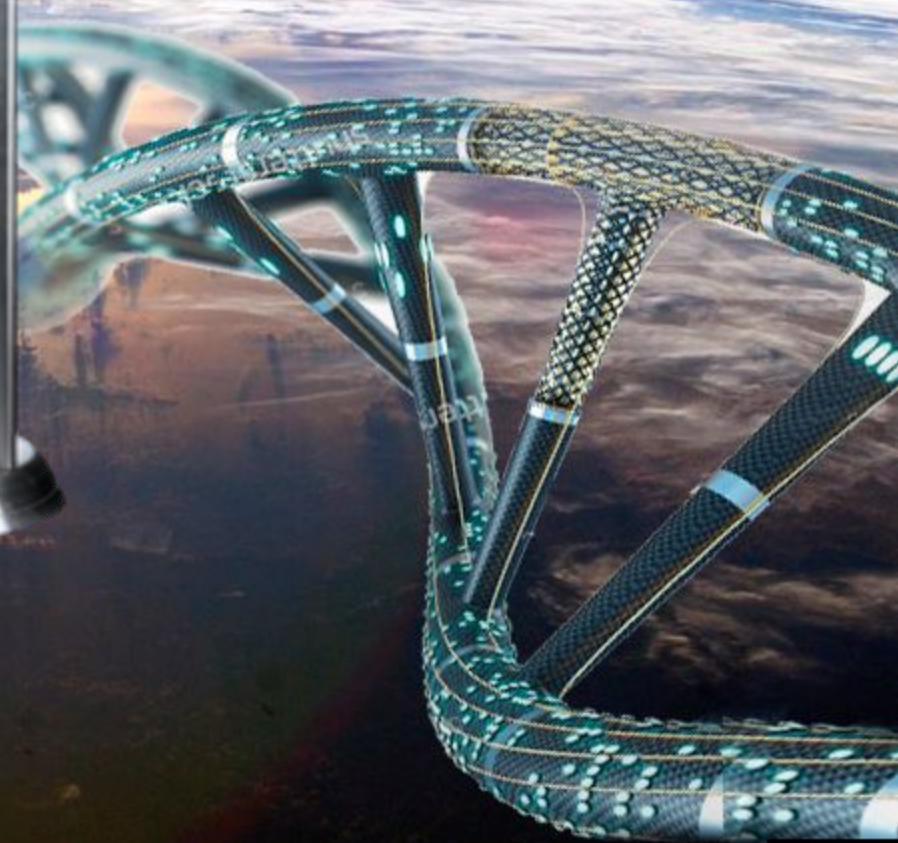


Longevity Industry Landscape Overview 2017

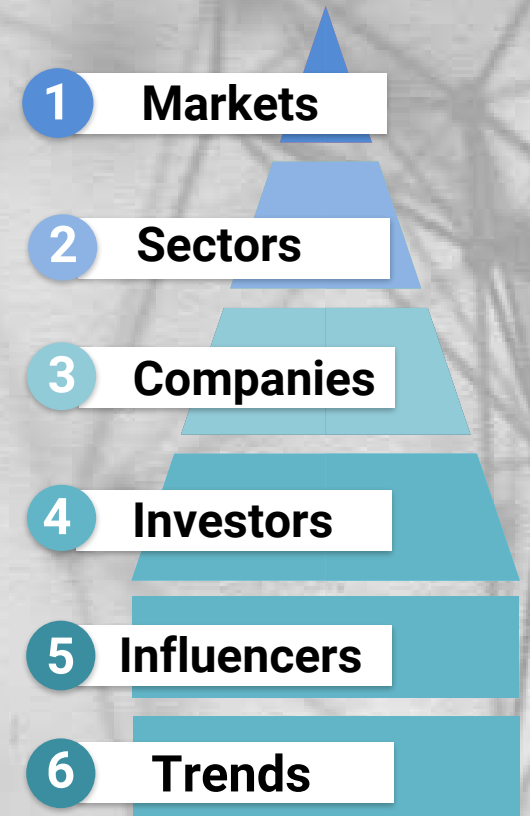
Volume I: The Science of Longevity

Volume II: The Business of Longevity



Volume I: The Science of Longevity

Volume II: The Business of Longevity



The topics covered in the following infographic preview, which is part of a joint project between the:

- Biogerontology Research Foundation,
- Deep Knowledge Life Sciences,
- Aging Analytics Agency,

and are explored in more far greater detail in our soon to be released reports:

- Longevity Industry Landscape Overview Volume I: The Business of Longevity
- Longevity Industry Landscape Overview Volume II: The Science of Longevity
- Longevity.International: interactive online platform and database, which employs automated chart, graph, and network map creation software to visualize the data contained in all of our reports.

This series of reports, entitled Longevity Industry Landscape Overview 2017, is a joint project between The Global Longevity Consortium, consisting of the Biogerontology Research Foundation, Deep Knowledge Life Sciences, Aging Analytics Agency and Longevity.International platform. The consortium behind this series of reports hope that they will come to be used as a sort of Encyclopedia Britannica and specialized Wikipedia of the emerging longevity industry, with the aim of serving as the foundation upon which the first global framework of the industry will be built, given the significant industry growth projected over the coming years.

At nearly 800 pages in length, Volume I: The Science of Longevity serves as a comprehensive overview of the global geroscience research landscape, while Volume II: The Business of Longevity, standing at another 500 pages in length, serves as a comprehensive overview of the longevity industry (i.e. company and investor) landscape. These reports will be followed up throughout the coming year with Volume 3 ("Special Case Studies"), featuring 10 special case studies on specific longevity industry sectors, such as cell therapies, gene therapies, AI for biomarkers of aging, and more, Volume 4 ("Novel Longevity Financial System"), profiling how various corporations, pension funds, investment funds and governments will cooperate within the next decade to avoid the crisis of demographic aging, and Volume 5 ("Region Case Studies"), profiling the longevity industry in specific geographic regions.

These reports are, however, only the beginning, and ultimately will serve as a launching pad for an even more ambitious project: Longevity.International, an online platform that will house these reports, and also serve as a virtual ecosystem for uniting and incentivizing the many fragmented stakeholders of the longevity industry, including scientists, entrepreneurs, investors, policy makers, regulators and government officials to unite in the common goal of healthspan extension and aversion of the looping demographic aging and Silver Tsunami crisis. The platform will use knowledge crowdsourcing of top tier experts to unite scientists with entrepreneurs, entrepreneurs to investors, and investors to policy-makers and regulators, where all stakeholders can aggregate and integrate intelligence and expertise from each other using modern IT technologies for these types of knowledge platforms, and all stakeholders can be rewarded for their services.

TABLE OF CONTENTS Volume I “The Science of Longevity”

Executive Summary

Part I Geroscience Research Landscape Overview

- Chapter 1: The Silver Tsunami
- Chapter 2: A History of Modern Geroscience
- Chapter 3: Major Trends in Geroscience
- Chapter 4: The Convergence of Regenerative Medicine, P3 Medicine, and Geroscience
- Chapter 5: Fast and Accurate: AI-powered biotech
- Chapter 6: Major Roadblocks & The Road Ahead

Part II Top 100 Longevity Research Hubs

Part III Top 100 Longevity Non-Profits

Part IV Top 100 Longevity Conferences

Part V Top 100 Longevity Journals

Part VI Top 100 Longevity Books

Part VII Top 100 Longevity Geroscience

Part VIII Top 100 Longevity Databases

INSTITUTIONAL PARTNERS



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LONGEVITY
— SOCIETY —

GERONTOLOGY RESEARCH GROUP

TABLE OF CONTENTS Volume II “The Business of Longevity”

Executive Summary

Chapter I The Dawn of the Longevity Industry (2000-2016)

- 2000-2013 period, the early stage development of Geroscience
- 2014 The Threshold, the birth of the Longevity Industry
- 2015-2016 the early stage development of the Longevity industry

Chapter II The Current State of The Longevity Industry (2017)

Mind Maps Longevity Industry Landscape Overview 2017

Top 100 companies / investors / hubs / key persons

The business of P3 Medicine technology overview

- Introduction to P3 medicine
- Mind Map 124 P3 medicine technologies
- Digital Health
 - *Wearables*
 - *Health / Fitness apps*
 - *Telemedicine*
 - *Virtual / Augmented Reality*
 - *Digital Health Records*
 - *Blockchain / NextGen Databases*

-Biomarkers

-Artificial Intelligence

-Geroprotectors

-Regenerative Medicine

-Gene therapy

-Cell therapy

-NeuroTech

-Prosthetics

-Nutraceuticals

-Microbiome

-AgeTech

-Scientificallly-validated lifestyle recommendations

Chapter III Stagnation of Biotech/Healthcare Industry

- Outdated business model of Biopharma
- Silver Tsunami
- Government programs deficit
- Pensions funds bankruptcy
- IT-giants and tech venture funds entering BioTech/Healthcare

Chapter IV 2018-2022 The Rise of the Longevity Industry

Convergence of Technological MegaTrends

- Digital Health
- Artificial Intelligence
- Blockchain
- P3 medicine
- AgeTech
- Exponential acceleration of further progress
- Objective forecasting for 2018 - 2022 (applying TRL's)

Chapter V The Progressive Model of P3 Medicine Clinic

- The engineering approach for architecture design

Chapter VI Paradigm Shift - From Treatment to Prevention

- Industry
- Government
- Society
- Forecasting

Chapter VII Novel Financial System (2022-2025 perspective)

- Venture Funds / Hedge Funds
- BioPharma
- Pension Funds / Insurance Companies
- AgeTech Banks
- Derivatives
- Longevity Index Fund
- Longevity Stock Exchange

Appendix I Top 100 Longevity Industry Companies Profiles

Appendix II Top 100 Longevity Industry Investor Profiles

GLOBAL LONGEVITY SCIENCE LANDSCAPE 2017



- SCIENCE LABS
- NON-PROFIT
- GEROSCIENCE HUBS



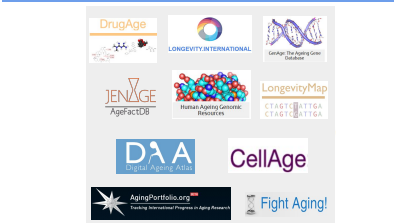
Top 10 Geroscience Books



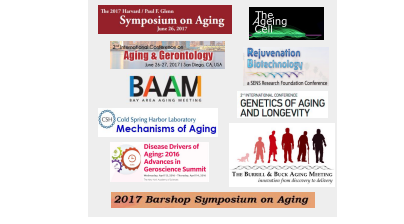
Top 10 Geroscience Journals



Top 10 Online Resources



Top 10 Geroscience Conferences



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Invest for life

Biogerontology Research Foundation
Prevent. Restore. Preserve.

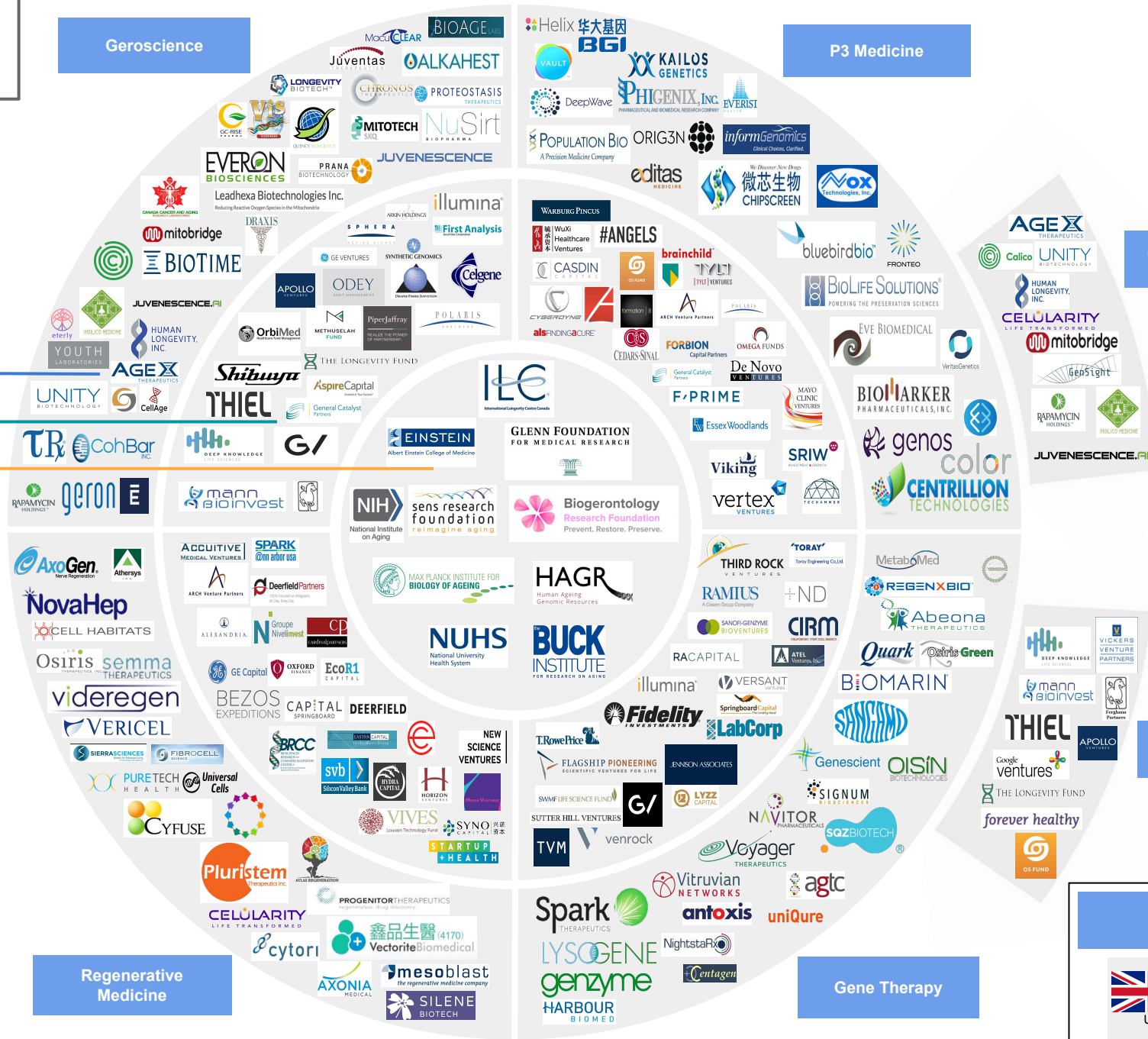
DEEP KNOWLEDGE LIFE SCIENCES

LONGEVITY INTERNATIONAL

GLOBAL LONGEVITY INDUSTRY LANDSCAPE 2017



- COMPANIES
- INVESTORS
- SCIENCE HUBS



Top 10 Longevity Companies

Top 10 Longevity Investors

Top 5 Countries



AGING ANALYTICS AGENCY Invest for life

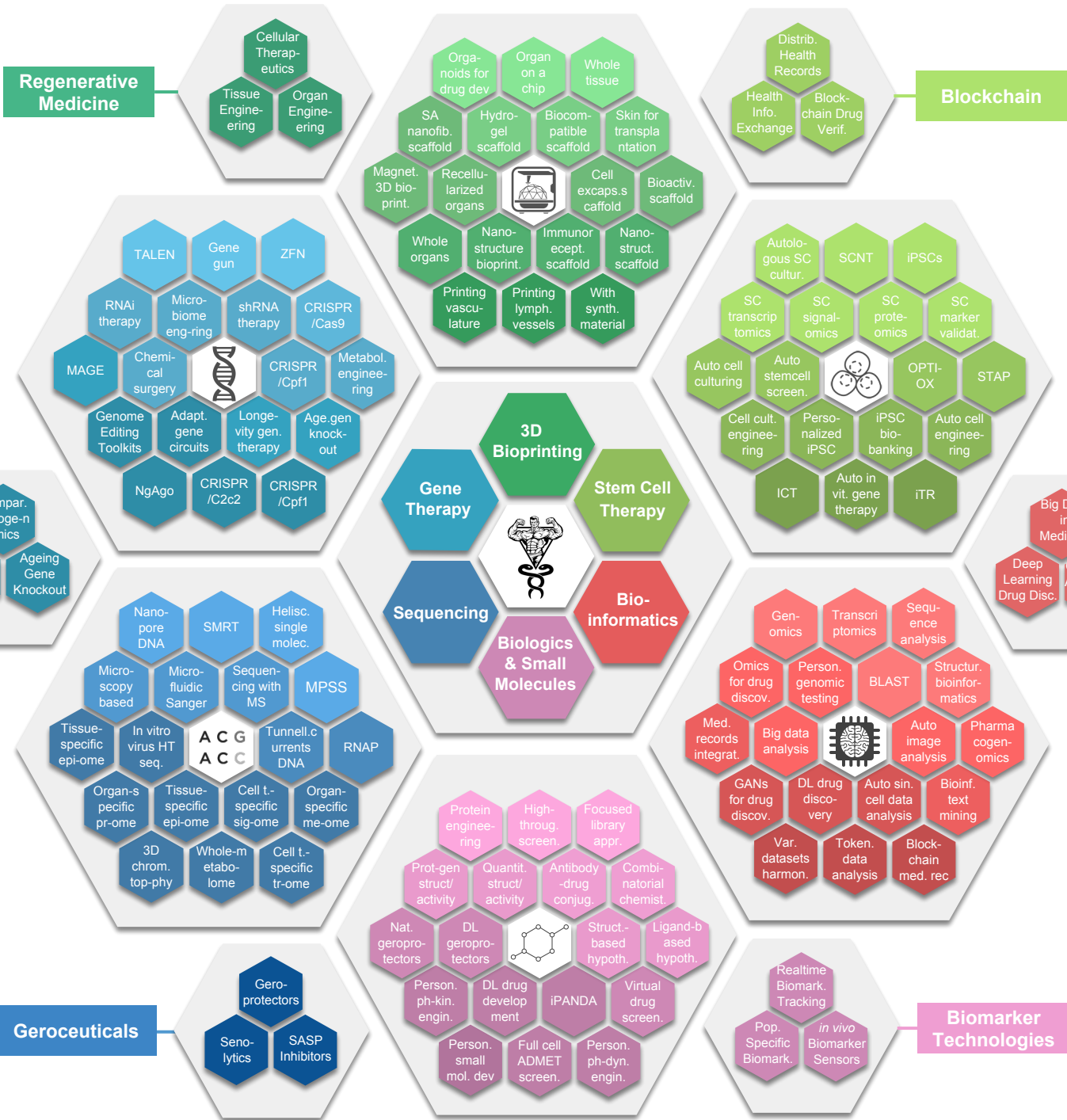
Biogerontology Research Foundation Prevent. Restore. Preserve.

DEEP KNOWLEDGE LIFE SCIENCES

LONGEVITY.INTERNATIONAL

THE SCIENCE OF PROGRESSIVE MEDICINE 2017 LANDSCAPE

Top 120+ R&D Topics TRL 4-7



Translational Geroscience

Blockchain

Artificial Intelligence

Biomarker Technologies

Geroceuticals

Technology Readiness Level (TRL)

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

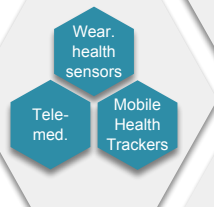
Technology Readiness Levels (TRL) are a common measure of how close a technology is for practical use, used in many engineering disciplines. By applying it to progressive medicine, we can forecast how long it will take a given therapeutic or technology to witness practical applications in the clinic 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 TLR of 8 are transferred to the practical applications of progressive medicine landscape overview.

THE BUSINESS OF PROGRESSIVE MEDICINE 2017 PRACTICAL APPLICATIONS

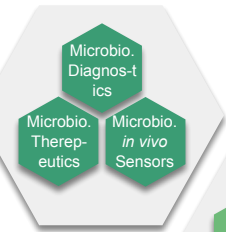


Top 120+ Technologies & Therapeutics TRL 8-9

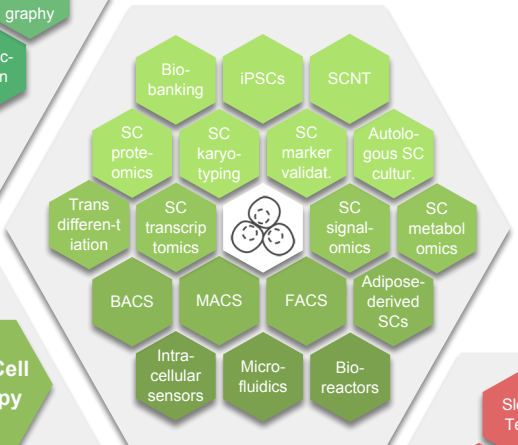
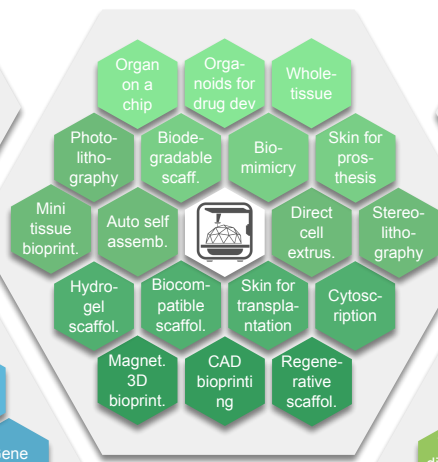
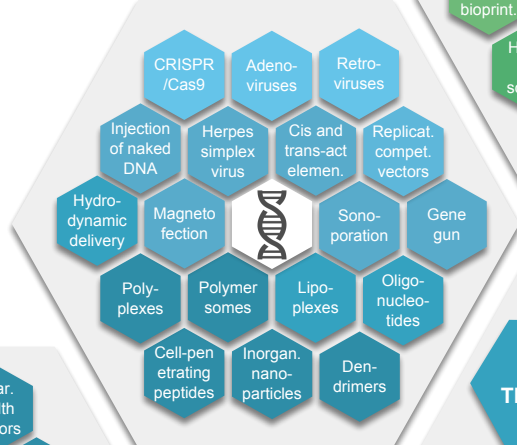
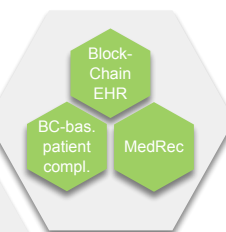
AgeTech



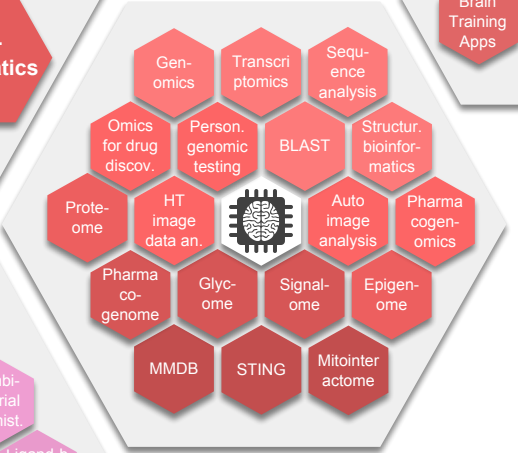
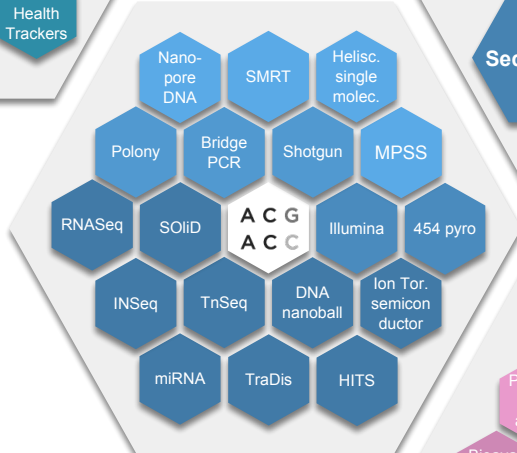
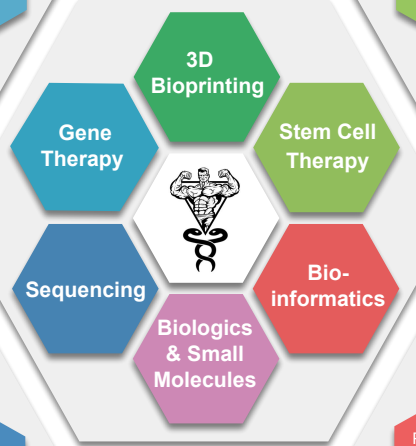
Microbiome Technology



Blockchain



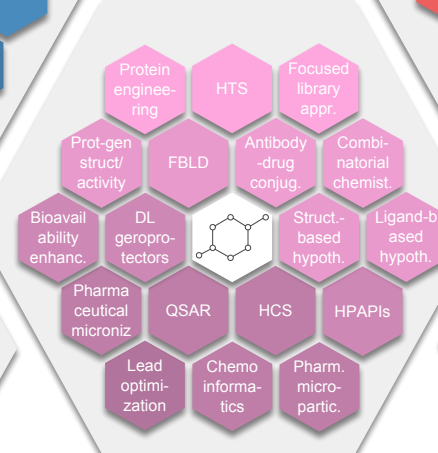
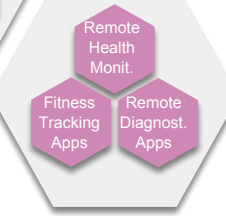
Cognitive Technologies



Mobile Health Apps



Digital Health



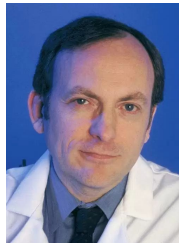
Technology Readiness Level (TRL)

9	Commercialized
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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.

Top 10 Lists

Top 10 Longevity Scientists



Michael West



Eric Verdin



Cynthia Kenyon



Aubrey de Grey



Joao Pedro de Magalhães



David Sinclair



Nir Barzilai



George Church



Brian Kennedy

Top 10 Longevity Companies



Top 10 Longevity Venture Funds



Top Longevity Investors



Dmitry Kaminskiy



Jeff Bezos



Peter Thiel



Jim Mellon



Bryan Johnson



Finian Tan

Top 10 Research Institutions



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

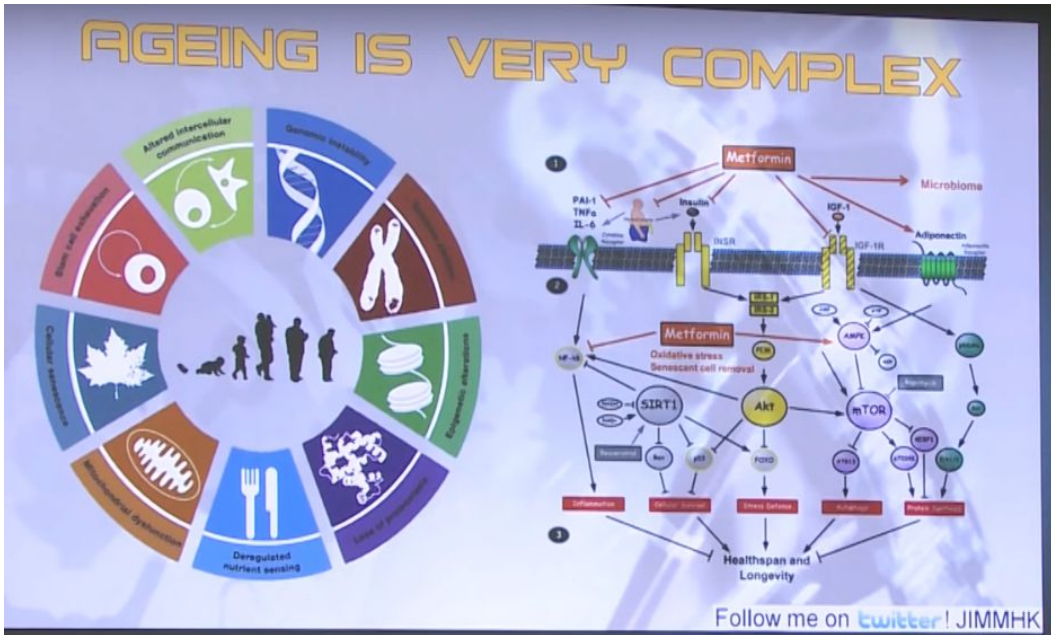


Landmark Longevity Conferences

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



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



Landmark Longevity Conferences

Basel Life Sciences Aging Forum



September 12-13, 2017 ■ BASEL LIFE EMBO ■ Congress Center, Basel, Switzerland

ARTIFICIAL INTELLIGENCE AND BLOCKCHAIN FOR HEALTHCARE

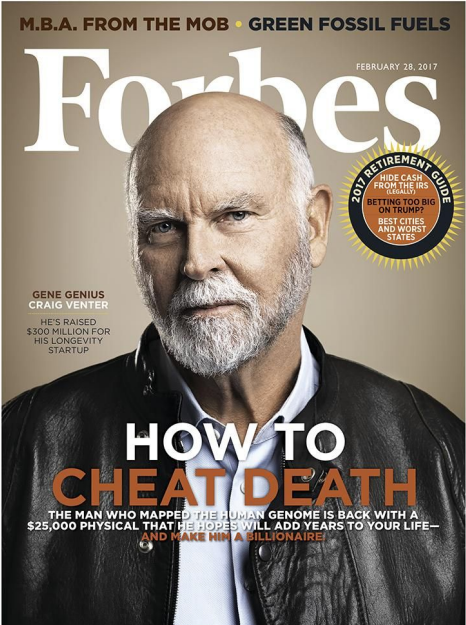
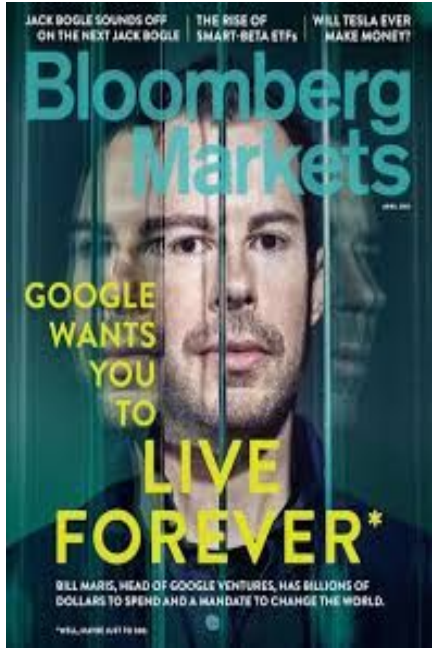
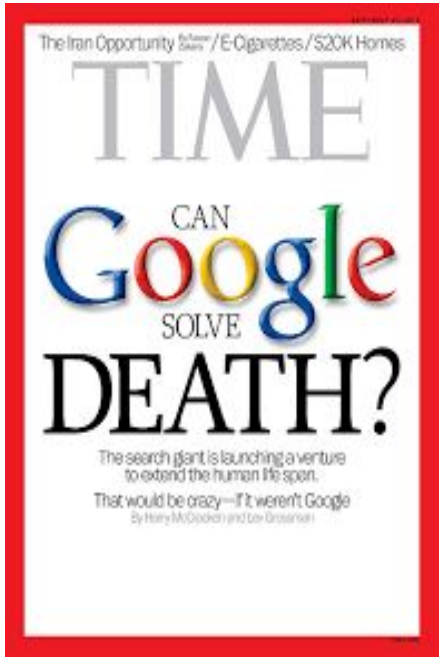
*AI and Blockchain are profound technologies transforming healthcare and society as we know it.
This forum brings together the academic and industry thought leaders from both areas.*



World Economic Forum



Top Media Brands in Support of Longevity



Top 100 Longevity Companies

- 1 Abeona Therapeutics
- 2 AgeX
- 3 Alkahest
- 4 Antoxis
- 5 AstraZeneca
- 6 Athersys
- 7 Atlas Regeneration
- 8 AxoGen
- 9 Axonia Medical
- 10 BGI
- 11 BIOAGE Labs
- 12 BioLife Solutions
- 13 BioMarin
- 14 BioMarker Pharmaceuticals
- 15 BioTime
- 16 Calico
- 17 Canada Cancer & Aging Research Laboratories (CCARL)
- 18 Cell Habitats
- 19 CellAge
- 20 Cellularity
- 21 Centagen
- 22 Centrillion Technologies
- 23 Chipscreen
- 24 Chronos Therapeutics
- 25 CohBar
- 26 Color Genomics
- 27 Cyfuse Biomedical
- 28 Cytori
- 29 DeepWave Technologies
- 30 Draxis Health
- 31 Elysium Health
- 32 Emulate
- 33 Epitracker
- 34 Eterly
- 35 Everist Health
- 36 Everon Biosciences
- 37 Evox Therapeutics
- 38 Fronteo
- 39 GC-Rise Pharma
- 40 Genescent Corp
- 41 Genos
- 42 GenSight Biologics
- 43 Genzyme Corporation
- 44 Geron
- 45 Harbour Biomed
- 46 Hua Medicine
- 47 Human Longevity Inc.
- 48 Ichor Therapeutics
- 49 Inception Sciences
- 50 Insilico Medicine
- 51 Juvenescence AI
- 52 Juventas Therapeutics
- 53 Kailos Genetics
- 54 Leadhexa Biotechnologies
- 55 LifeGen
- 56 Longevity Biotech
- 57 MacuCLEAR
- 58 Mesoblast
- 59 Metabomed
- 60 Mitobridge
- 61 Mitotech
- 62 Navitor
- 63 NovaHep
- 64 NovaDip Biosciences
- 65 NuSirt
- 66 Oisin Biotechnologies
- 67 NOX Technologies
- 68 Orig3n
- 69 Osiris Therapeutics
- 70 Oxstem
- 71 PHIGENIX
- 72 Pluristem
- 73 Population Bio
- 74 Prana Biotechnology
- 75 Progenitor Therapeutics
- 76 Proteostasis Therapeutics
- 77 PureTech Health
- 78 Retrotope
- 79 Quark Pharmaceuticals
- 80 Quincy Bioscience
- 81 Rapamycin Holdinds
- 82 ReThink Pharmaceuticals
- 83 Revance Therapeutics
- 84 RondinX
- 85 Samumed
- 86 Semma Therapeutics
- 87 Signum
- 88 Silene Biotech
- 89 Sierra Sciences
- 90 SIWA Therapeutics
- 92 SQZ Biotech
- 92 TauRx Therapeutics
- 93 Unity Biotechnology
- 94 Universal Cells
- 95 Vault
- 96 Vericel Corporation
- 97 Veritas Genetics
- 98 Vitruvian Networks
- 99 Voyager Therapeutics
- 100 Youth Laboratories

Company Landscape

Regenerative Medicine

P3 Medicine

Gene Therapy

Geroscience

Top 100 Venture Firms

- 1 ABN AMRO
- 2 Accuitive Medical Ventures
- 3 Advantech Capital
- 4 Alexandria Venture
- 5 Ally Bridge Group
- 6 AME Cloud Ventures
- 7 Amino Capital
- 8 Ann Arbor SPARK
- 9 ARCH Venture Partners
- 10 Arkin Holdings
- 11 Aspire Capital Partners LLC
- 12 ATEL Ventures
- 13 BRCC
- 14 Brainchild Holdings
- 15 Cardinal Partners
- 16 Casdin Capital
- 17 Celgene
- 18 CIRM
- 19 Cyberdyne
- 20 Deep Knowledge Life Sciences
- 21 Deerfield Partners
- 22 DeNovo Ventures
- 23 Draper Fisher Jurvetson (DFJ)
- 24 Easton Capital
- 25 EcoR1 Capital
- 26 Eight Roads Ventures
- 27 Emerson Collective
- 28 "Essex Woodlands Health Ventures"
- 29 F-Prime Capital Partners
- 30 Ferghana Partners
- 31 Fidelity Investments
- 32 First Analysis
- 33 Flagship Pioneering
- 34 Forbion Capital Partners
- 35 Formation 8
- 36 GE Capital
- 37 GE Ventures
- 38 General Catalyst
- 39 GV
- 40 Harvest Global Investments
- 41 Horizon Ventures
- 42 Illumina
- 43 Integrale Advisors
- 44 Inventages Capital Investment inc
- 45 Jennison Associates
- 46 Juno Therapeutics
- 47 Juvenescence Limited
- 48 Khosla Ventures
- 49 LabCorp
- 50 Legend Capital
- 51 LYZZ Capital
- 52 Magic Stone Alternative
- 53 Mann BioInvest
- 54 Mayo Clinic Ventures
- 55 Merck Ventures
- 56 Mistletoe
- 57 NanoDimension
- 58 Nazem and Company
- 59 New Science Ventures
- 60 Nivelinvest
- 61 Odey Asset Management
- 62 Odey Swan
- 63 Omega Funds
- 64 OrbiMed
- 65 OS Fund
- 66 Oxford Finance Corporation
- 67 Oxford Sciences Innovation
- 68 Partners Innovation Fund
- 69 Partners Innovation Fund
- 70 Piper Jaffray Private Capital Group
- 71 Polaris Partners
- 72 RA Capital Management
- 73 Ramius Advisors
- 74 Sanofi-Genzyme BioVentures
- 75 Shibuya Kogyo
- 76 Silicon Valley Bank
- 77 Sino-Alliance International LTD
- 78 S.R.I.W.
- 79 Sphera Funds Management
- 80 Springboard Capital
- 81 StartUp Health
- 82 Shutter Hill Ventures
- 83 SWMF Life Science Fund
- 84 Syno Capital
- 85 Synthetic Genomics
- 86 T. Rowe Price
- 87 Techammer
- 88 Techno Venture Management
- 89 Testudo Funds
- 90 The Thiel Foundation
- 91 Third Rock Ventures
- 92 Toray Engineering
- 93 TVM Capital
- 94 TYLT Ventures
- 95 Venrock
- 96 Versant Ventures
- 97 Vertex Ventures
- 98 Viking Global Investors
- 99 Vives Fund
- 100 Warburg Pincus

Venture Firm Landscape

SPARK @m arbor usa, HYDRA CAPITAL, ALEXANDRIA, EASTON CAPITAL Investment Group, BEZOS EXPEDITIONS, ACCUITIVE MEDICAL VENTURES, DeerfieldPartners, NEW SCIENCE VENTURES, EcoR1 CAPITAL, CP, CARDINAL PARTNERS, SYNO CAPITAL 兴诺资本, OXFORD FINANCE, DEERFIELD, Merck VENTURES, ARCH Venture Partners, BRCC, svb, Silicon Valley Bank, HORIZON VENTURES, GE Capital, VIVES Louvain Technology Fund, CAPITAL SPRINGBOARD, CIRM CALIFORNIA / STEM CELL AGENCY, STARTUP + HEALTH

Regenerative Medicine

General Catalyst Partners, ODEY ASSET MANAGEMENT, OrbiMed Healthcare Fund Management, PiperJaffray, SHIBUYA, POLARIS PARTNERS, AspireCapital Invested in Your Success™, GE VENTURES, APOLLO VENTURES, G/ TECHAMMER, MANN BIOINVEST, illumina®, DEEP KNOWLEDGE LIFE SCIENCES, METHUSELAH FUND, Celgene, SYNTHETIC GENOMICS, THE LONGEVITY FUND, SPHERA, DRAPER FISHER JURVETSON, First Analysis Securities Corporation, THIEL, ARKIN HOLDINGS

Geroscience

JENNISSON ASSOCIATES, RAMIUS A Cowen Group Company, ARCH Venture Partners, CIRM CALIFORNIA / STEM CELL AGENCY, CASDIN CAPITAL, F-PRIME, SANOFI-GENZYME BIOVENTURES, Fidelity INVESTMENTS, OS FUND, als FINDINGACURE™, ATEL Ventures, Inc., illumina®, FORBION Capital Partners, CYBERDYNE, #ANGELS, CEDARS-SINAL, formation | 8, ND, T.RowePrice, General Catalyst Partners, khosla ventures, FLAGSHIP PIONEERING SCIENTIFIC VENTURES FOR LIFE, SRIW INVESTMENT & GROWTH, RACAPITAL, LYZZ CAPITAL, Essex Woodlands TORAY Toray Engineering Co., Ltd., WuXi Healthcare Ventures, De Novo VENTURES, VERSANT ventures, G/ TECHAMMER, THIRD ROCK VENTURES, PARTNERS HEALTHCARE, Springboard Capital The Leading Hand, MAYO CLINIC VENTURES, LabCorp, TVM|Capital HEALTHCARE PARTNERS, TVM, venrock, OMEGA FUNDS, brainchild™, SUTTER HILL VENTURES, VIKING, WARBURG PINCUS, SWMF LIFE SCIENCE FUND, POLARIS PARTNERS

P3 Medicine



Top 100 Geroscience Foundations

- 1 Ageing Research Centre
- 2 Age Institute
- 3 Aging Institute of UPMC Senior Services and the University of Pittsburgh
- 4 Aging Research Center (ARC)
- 5 Alberta Centre on Aging
- 6 ARC Centre of Excellence in Population Ageing Research (CEPAR)
- 7 Arizona Center of Aging (ACOA)
- 8 Aston Research Centre for Healthy Ageing (ARCHA)
- 9 Australian Institute for Population Ageing Research (AIPAR)
- 10 Barshop Institute for Longevity and Aging Studies
- 11 Baycrest Research Centre for Aging and the Brain
- 12 Biogerontology Research Foundation
- 13 Brookdale Center for Healthy Aging
- 14 Brunel Institute for Ageing Studies (BIAS)
- 15 Buck Institute for Research on Aging
- 16 Canadian Centre for Activity and Aging (From Research to Action) CCAA
- 17 Center for Aging & Community (CAC)
- 18 Center for Aging Research
- 19 Center for Aging Research (IU-CAR)
- 20 Center for Healthy Aging
- 21 Center for Healthy Aging (CEHA)
- 22 Center for Healthy Aging Research
- 23 Center for Population Health and Aging (CPHA)
- 24 Center for Research and Education in Aging (CREA)
- 25 Center for Research on Aging
- 26 Center for Translational Research in Aging and Longevity
- 27 Center on Aging - University of Maine
- 28 Center on Aging - University of Utah
- 29 Center on Demography and Economics of Aging (CoA) - NORC and University of Chicago
- 30 Centre for Ageing and Mental Health (CAMH) - University Staffordshire
- 31 Centre for Ageing and Supportive Environments (CASE) - Department of Health Sciences,
- 32 Centre for Ageing Research (C4AR) - Faculty of Health & Medicine, Lancaster University
- 33 Centre for Ageing Research and Development in Ireland (CARDI)
- 34 Centre for Cognitive Ageing and Cognitive Epidemiology (CCACE)
- 35 Centre for Education and Research on Ageing (CERA)
- 36 Centre for Geriatric Medicine and Gerontology (ZGGF)
- 37 Centre for Innovative Ageing (CIA)
- 38 Centre for Integrated Systems Biology of Ageing and Nutrition (CISBAN)
- 39 Centre for Policy on Ageing (CPA)
- 40 Centre for Research on Ageing (CRA)
- 41 Centre for Research on Ageing (CRA)
- 42 Centre for Social Gerontology
- 43 Centre Hospitalier Affilié Universitaire de Québec (CHA)
- 44 Centre on Aging - University of Manitoba
- 45 Centre on Aging - University of Victoria
- 46 Clinical Ageing Research Unit (CARU)
- 47 Cologne Cluster of Excellence on Cellular Stress Responses in Aging-associated Diseases (CECAD Cologne)
- 48 Comprehensive Center on Brain Aging
- 49 Danish Aging Research Center (DARC)
- 50 Danish Centre for Molecular Gerontology (DCMG)
- 51 Del E. Webb Neuroscience, Aging and Stem Cell Research Center (NASCR)
- 52 Donald W. Reynolds Institute on Aging and Department of Geriatrics
- 53 European Centre for Gerontology
- 54 European Research Institute for the Biology of Ageing (ERIBA)
- 55 Fischer Center for Alzheimer's Disease Research
- 56 Flinders Centre for Ageing Studies (FCAS)
- 57 Geriatrics Center & Institute of Gerontology
- 58 German Centre of Gerontology (DZA)
- 59 Gerontology Research Institute at the University of Massachusetts Boston
- 60 Gerontology Research Center (GRC) - Simon Fraser University
- 61 Gerontology Research Unit - Massachusetts General Hospital
- 62 Glenn Center for Aging Research
- 63 Harvey A. Friedman Center for Aging
- 64 Huffington Center on Aging (HCOA)
- 65 Institut für Gerontologische Forschung IGFe.v.
- 66 Institute for Ageing at Newcastle University
- 67 Institute for Aging Research (IAR) - Albert Einstein College of Medicine of Yeshiva University
- 68 Institute for Aging Research (IFAR) - Hebrew SeniorLife
- 69 Institute for Biomedical Aging Research (IBA)
- 70 Institute for Biostatistics and Informatics in Medicine and Ageing Research (IBIMA)
- 71 Institute of Ageing and Chronic Disease Research
- 72 Institute of Ageing Research - Hangzhou Normal University
- 73 Institute of Aging (IA) - Canadian Institutes of Health Research
- 74 Institute of Development, Aging and Cancer (IDAC)
- 75 Institute of Gerontology (IFG) - Rupprechts Carls University of Heidelberg
- 76 Institute of Gerontology - College of Public Health, University of Georgia
- 77 Institute of Gerontology (IOG) - Wayne State University
- 78 Institute of Healthy Ageing (IHA)
- 79 Institute on Aging - University of California
- 80 Institute on Aging - University of Florida
- 81 Institute on Aging (IOA) - University of North Carolina
- 82 Institute on Aging - University of Pennsylvania
- 83 Institute on Aging - University of Virginia
- 84 Institute on Aging - University of Wisconsin-Madison
- 85 International Institute on Ageing
- 86 International Research Centre for Healthy Ageing and Longevity (IRCHAL)
- 87 Jean Mayer USDA Human Nutrition Research Center on Aging (HNRCA)
- 88 Jena Centre for Systems Biology of Ageing (JenAge)
- 89 Johns Hopkins Center on Aging and Health (COAH)
- 90 Landon Center on Aging
- 91 Leibniz Institute on Aging - Fritz Lipmann Institute (FLI)
- 92 Lifespan Health Research Center (LHRC)
- 93 Manchester Institute for Collaborative Research on Ageing (MICRA)
- 94 Max Planck Institute for Biology of Ageing
- 95 Michiana Gerontology Institute (MGI)
- 96 National Institute on Aging (NIA)
- 97 Princeton Longevity Center (PLC)
- 98 Stanford / VA / NIA Aging Clinical Research Center (ACRC)
- 99 USC/UCLA Center of Biodemography & Population Health (CBPH)
- 100 USC Leonard David School of Gerontology

Geroscience Institutes by Region

USA

USA Institutes:

- Harvey A. Friedman Center for Aging
- USC | UCLA
- INSTITUTE ON AGING
- sens research foundation
- University of Massachusetts Boston Gerontology Institute
- Gerontology Research Centre
- Paul F. Glenn Center for Aging at the University of Michigan
- BUCK INSTITUTE FOR RESEARCH ON AGING
- Princeton Longevity Center
- Institute for Aging Research
- Harvard Medical School AFFILIATE
- Tufts Geriatrics Center & Institute of Gerontology
- INSTITUTE FOR RESEARCH ON AGING
- Institute on Aging
- UT HEALTH SCIENCE CENTER
- Creighton University
- Indiana University
- Center for Healthy Aging Research
- Baylor College of Medicine
- Michigan Gerontology Institute
- CAC
- Boonshoft School of Medicine
- AGING INSTITUTE
- Arizona Center on Aging
- Stanford University
- Huffington Center on Aging
- SBP
- Medical Discovery Institute
- Dartmouth Institute
- Duke CENTER FOR POPULATION HEALTH & AGING
- UAMS
- THE UNIVERSITY OF NORTH CAROLINA at CHAPEL HILL
- UC San Diego
- Institute of Gerontology
- Penn Institute on Aging
- center on demography and gerontology of aging
- THE UNIVERSITY OF MICHIGAN
- THE UNIVERSITY OF ALABAMA
- KU
- London Center on Aging
- Center for Translational Research in Aging and Longevity
- UF
- THE UNIVERSITY OF TEXAS AT A&M
- Center on Aging

UK

UK Institutes:

- MANCHESTER B24
- Newcastle University
- CARDI
- Centre for Ageing Research and Development in Ireland
- Centre for Integrated Systems Biology of Ageing and Nutrition
- Aston Research Centre for Healthy Ageing (ARCHA) at Aston University, Birmingham
- University of Southampton
- Keele University
- THE UNIVERSITY OF EDINBURGH
- Centre for Cognitive Ageing and Cognitive Epidemiology
- Newcastle University
- CISBAN
- Centre for Policy on Ageing
- Institute for Ageing
- Newcastle Biomedical Research Centre
- Swansea University Prifysgol Abertawe
- CRAG
- DRC
- CPA
- BIAS
- UNIVERSITY OF LIVERPOOL
- STAFFORDSHIRE UNIVERSITY
- Biogerontology Research Foundation
- MAX PLANCK UCL CENTRE for Computational Psychiatry and Ageing Research
- INSTITUTE OF AGEING AND CHRONIC DISEASE
- THE OXFORD INSTITUTE of Population Ageing
- UCL

EU

EU Institutes:

- IUF
- LEIBNIZ-INSTITUT FÜR UMWELT-MEDIZINISCHE FORSCHUNG
- fli
- Leibniz Institute on Aging - Fritz Lipmann Institute
- DANISH AGING RESEARCH CENTER
- UNIVERSITÄT INNSBRUCK
- IKÄINSTITUUTTI
- L-Università ta' Malta
- ERIBA
- European Research Institute for the Biology of Ageing
- INSTITUTE OF GERONTOLOGY
- JENVA GE
- MAX PLANCK INSTITUTE FOR BIOLOGY OF AGEING
- CECAD
- COLOGNE
- IFG
- DZA
- German Centre of Gerontology
- Institut für Gerontologische Forschung e.V.
- INTERNATIONAL INSTITUTE on Ageing
- United Nations - Malta
- UNIVERSITÄTS KLINIKUM MERIBURG

Other

Other Institutes:

- RIA
- RESEARCH INSTITUTE OF AGING
- University of Victoria
- Institute on Aging & Lifelong Health
- CASE
- FACULTY OF MEDICINE | LUND UNIVERSITY
- IBIMA
- ARC
- AGING RESEARCH CENTER
- Tokohu University
- IDAC
- Institute of Aging Research, HZNU
- 杭州师范大学医学院衰老研究所
- 香港大學秀圃老年研究中心
- Sau Pe Centre on Ageing
- The University of Hong Kong
- Curtin University
- Alberta Centre on Ageing
- Centre de recherche sur le vieillissement
- Research Centre on Aging
- Western Canadian Centre for Activity and Aging
- THE UNIVERSITY OF SYDNEY
- Baycrest
- INTERNATIONAL RESEARCH CENTRE FOR HEALTHY AGEING AND LONGEVITY
- AUSTRALIAN INSTITUTE FOR POPULATION AGEING RESEARCH
- cepap
- CHU de Québec
- Université Laval



LONGEVITY.INTERNATIONAL

P3 Medicine Clinics: Personalized Precision Preventative

Longevity Industry Report Volume I



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 Clinic Platform

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



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

Progressive Model of P3 Medicine Clinic Platform

Advanced Diagnostics

Precision Prognostics

Personalised Experimentation

Preventative Treatment



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

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

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

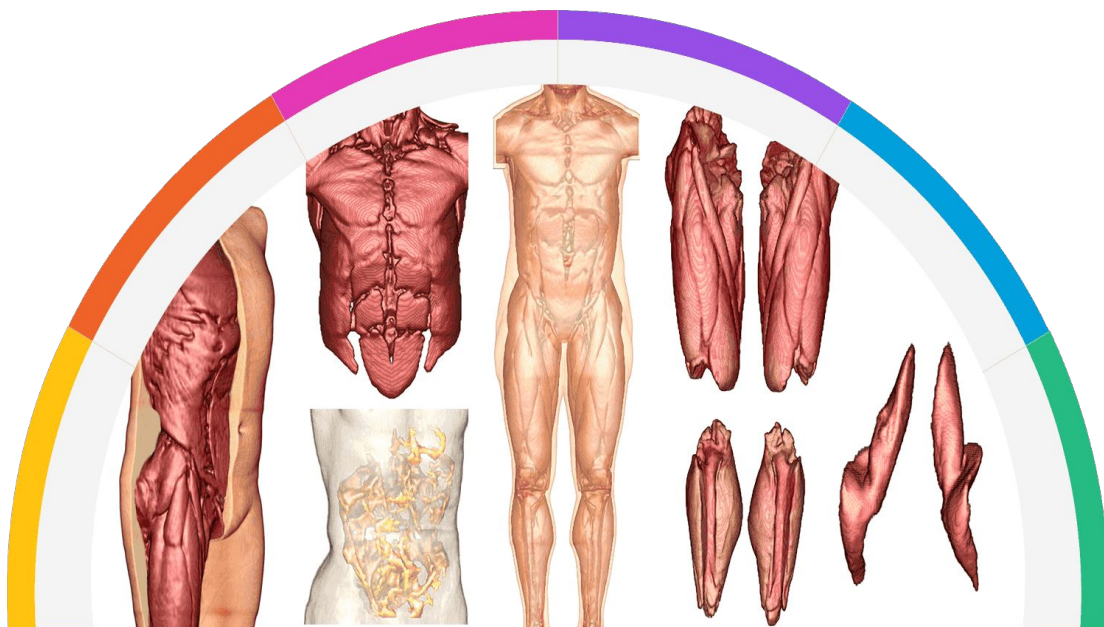
- Gene therapies
- Cell therapies
- Tissue engineering
- Small molecules & biologics

Progressive Model of P3 Medicine Clinic Platform

Advanced Diagnostics



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



PRECISION MEDICINE:
Integrating multi-omics, clinical and real world data

'omic' Latin suffix "ome" = mass or many.

Genome
Transcriptome
Proteome
Metabolome
Microbiome
Epigenome
Exposome

Social graph
Biosensors
Imaging

Creation of topological maps of health/disease

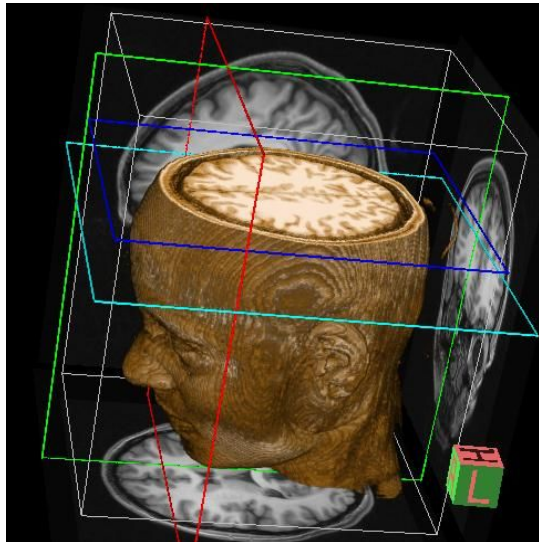
Eric Topol, CELL, Volume 15, Issue 1, 21 March 2014, Pages 241-253

Progressive Model of P3 Medicine Clinic Platform

Precision Prognostics



- Virtual Human Prognostics
- Personalised *in vitro* prognostics
- Deep-Learning based biomarker analysis for disease and disease outcome prognostics
- Personalised prognostic transcriptomic analysis using patient-specific cells
- Personalised prognostic microbiomic analysis using patient-specific cells
- Personalised prognostic epigenetic analysis using patient-specific cells

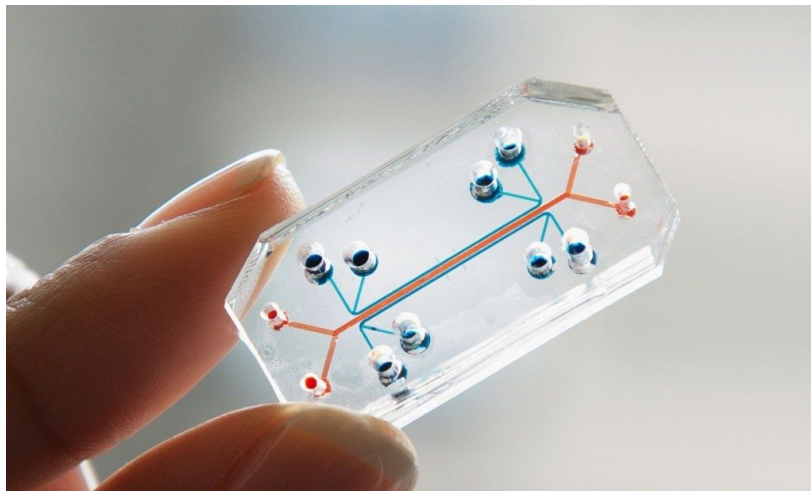


Progressive Model of P3 Medicine Clinic Platform

Personalised Experimentation

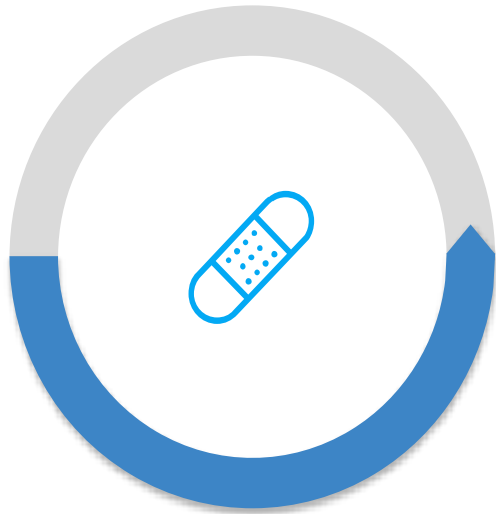


- Intelligent *in silico* experimentation
- Personalised *in vivo* experimentation on human cells
- Organ-on-a-chip systems
- Realtime tracking of changes in health and aging biomarkers in response ongoing treatments
- Personalised *ex vivo* experimentation on 3D bioprinted tissues and organs using patient-specific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



Progressive Model of P3 Medicine Clinic Platform

Preventative 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



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

2017

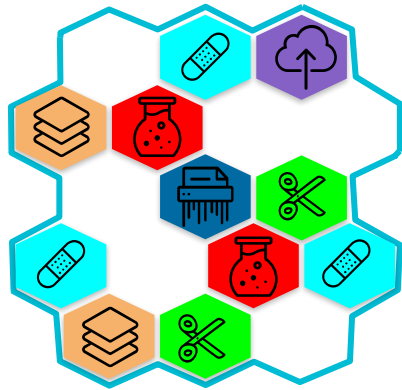
2020

2022

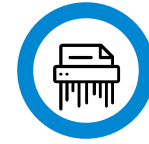
30%

50%

100%



**Small
Molecules
and
Biologics**



**Next
Generation
Sequencing**



**Stem
Cell
Therapy**



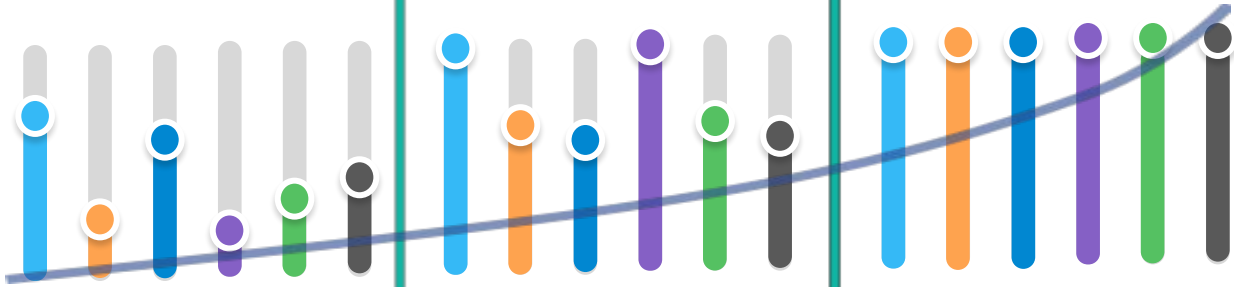
Bioinformatics



**Gene
Therapy
(CRISPR)**



3D Bioprinting



Applying Technology Readiness Levels (TRL) to Geroscience and Longevity

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. It is very common in, for example, the Aerospace Industry, and is widely used for strategizing and tangible forecasting.

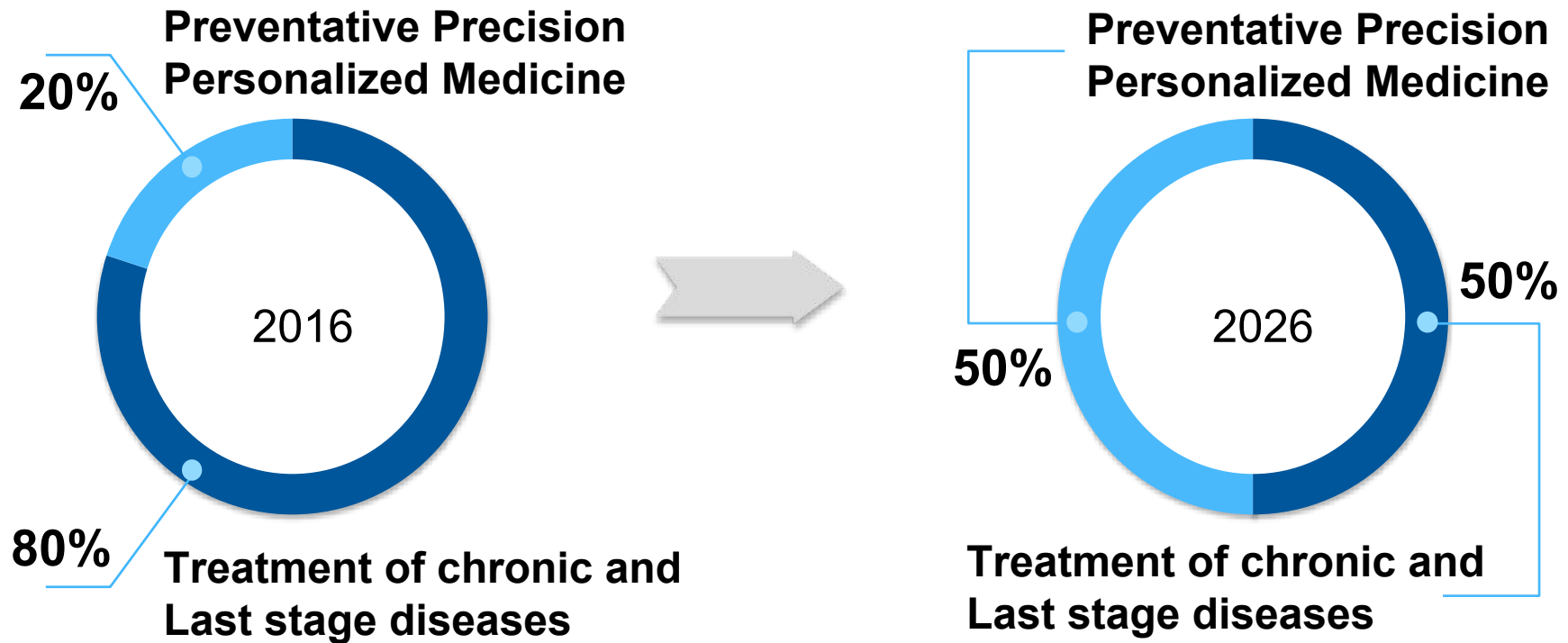
By applying it to progressive medicine, we can forecast how long it will take a given therapeutic or technology to witness practical applications in the clinic. The darkness of each hexagon represents its TRL, with darker colors indicating a low TRL and brighter colors indicating a high TRL.

We applied the concept of TRLs to 120+ emerging topics in geroscience R&D today as well as 50+ practical applications of geroscience today, to serve as the basis for a more precise and comprehensive framework to analyzing, mindmapping and landscaping the field of geroscience and the longevity industry.

The application of TRL to the geroscience, longevity and disruptive bioscience industries will serve as an important step toward

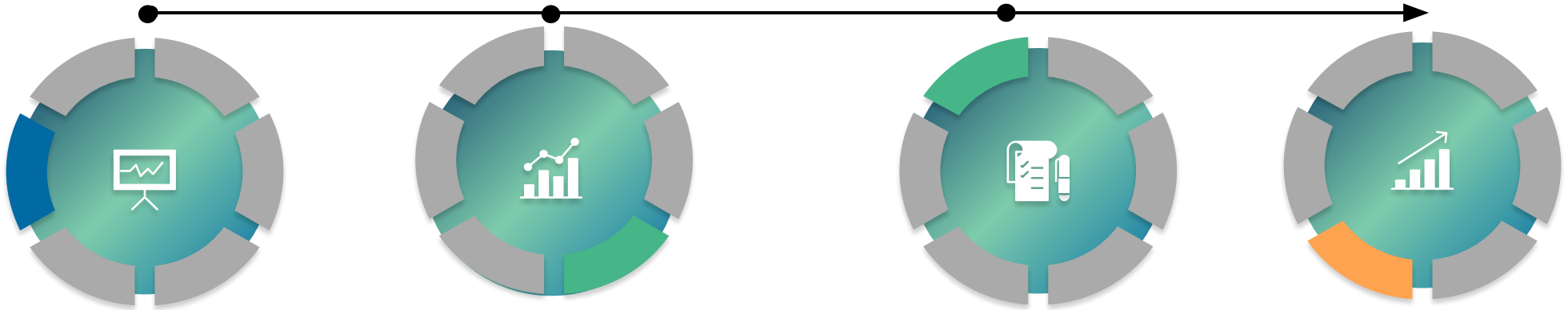
- Developing the methodology for tangible and measurable forecasting, strategizing, synergization and optimization of further development of progressive biomedicine, and
- Developing novel investment strategies for financial and investment entities which will specialize in the progressive medicine and Longevity industries, based on TRL's and precise forecasting with a focus on the convergence of technologies

Overview of the Optimal Model of P3 Medicine Market - Present & Projected



Paradigm Shift from Treatment to Prevention

Roadmap Toward Novel Longevity Financial Industry



Longevity VC Fund:

VC Fund focused on longevity startups, with deep scientific expertise in geroscience

Longevity Hedgefund:

Hedge fund that shorts risky and non-scientific life science and longevity companies via special synthetic financial vehicle

AgeTech Bank:

New generation of bank for the aging demographic combined with AgeTech and geroscience based healthcare services

Longevity Trust:

Trust optimized to manage clients' wealth and assets across an extended period of healthy longevity

2018

Longevity
Venture
Fund

2019

AgeTech Bank

Longevity
Hedge fund











2019

Longevity Trust

2020



Our Publications Timeline

<p>2013</p>	<p>2013 Regenerative Medicine Industry Framework (150 pages)</p>	
<p>2014</p>	<p>2014 Regenerative Medicine Analysis & Market Outlook (200 pages)</p>	
<p>2015</p>	<p>Big Data in Aging & Age-Related Diseases (200 pages)</p>	<p>Stem Cell Market Analytical Report 2015 (200 pages)</p>  
<p>2016</p>	<p>Longevity Industry Landscape Overview 2016 (200 pages)</p> 	
<p>2017</p>	<p>Volume I: The Science of Longevity (750 pages)</p> 	<p>Volume II: The Business of Longevity (500 pages)</p> 
<p>2018</p>	<p>Volume III: 10 Special Case Studies</p> 	<p>Volume IV: Novel Financial Longevity Industry</p>  <p>Volume V: Regional Case Studies</p> 

Volume III: Special Case Studies

Biomarkers of Aging

Geroprotectors and
Nutraceuticals

Gene Therapy

AI & Blockchain

LONGEVITY INDUSTRY

Landscape Overview 2017
Volume III

Special Case Studies



P3 Medicine Clinic

Regenerative Medicine

Stem Cells

Novel Regulatory
Approaches

Framework for Optimal Industry Forecasting:
Applying Technology Readiness Levels to
Geroscience

Framework for Industry Optimization: Differentiated
Valid Science from Overvalued, Hyped and
Fraudulent Technologies

**Novel Financial System
2022-2025 perspective**

Longevity Venture Funds

BioPharma corporations in
2022-2025

Longevity Hedge Funds

Pension Funds

Insurance Companies

Derivatives

LONGEVITY INDUSTRY

**Novel Financial Systems
2022-2025 Perspective**



AGING ANALYTICS AGENCY
Invest for life

Biogerontology Research Foundation
Prevent. Restore. Preserve.

DEEP KNOWLEDGE
LIFE SCIENCES

AgeTech Banks

Longevity Trust

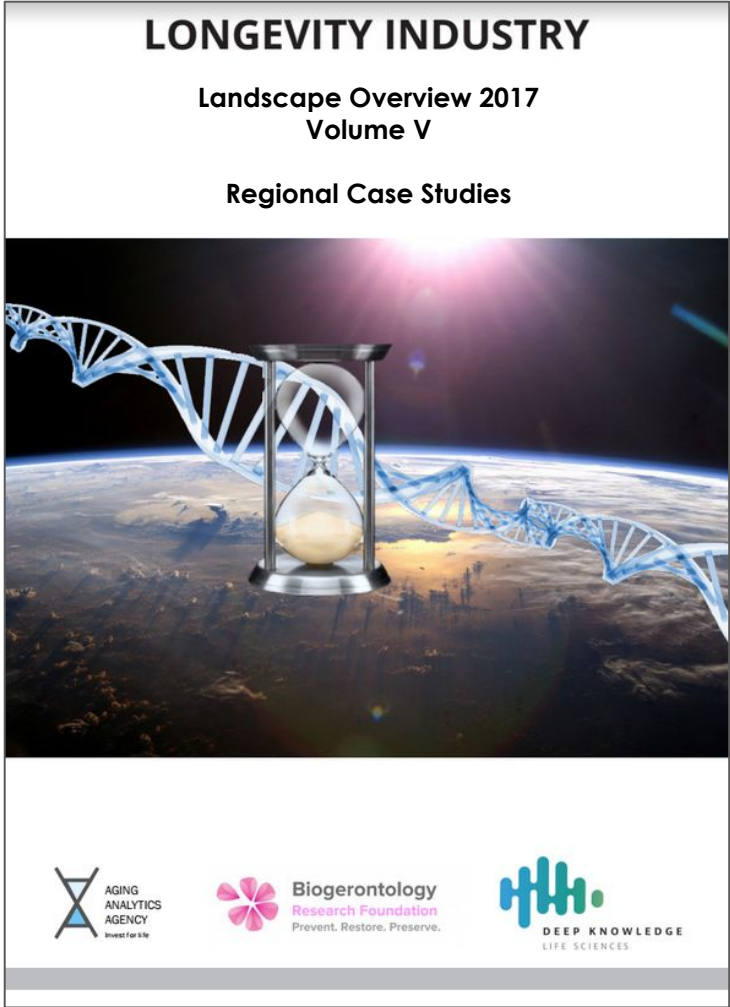
Longevity Index Fund

Longevity Stock Exchange

Progressive Regulatory
systems

Progressive Government
Healthcare Systems

Volume V: Regional Case Studies



USA

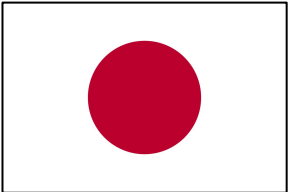


UK

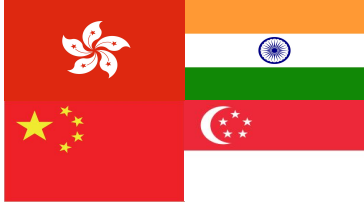


European
Union

Japan



Asia



Eastern
Europe



Israel





Biogerontology Research Foundation

Prevent. Restore. Preserve.

Website: <http://bg-rf.org.uk>

Contact: info@bg-rf.org.uk

The **Biogerontology Research Foundation (BGRF)** is the UK's oldest longevity non-profit organization founded by leading geroscientists. The **BGRF** funds and conducts research which aims to develop biotechnological interventions to remediate the molecular and cellular deficits which accumulate with age and which underlie the ill-health of old age. The **BGRF's** Board of Trustees include British billionaire Jim Mellon, prominent longevity investor Dmitry Kaminskiy, renowned geroscientists Dr. Alex Zhavoronkov, João Pedro De Magalhães and Dr. Richard Faragher, as well as Jim Plante and Franco Cortese.



Website:
<http://deepknowledge.life>

Contact:
info@deepknowledge.life

Deep Knowledge Life Sciences is a London based investment fund focused on ground-breaking research in life sciences and aging. **DKLS** strategically invests in mission-driven companies and supports founders who will bridge the gap between basic biological research and real-world healthcare products that extend healthy lifespan. **Insilico Medicine**, a company applying the latest advances in deep learning to biomarker development, drug discovery and aging research, is the **DKLS flagship investment**.



LONGEVITY.INTERNATIONAL

Website: <http://longevity.international>

Contact: 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.



Website:
<http://aginganalytics.com>

Contact:
info@aginganalytics.com

Aging Analytics Agency aims to use its knowledge of anti-aging technologies and current research paradigms to create invaluable databases and provide a supporting framework for financial decision making. The goal of **the Agency** is to promote the growth of biogerontology, enhance international collaboration, and increase interaction and cooperation between companies to benefit the field as a whole.