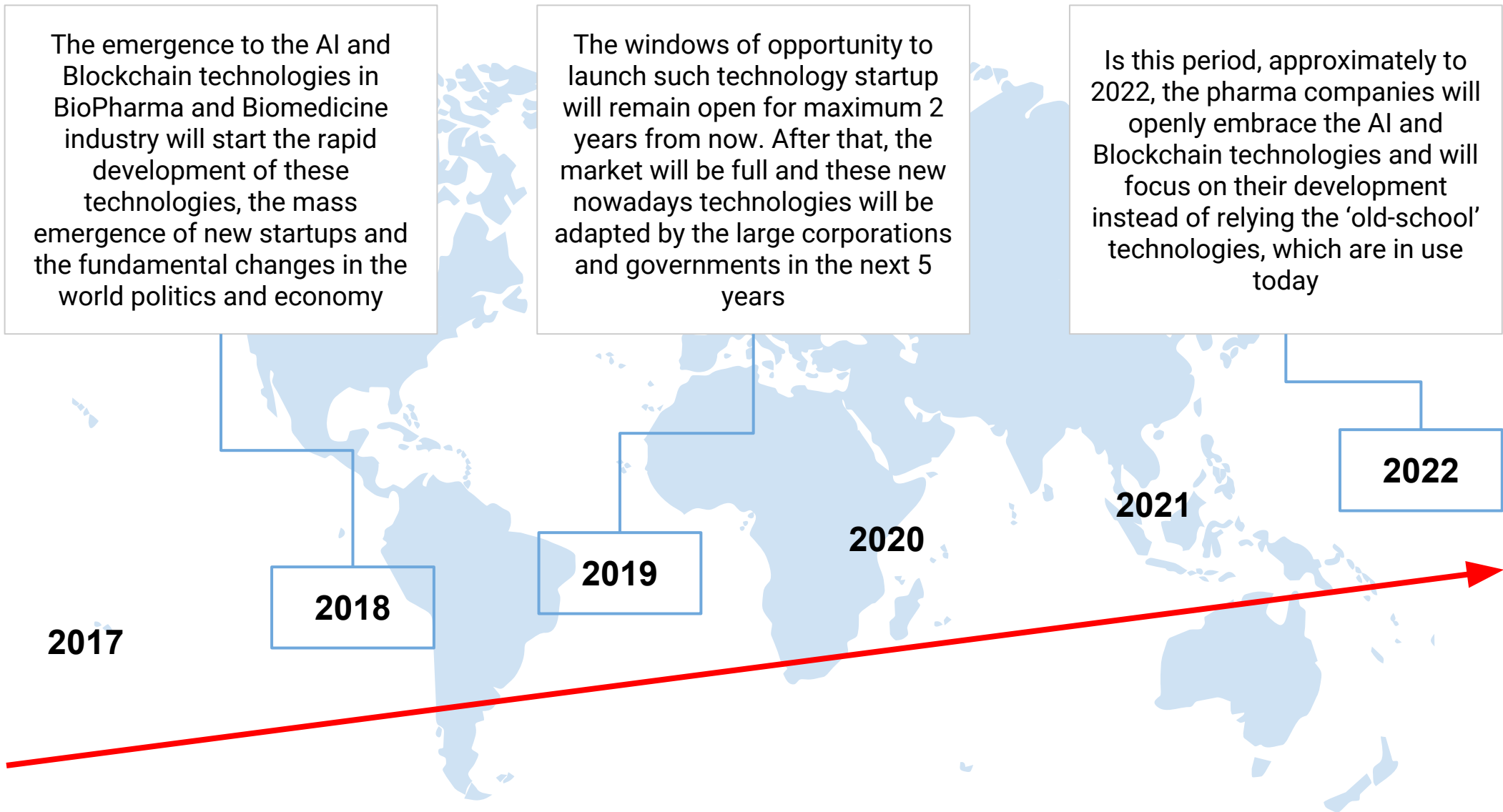
# Longevity and Convergence of Technological Megatrends

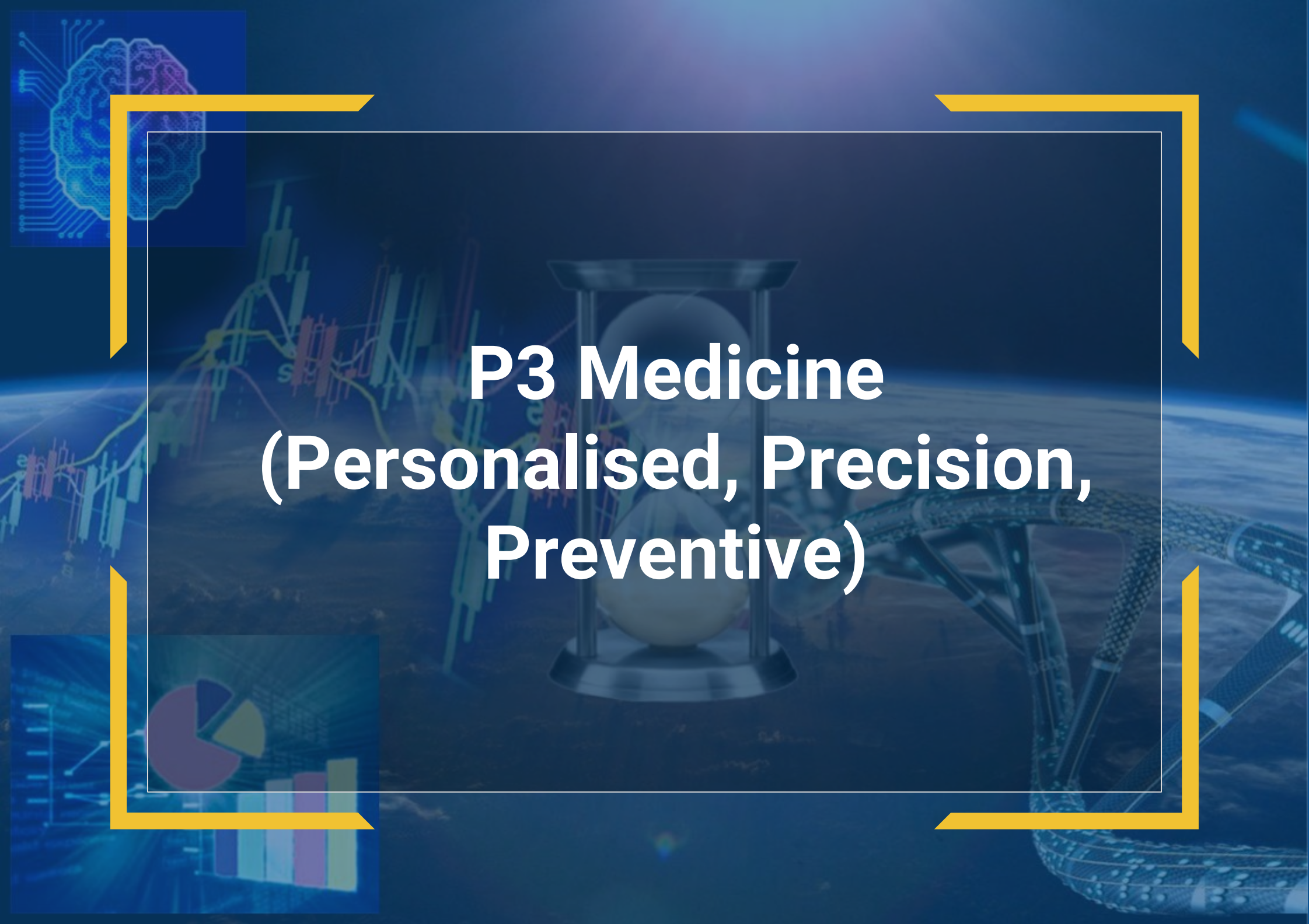
# Convergence of 5 Mega Trends in the BioTech and BioMedicine Industries





# Consequence: The Major Shift in the BioMedicine Industry





**P3 Medicine  
(Personalised, Precision,  
Preventive)**

## P3 Medicine Clinics:

- Personalized
- Precision
- Preventative

The following section gives a broad overview of the emerging P3 (personalized, precision and preventive) Medicine market, including the core technologies underlying the market, timelines for the growth and development of its core technologies, and a roadmap toward the creation of the optimal P3 Medicine clinic.

### Topics covered include:

- Overview of the optimal Model of P3 Clinic Platform
- Overview of the P3 Medicine Market - Present & Projected
- Timeline for Completion of Technologies from 100 Companies Underlying optimal P3 Clinic Platform
- Roadmap Toward the optimal P3 Clinic





# Overview of the Progressive Model of P3 Medicine Platform

Personalisation and precision of diagnostics, prognostics and treatment for individual patients



Healthy lifespan extension and ageing processes reversal to a young state

01

Exclusive access to advanced restorative medicine technologies

- Exclusive safe testing of novel therapies on individual's stem cells, skin and other organs

02

Personalized longevity programs

- Personalised diagnostics, prognostics and therapeutics
- Virtual human body for health monitoring

03

Health management by world leading experts

- Continuous health monitoring by the world leading experts

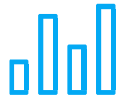
# Pipeline for the Progressive Model of P3 Medicine Platform

## Precision Diagnostics



- Multi-Omic Sequencing
- Non-invasive continuous monitoring
- Total-body imaging

## Advanced Prognostics



- Virtual Human Prognostics
- Personalised *in vitro* Prognostics
- AI & Deep Learning-based prognostics

## Personalised Experimentation



- Intelligent *in silico* Experimentation
- Personalised *in vivo* experimentation on human skin
- AI & Deep learning-based biomarker development

## Preventative Treatment



- Gene therapies
- Cell therapies
- Tissue engineering
- Small molecules & biologics





# Precision Diagnostics



**Digital avatar visualizes a combination of biomarkers and other diagnostic**

## Collect your data today:

- Blood samples
- Biomarker analysis
- Database of personal biomedical data stored on blockchain

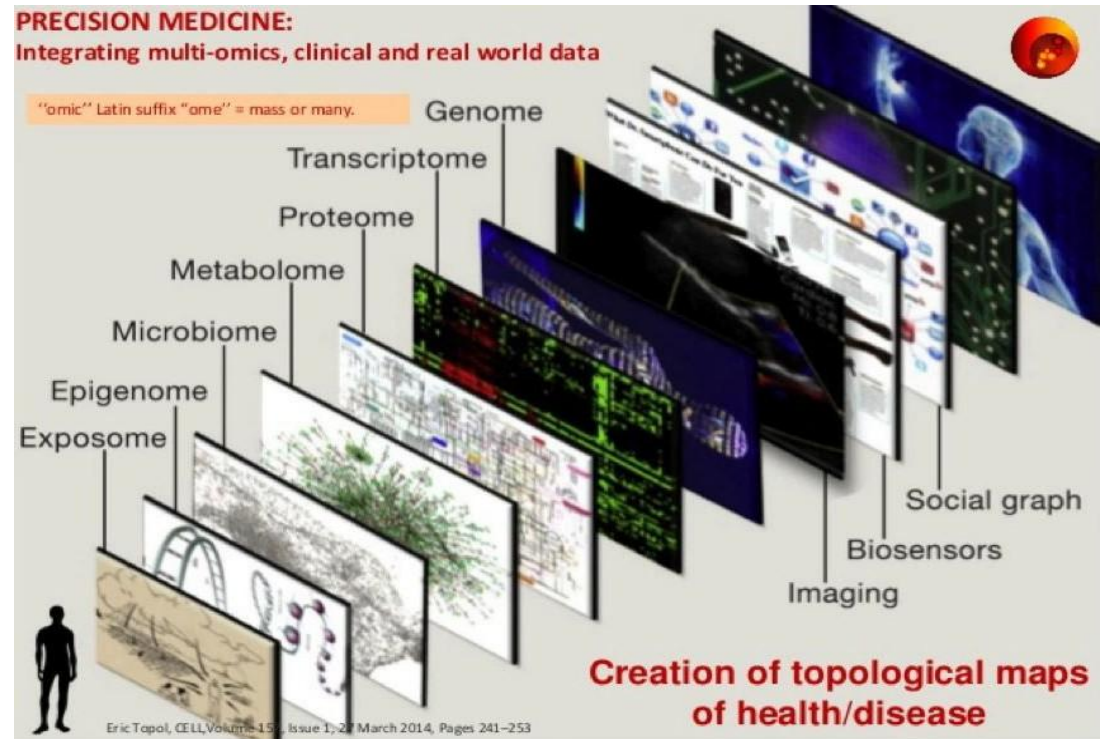
## Future benefits:

- Data driven analysis of biomarkers dynamics over time
- Analyse the changes in your digital avatar
- Personalized interventions

# Precision Diagnostics



- Multi-Omics Sequencing
- Non-invasive continuous monitoring of biomarkers
- Multi-modal total-body imaging
- Qualitative functional tests
- Whole-body and organ specific biological age calculation based on biomarkers
- 3D integration of cross-sectional tissue and organ imaging



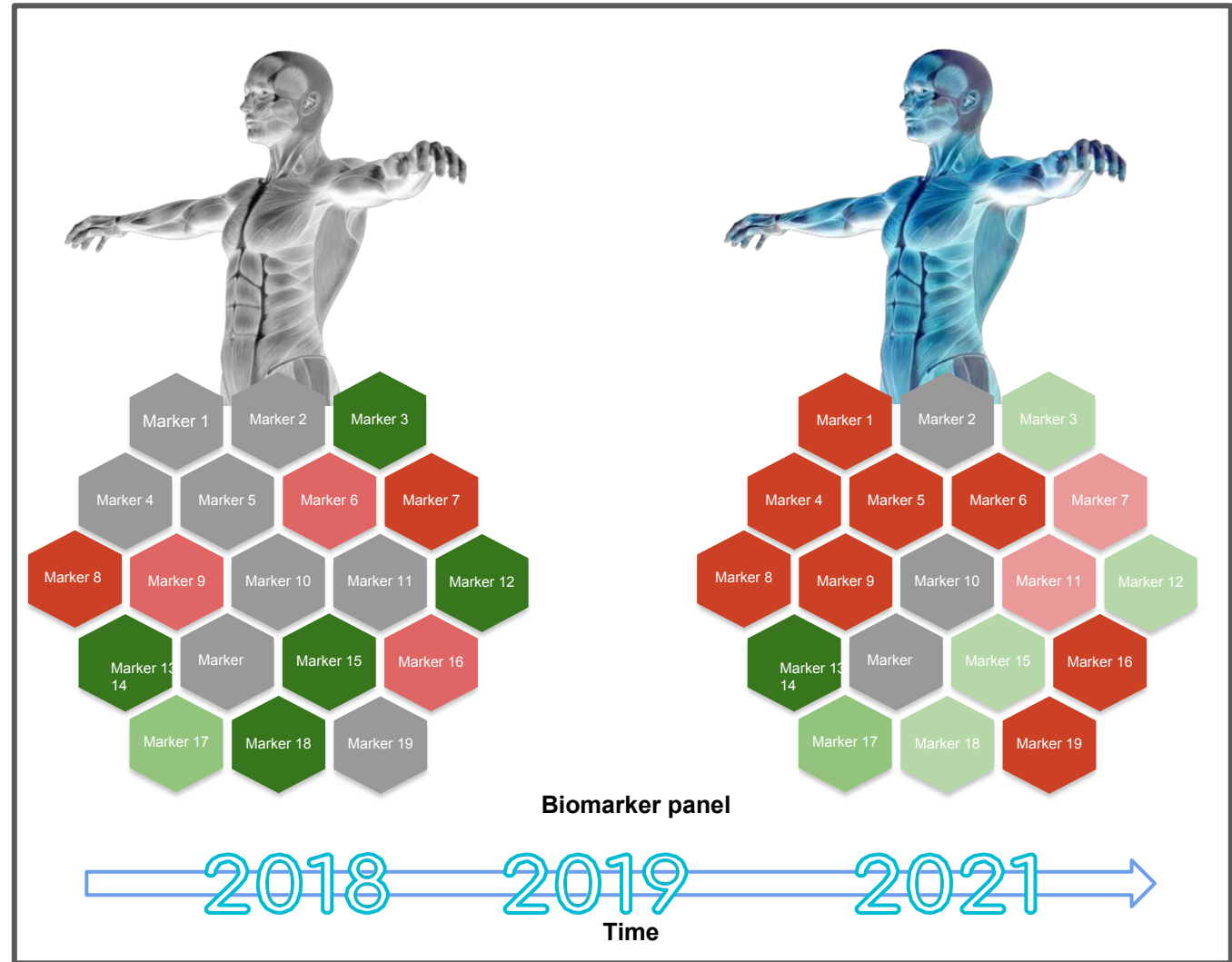
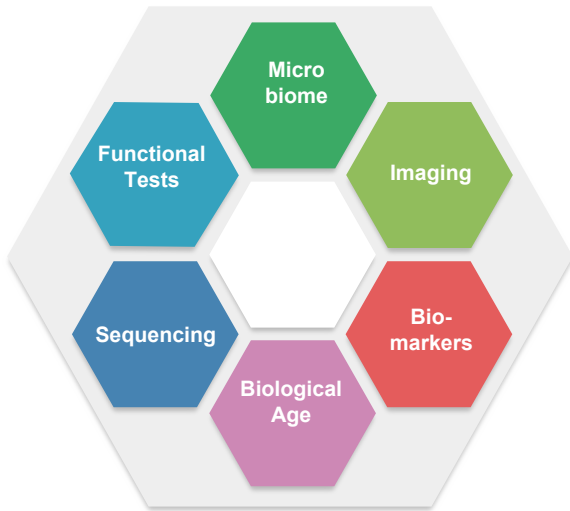
**Young.AI** is one such digital avatar, powered by AI to take biological data and assess patient health and age. The power of taking patient information and plugging into an AI-driven, digital environment is that not only does it enable insights impossible to obtain otherwise, but it allows for a powerful analysis of all these layers of data **over time**.

A truly 3D visualisation of patient health includes time, and follows not only deteriorations but also improvements over custom timeframes that allow interpretation based on personal circumstances including changing lifestyle, trialling treatments, etc. As such, a patient may be able to see how their body has been changing over 5 years in terms of health, function, biological age, etc.

A patient may see that their **biological age** is 36 in 2021 - younger than a couple of years before, and younger than their chronological age of 37.



# Diagnostics Panel for Digital Avatar

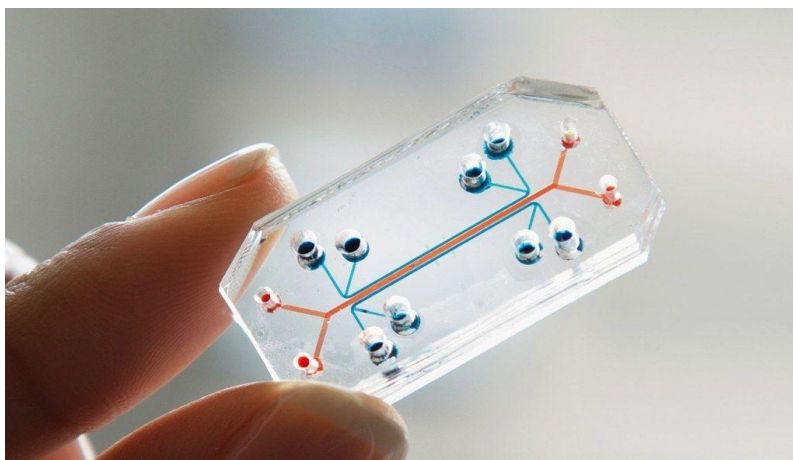




# Personalized Experimentation



- Intelligent in silico experimentation
- Personalised in vivo experimentation on human cells
- Organ-on-a-chip systems
- Real time tracking of changes in health and aging biomarkers in response ongoing treatments
- Personalised ex vivo experimentation on 3D bioprinted tissues and organs using patient-specific cells
- AI based personalized biomarker development and drug response profiling via Deep Learning and Generative Adversarial Networks





# Preventive Treatment

- Gene therapies
- Cell therapies
- Tissue engineering
- Small molecules & biologics
- Natural mimetics of validated geroprotectors (e.g. metformin, rapamycin)
- Genetically engineered cell therapies
- 3D bioprinting
- Microbiome engineering





# Preventive Treatment



Small doses of medications



Measurement of biomarkers

Personalized dose optimization

Digital avatar visualization



New intervention



# Chronological versus Biological Age



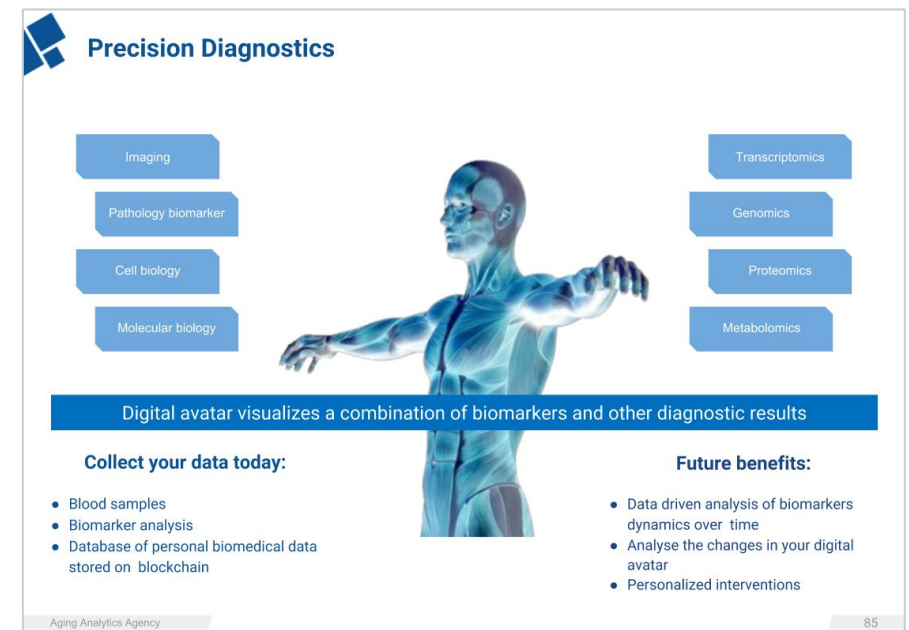
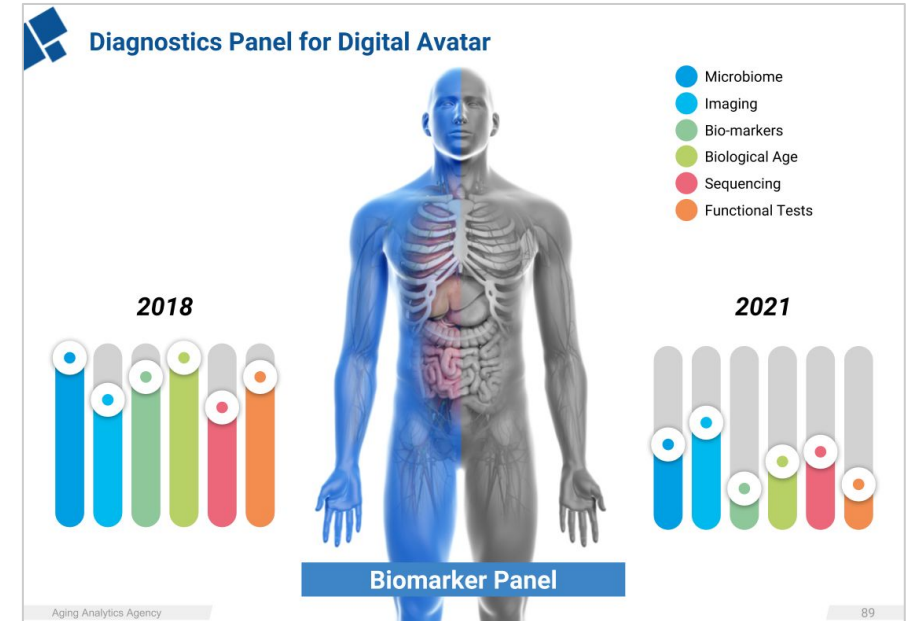
## Chronological Age

- Measure how many times you, in this body, have revolved around the sun
- Cannot be altered by mind/body approaches
- Has little relevance to how you feel and function

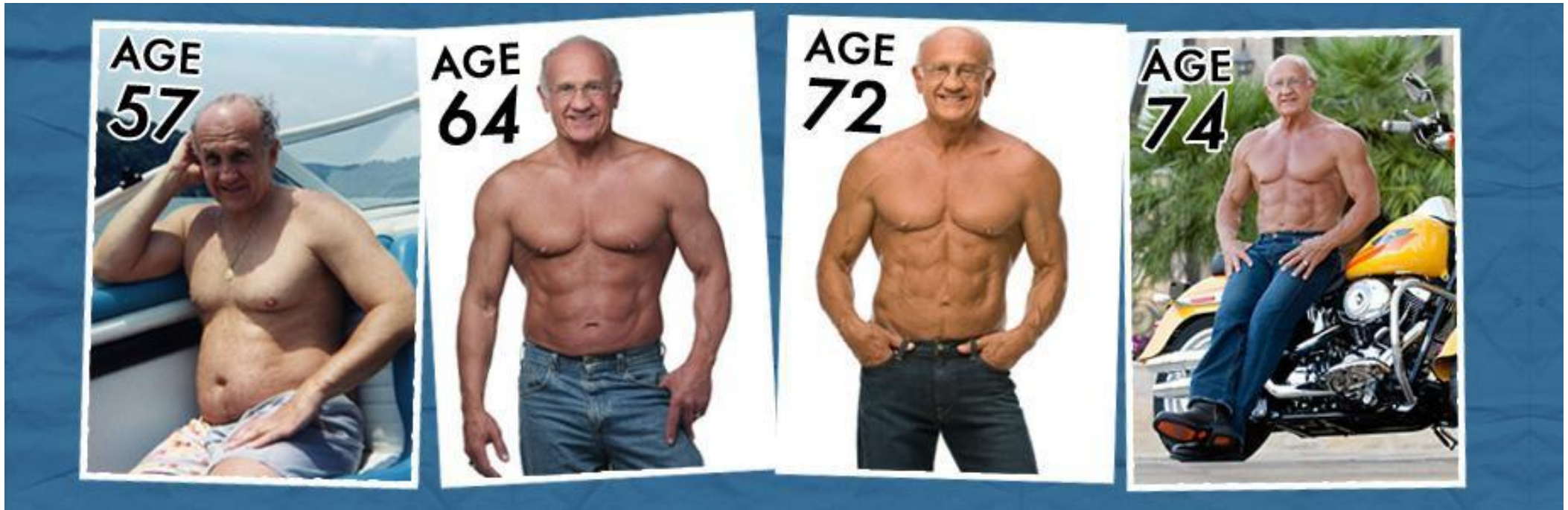


## Biological Age

- Measures how well your physiological systems are functioning
- Can be reversed by attending to your health
- Is the most important component of the aging process



# The Example of Jeffry Life



“Today at 78 years of age I am in the best shape of my life. I am in the gym 5 days a week. I have a thriving practice in Charleston, West Virginia (The Life Center for Healthy Aging), and I have authored three books: *The Life Plan*, *Mastering the Life Plan* and *The Life Plan Diet*. *At the end of 2012 Men’s Fitness Magazine* selected me and 24 others as the top 25 fittest men of the year. The other 24 honorees were men in their 20’s and 30’s and most were professional athletes or actors. The program works, I am living my dream, and there is no end in sight. It just keeps getting better.

It would have never happened if I had not made the decision to live a healthier life. While your life may not take the same path as mine, it most certainly can be more productive, happier, and healthier for longer if you start taking care of it now. *It is never too late, nor too early, to start living a healthy and fit lifestyle.*”

– Dr. Life



# Longevity & Advancing Financial Industry



# Next Multi-Trillion Underdeveloped Market for Financial Institutions

## AgeTech Market

Globally

1 Billion on Retirement

In the UK

10 Million on Retirement

“ The one billion retired people globally are a multi-trillion dollar opportunity for business ”

– *Dmitry Kaminskiy interview in the Financial Times.*

The global aging demographic challenge, and the prospect of technological solutions (digital, biomedical and financial), are now recurring talking points at conferences hosted by major investment banks. The previous slides exemplify a sliver of such conferences from the past two years. The **Deep Knowledge Group**, consisting of **Deep Knowledge Ventures**, **Aging Analytics Agency** and **Deep Knowledge Analytics**, lies at the heart of the emerging Longevity industry and is committed to furthering the conversation via similar events.



*“Longevity is a blessing. And as an investor, it provides you opportunities to benefit from compounding and to have a longer investment horizon. But if you don’t prepare for it, you are left with two options: Work longer in life, perhaps much longer than you’d like, or hope you’ve been good to your children and that they’ll be willing to care for you in your old age. And, second, I hope you’ll speak out. Longevity is an issue of social justice that will have a more profound impact on your generation than on any generation before. If we don’t start to address it – not just in this country but globally – we’re going to see fewer job prospects for young people, higher unemployment, lower growth and many older people – maybe your parents – left without the means to support themselves.”*

**– Larry Fink, Chairman of Blackrock Capital**

*“There will come an age when our average life expectancy will reach 200 years.”*

**– Masayoshi Son, CEO of SoftBank and Vision Fund.**



*“To finance longer life spans, we must convince individuals to start investing now for the long term. But longevity should be an asset that can be leveraged, not a curse.”*

**– Laurence D. Fink, BlackRock Capital, Chairman of the World’s Biggest Investment Fund, with \$6.28 Trillion under management.**

The current financial system was designed 50-100 years ago, at a time when no one could imagine that life expectancy could increase at all, nevermind to the extent with which it has actually increased in the past 50 years. To adjust to the current reality nations will have to endure multiple financial paradigm shifts, and experience of several significant financial crisis cycles. And they will have to enable these shifts fast if they hope to avoid systemic stagnation, within the next 10-15 years.

The backbone of today’s global financial system do not possess the resources or infrastructures needed to enable such rapid adaptation and adjustment. This is why this report concludes that the necessary changes required to weather this storm will be deep and fundamental shifts, almost equal to the creation of wholly novel financial system from scratch.

This chapter considers how a preliminary blueprint of the novel financial Longevity economy should be designed, and outlines major topics which will be covered in greater detail in a forthcoming special report later this year titled **“Novel Financial System”**.

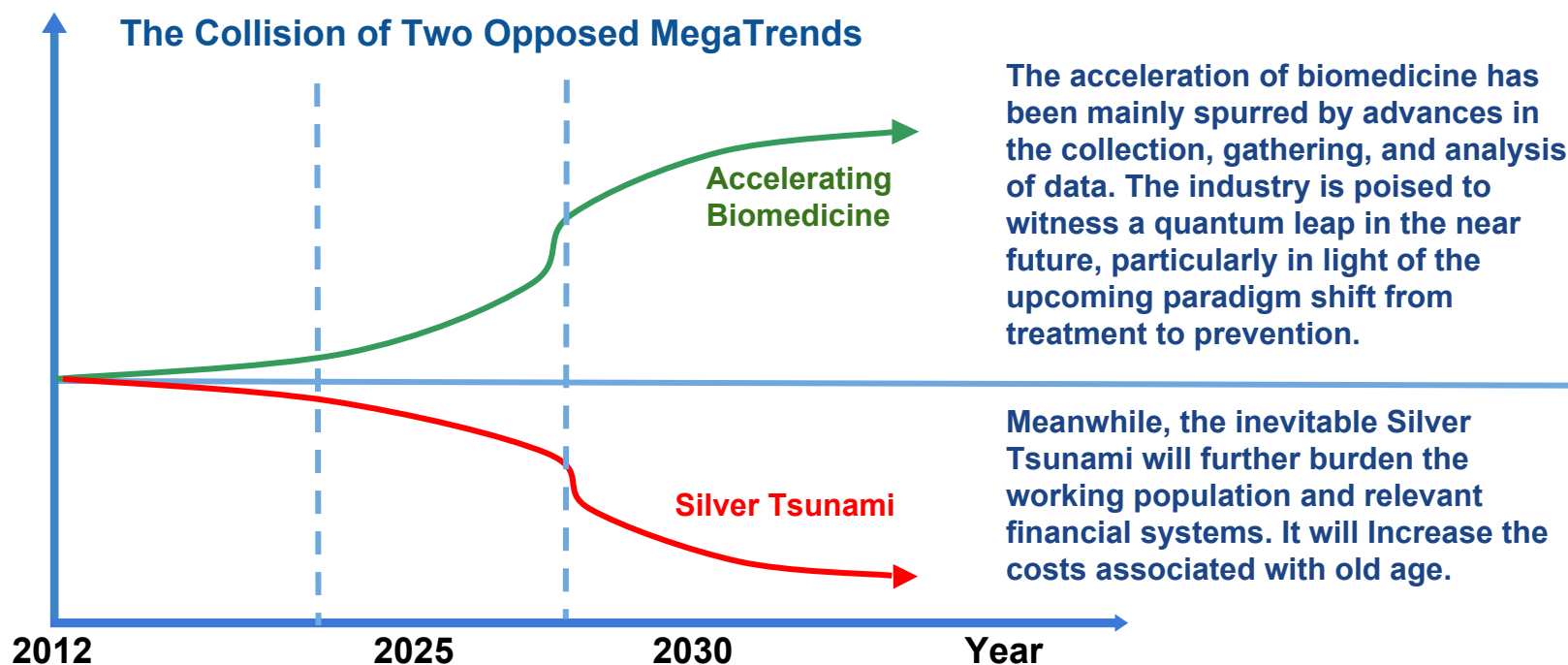
*“The future of the longevity industry not only has the logical potential to become the wealthiest industry in all of history, but also represents the most ethical way of doing business.”*

**– Dmitry Kaminskiy, Managing Partner, Deep Knowledge Life Sciences.**

## Novel Financial Systems in the Age of Longevity

Chapter VII of the Global Longevity Industry Landscape Overview Volume II: The Business of Longevity outlines the collision of two global megatrends, about to collide like matter and antimatter, resulting in a global shockwave that will inevitably result in the creation of **Novel Financial System**.

- **The silver tsunami** (global aging population) described previously, and the concomitant global stagnation of the biopharma, national economies and healthcare systems.
- **The acceleration of biomedicine** as a result of its convergence with data science.

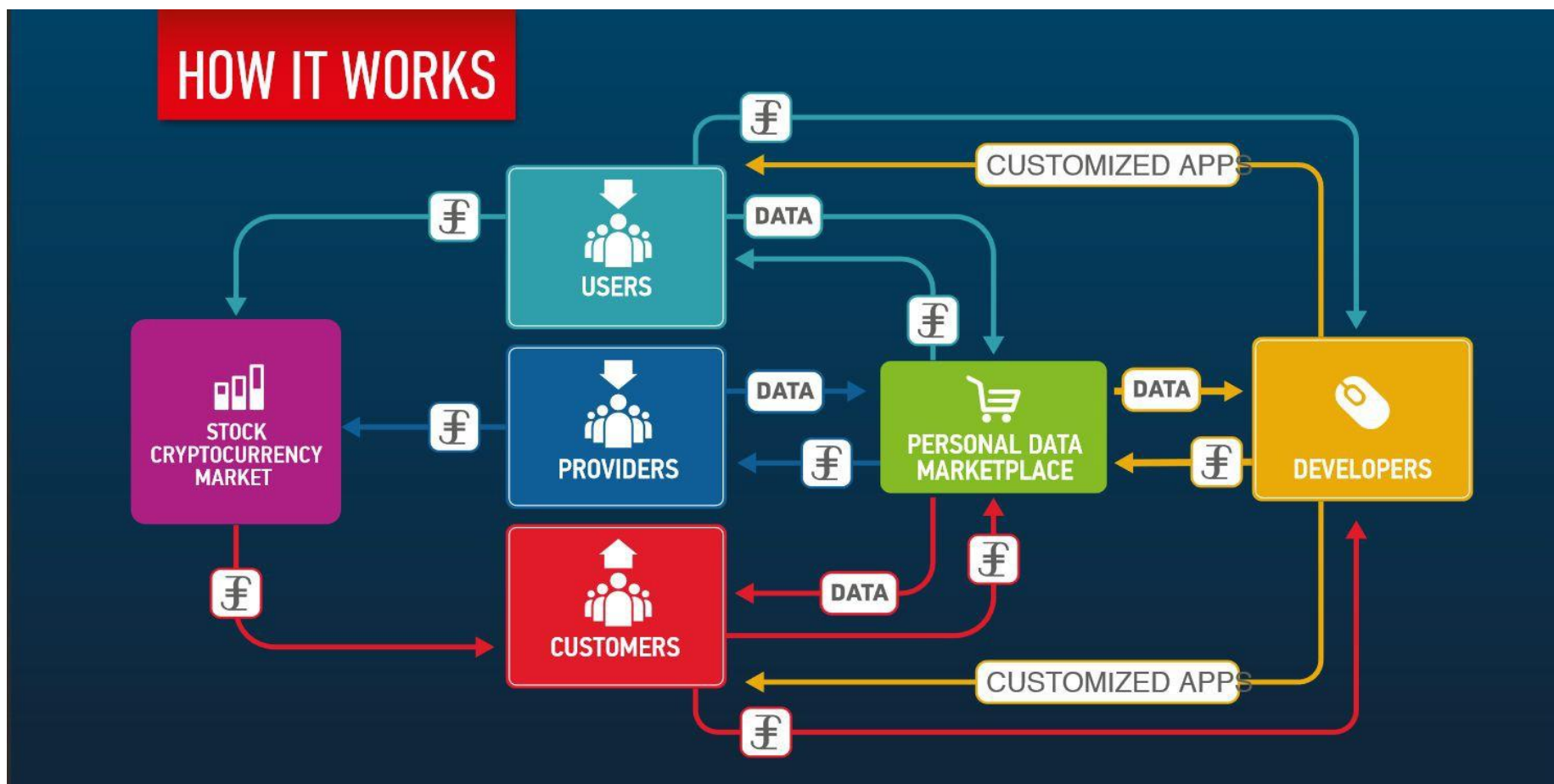


We consider the implications, opportunities and threats involved in this shift, and examine the range of tools at our disposal for making step-by-step predictions and forecasting for various possible futures. We analyze who will be left standing, who will thrive, and who will be swept away by the Silver Tsunami. The following chapter offers an overview of the factors involved with this analysis.



# Tying Healthcare Data to the Financial Industry: Longgenesis as a Case Study

Longgenesis was born out of a partnership between Insilico Medicine, a biotechnology company focused on deep learning for drug discovery and biomarker development, and the Bitfury Group, one of the largest private infrastructure providers in the Blockchain ecosystem. The pair aim to foster a decentralized ecosystem for exchange and utilization of human life data. They plan on achieving this by building a revolutionary platform that marries nextgen artificial intelligence and blockchain technologies. Their ultimate mission is to improve human performance, extend life, and prevent disease.







# Financial Futurism

*Dictionary.Com* defines 'futurism' as:

***"The study or forecasting of trends or developments in science, technology, political or social structure, etc."***

So intertwined are the fates of technology and finance at this juncture in history that predicting them calls for a form of **'financial futurism'**.

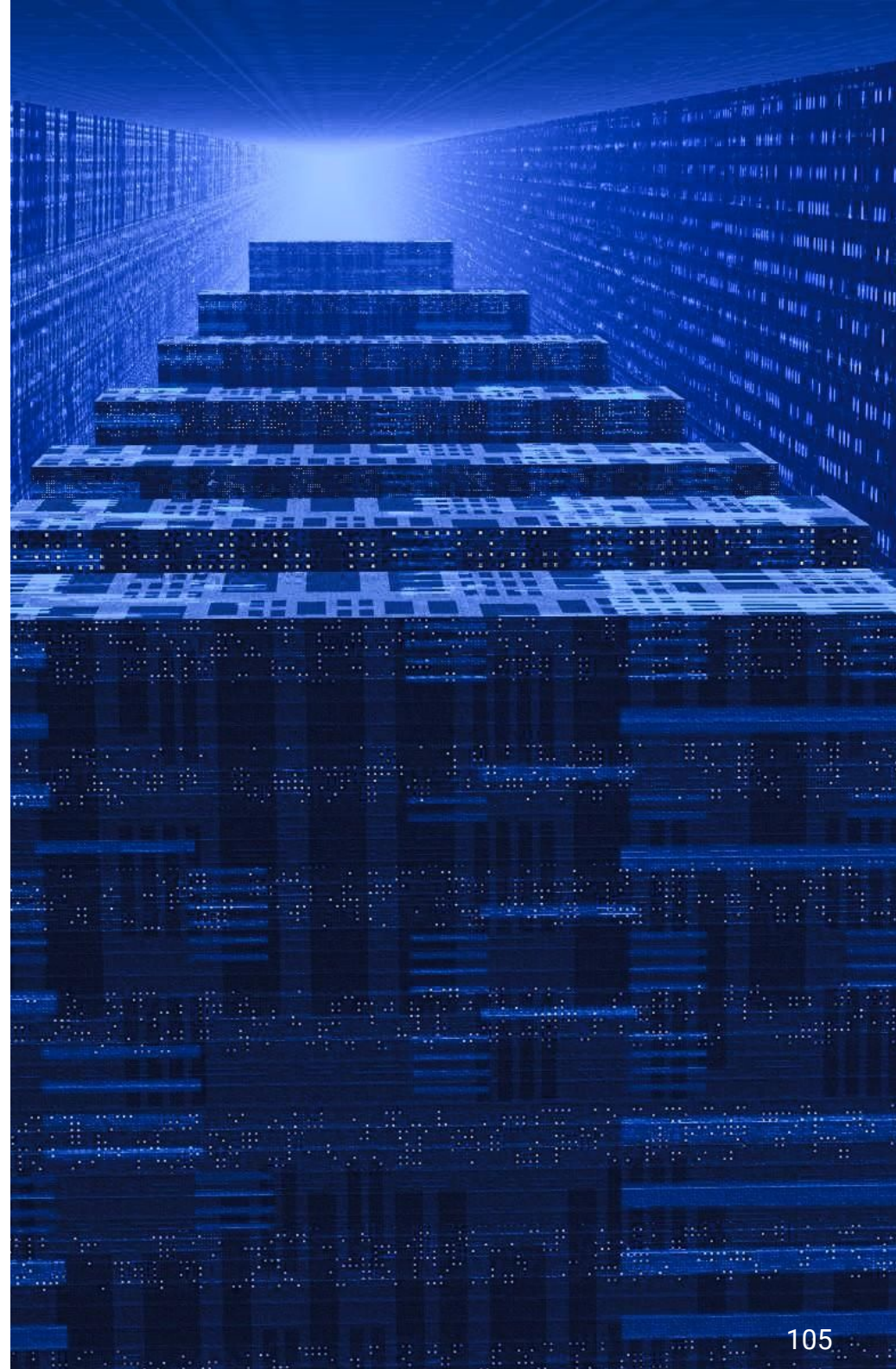
In this chapter we apply forecasting methods to identify possible scenarios and create a roadmap for how financial entities could evolve from scratch in the novel financial realm.

## **The Pathway toward Financial Futurism**

Looming changes to the global financial system resulting from the convergence of two collapsing megatrends, the Silver Tsunami and advancing Longevity industry, will shake the global financial system.

### **Financial institutions that don't adapt will not survive in their present form**

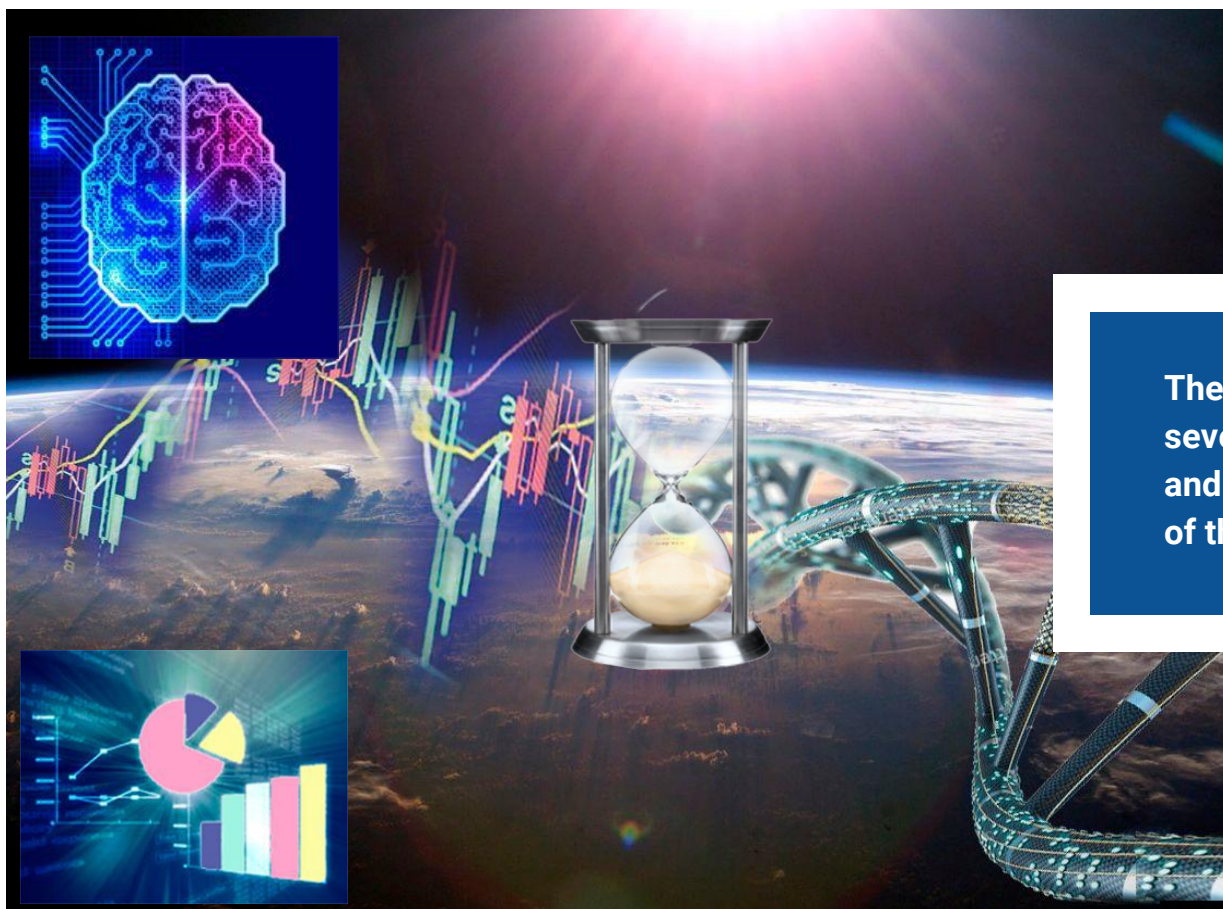
After the tsunami has passed, such economies will have reformed themselves beyond recognition, absorbed by novel financial institutions and systems, or transformed by government initiatives of progressive technocratic countries.





*“There have been many well documented efforts to predict the future of biomedical progress, but is there any good reason why the same logic could not be applied for the financial sphere? Many thought leaders have made reasoned predictions on how some fragments of collapsing financial systems will evolve, adapt and adjust to increasing life expectancy. We should work to assemble the framework of scenarios regarding the evolution of financial system in the next 10 years, and create the pathways that will be able to neutralize collapses and accelerate the dynamic of progress of the longevity industry, with a focus on extension of healthy period of life for the betterment of all of humanity.”*

**– Dmitry Kaminskiy, Managing Partner, Deep Knowledge Ventures**



The following pages give an initial overview on how several potential types of financial institutions could and should operate in the next 5 - 10 years in the face of these changes.



*“The way we prioritize projects at Insilico Medicine is by looking at the number of quality-adjusted life years (QALY) each project can generate. It is the most altruistic cause and the most effective investment. If you add just one year of life to everyone on the planet, you generate over 7 billion QALY.”*

*“The majority of politicians and the general public are unaware of the tremendous potential benefits of regenerative medicine. They fail to grasp the profound implications that extended longevity could have on the global economy, on their respective nation’s economic survival, and on their own lifespan and health.”*

**– Alex Zhavoronkov, Chief Science Officer of the Biogerontology Research Foundation and a scientific advisor on the reports**



*“A mere three years ago the rise of the Longevity Industry was yet unthinkable. Now, a mere few years later, it has become unthinkable to consider biomedicine without healthy longevity. The time has come to establish a framework for the rising Longevity Industry.”*

*“The future of the longevity industry not only has the logical potential to become the wealthiest industry in all of history, but also represents the most ethical way of doing business.”*

*“Aging is the ultimate evil. To invest in Anti-Aging technologies is the most ethical business, and to donate to longevity research is the most effective form of altruism.”*

**– Dmitry Kaminskiy, Managing Partner of Deep Knowledge Ventures**



*“The entire system is now wired toward the short term. Banks and securities firms grow revenue from the velocity of money. So they have a short-term incentive. Media, especially in the online age of the 24/7 news cycle, draw traffic from hyper-focusing on the latest developments... But they should do just the opposite, taking advantage of their longer investment horizon to keep their money working for them. Because let’s face it – if you have 25, 30 or 40 years to save for retirement and 20 or 30 years to fund in retirement, you should not be worrying about what’s happening this second, today, this week – even this quarter.”*

**– Larry Fink, Chairman of Blackrock Capital**

*“People are living longer than ever before, dramatically altering the financial challenges of retirement. Increased longevity is a blessing, but it’s an expensive one because that translates into the need for a bigger retirement nest egg and access to secure, retirement-long income. As our survey suggests, many Americans simply won’t have the money they need to enjoy their longer lives if they don’t start investing differently.”*

**– Rob Kapito, President of Blackrock Capital**

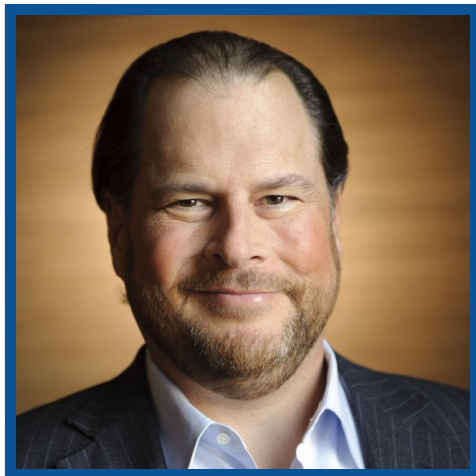


*“I’m actually pretty optimistic about the U.S. economy. But Europe’s got real challenges. A lot of that is due to the demographics in Europe. China has been the engine of growth for the world for the last 20 years, or the last 10 years in particular, but that’s not sustainable. So you’re looking at a world where growth is going to be more challenged than it’s been, unless you see some really big jumps in productivity.”*

**– Bill McNabb, Chair of Vanguard**



# Key Players in the Tech Industry on the Subject of Longevity and Long Term Planning



*“Every country needs a Minister for the Future”*

– **Mark. R. Benioff, Chairman and CEO of Salesforce**



*“With some longer term, moonshot thinking around healthcare and biotechnology, I believe we can improve millions of lives”*

– **Larry Page, CEO of Google**



*“The opportunity to raise the quality of life is the biggest business opportunity going”*

– **Anand Mahindra, Chairman and Managing Director of Mahindra & Mahindra**



*“Death never made any sense to me”*

– **Larry Ellison, Founder of Oracle**



## AGING ANALYTICS AGENCY

[www.aginganalytics.com](http://www.aginganalytics.com) | [info@aginganalytics.com](mailto:info@aginganalytics.com)

**Aging Analytics Agency** is dedicated to the production of industry analytical reports on the topics of Longevity, Personalised and Preventive Medicine. It is the only analytical agency focused exclusively on Ageing, Geroscience and Longevity. Operating for over five years, we began producing in-depth reports on Longevity long before it emerged as an industry. In 2014 we successfully predicted the boom in industry development and financing rounds in 2017, at a time when the vast majority of investors, business analysts, and even geroscientists believed its emergence to be in the next decade. The company also provides strategic consulting in the fields of Longevity, Preventive Medicine and Advanced Biomedicine.



## LONGEVITY INTERNATIONAL

[www.longevity.international](http://www.longevity.international) | [info@longevity.international](mailto:info@longevity.international)

**Longevity.International** is an online interactive database of longevity scientists, companies, and investors. This platform allows different stakeholders in the longevity industry to connect, network, research and analyze.

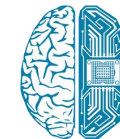
On the next stage this platform will also employ cutting-edge data visualization software and a networking section where various stakeholders within the longevity industry can connect and collaborate, where longevity companies are matched with the right investors, and where scientists can make contributions.



## LONGEVITY.CAPITAL

[www.longevity.capital](http://www.longevity.capital) | [info@longevity.capital](mailto:info@longevity.capital)

**Longevity.Capital** is a specialised Longevity industry Index Hedge Fund with enhanced liquidity that uses hybrid investment technologies to combine the profitability of venture funds with the liquidity of hedge funds, thus significantly de-risking the interests of LPs and providing the best and most promising Longevity companies with relevant amounts of investment.

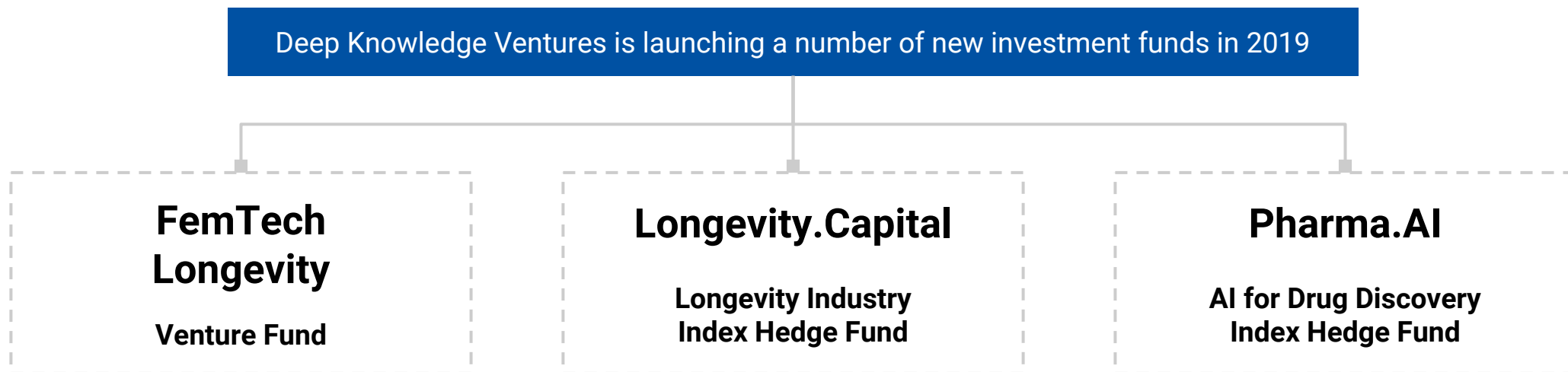


## DEEP KNOWLEDGE ANALYTICS

[www.dka.global](http://www.dka.global) | [info@dka.global](mailto:info@dka.global)

**Deep Knowledge Analytics** - the analytical arm of Deep Knowledge Ventures, specialising in forecasting on the convergence of technological megatrends, conducting special case studies and producing advanced industry analytical reports on AI, DeepTech, Blockchain and Invest Tech.

# New Specialized Index Hedge Funds Planned by Deep Knowledge Ventures for 2019



Aging Analytics Agency and Deep Knowledge Analytics will remain the main sources of expertise behind these funds, providing the necessary analysis to develop and **de-risk investment strategies**. The new funds will provide **financial products** similar to hedge funds.

The incorporation of both organizations' expertise into these new funds allows investors to enjoy the **profitability** of VC funds, but without the usual **liquidity** issues such as lockup periods.

Furthermore, Analytics Agency and Deep Knowledge Analytics are seeking to engage with potentially interested financial institutions to collaborate in promoting Longevity as a **concrete, realistic prospect** in the eyes of investors.

To better link investors with expertise, the Agencies are seeking prestigious venues where **investor relations** can be **cultivated**, **financial institutions** can **promote their brands** to HNWIs, and expertise can be made readily available and **free of charge**. In other words, we are seeking spaces to establish an **ecosystem of systematic cooperation**.



# Longevity Record

With the aim of getting the ball rolling in the emerging longevity industry, Dmitry Kaminskiy announced a \$1 million prize for the first person to reach the age of 123 - just 6 months longer than the current record holder, Jeanne Calment, who achieved 122 years and 6 months age.

## Life record of 122.5 by Jeanne Calment who died in 1997



**Forbes**

9,115 views | Apr 21, 2015, 12:40 pm

### Venture Capitalist Promises \$1M To First Person To Reach 123rd Birthday

Sarah Hedgecock Forbes Staff  
Pharma & Healthcare

Venture capitalist Dmitry Kaminskiy thinks he has what it takes to lengthen people's life spans: a million-dollar prize, which he will award to the first person to beat the current longevity record and reach his or her 123rd birthday.



**Using P3 medicine technologies, and leveraging the work of Geroscience, why should 122.5 years of age be considered the limit?**