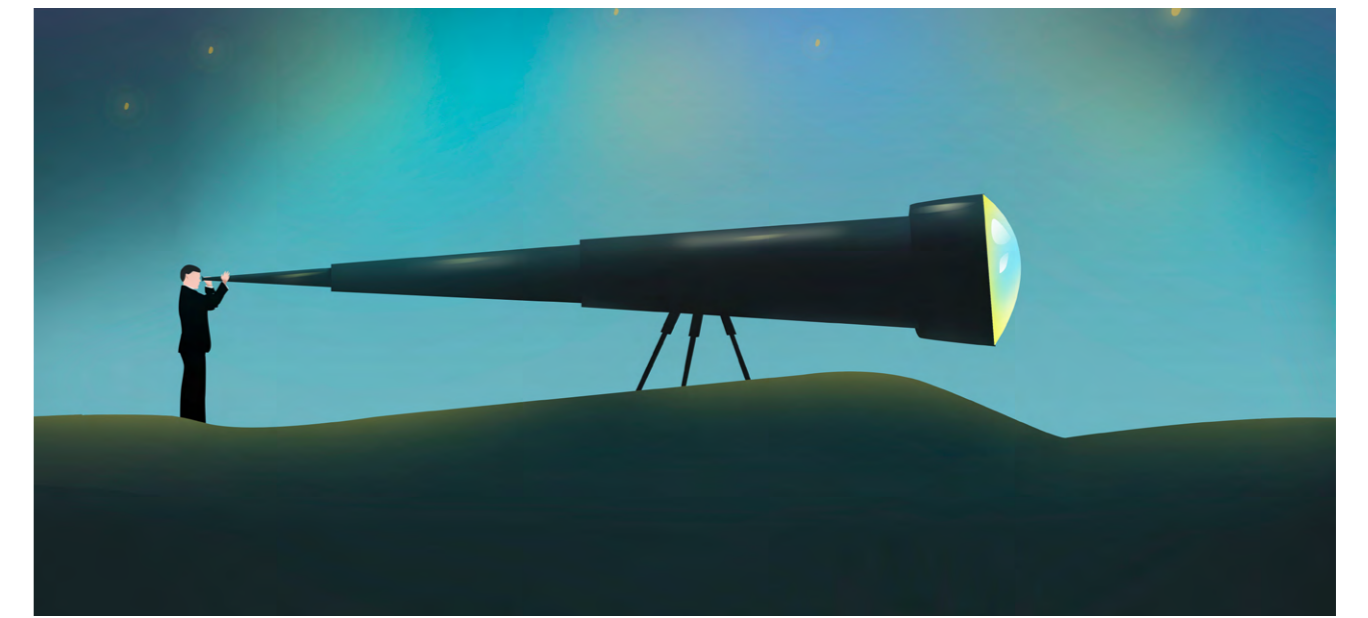
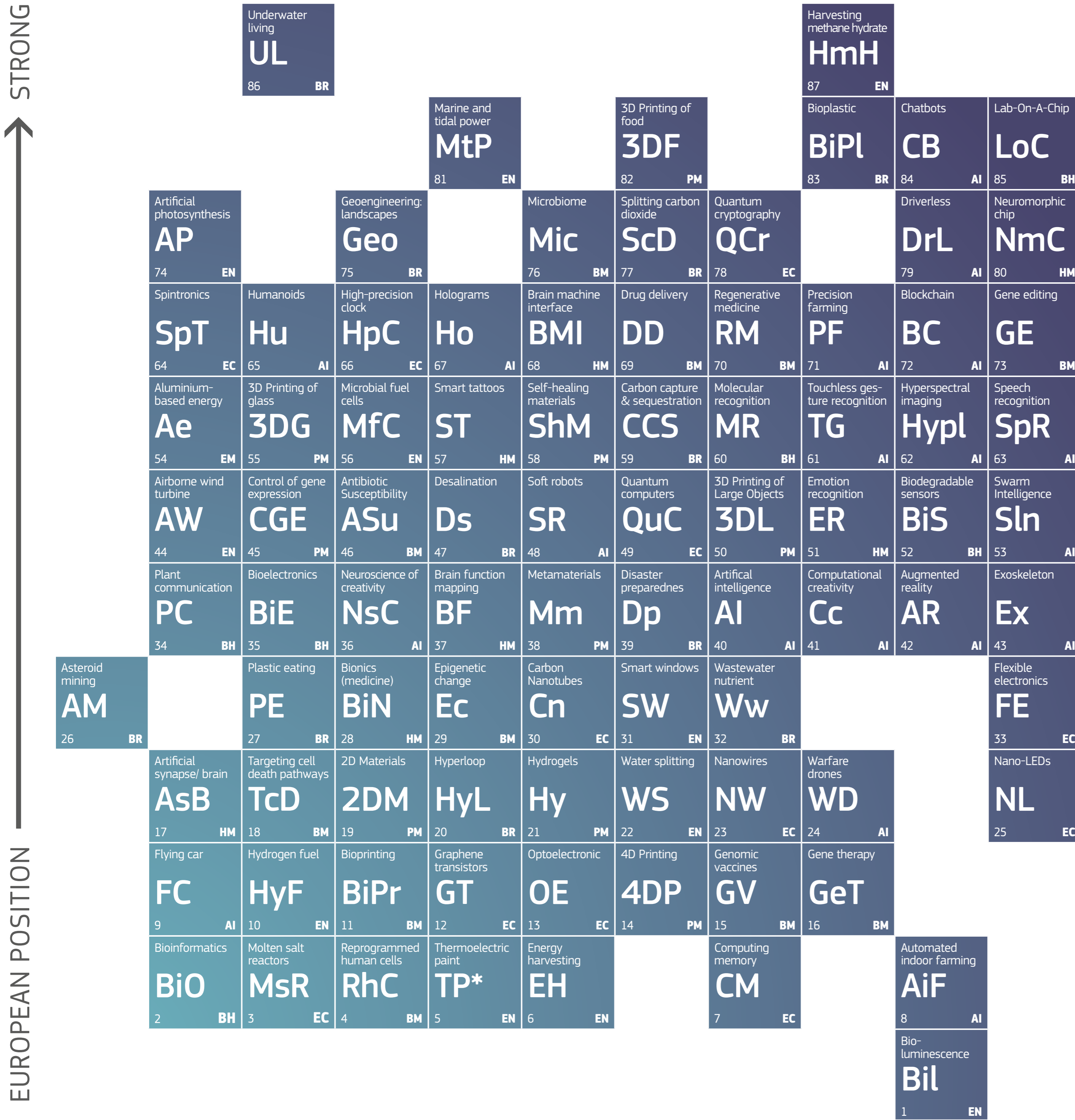


TABLE OF RADICAL INNOVATIONS BREAKTHROUGHS

A dashboard of 100 emerging developments offering strong impact on global value creation and potential solutions to societal needs



HOW TO READ ENTRIES

Bioinformatics — Full name
BiO — Abbreviation
BH — Thematic group code (See just below)
2 — Recent progress (See bottom part panel)

THEMATIC GROUPS

- AI** Artificial Intelligence and Robots
- HM** Human-Machine Interaction & Biomimetics
- EC** Electronics & Computing
- BH** Biohybrids
- BM** Biomedicine
- PM** Printing & Materials
- BR** Breaking Resource Boundaries
- EN** Energy
- SI** Social Innovations

LIKELIHOOD OF SIGNIFICANT USE / EXPANSION BY 2038

Local food circles Lf 88 SI	Basic income BI 89 SI	Owning & sharing health data Osh 90 SI	New journalist networks Nj 91 SI	Alternative currency AC 92 SI	Life caching LC 93 SI	Car-free city CF 94 SI	R/W culture diversifying RwC 95 SI	Access/commons economy AE 96 SI	Reinventing education Re 97 SI	Collaborative R&I spaces CS 98 SI	Body 2.0 & the quantified self B2 99 SI	Gamification Gm 100 SI
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|---|---|--|--|--|
| 1 Glowing plants, Visualization of gene expression | 22 New Catalysts, Fertilizers | 42 Synchronization with the physical world, Live instructions, Therapy | 63 Recycling, Security, Hardware & Software | 82 Soup with 3D printed twist, Technology to help people with dysphagia |
| 2 Biohybrid | 23 Batteries, Nanosensors, Electrochromic devices, FET, Heat dissipators | 43 Medical applications, Military applications, Industrial applications | 64 Dedicated chipsets and algorithms, Systems and devices | 83 Bioplastics for Skin contact, Wound repair, electronics |
| 3 Waste-burning with lithiumfluoride/thoriumfluoride material, Collaborative efforts in Canada, Prototypes in China | 24 Intelligence, Fuel autonomy, Microdrones, Defense against drones | 44 Ground- and flying Generator Airborne Energy Systems | 65 Spin relaxation and spin transport, Combination with Claytronics | 84 Unscripted chatbots, Reuse & integration with major platforms, Enterprise & Customer Service Applications |
| 4 Destruction of cancer cells, Macrophages to kill the Tuberculosis pathogen | 25 Multitasking LED displays, Deep UVC, Optical Data Communication | 45 Epitranscriptomics, Embryo development | 66 Mimicking humans, Application demonstrators, Control | 85 Sepsis detection, Lab-on-a-stick, Cheap lab-on-a-chip manufacturing |
| 5 (*No value for European position) - Thermoelectric paint, Harvest of electricity from waste heat | 26 Asteroid detection, Examination and mining technologies | 46 AST Micro-assay, Lab-on-a-Stick, Microfluidic devices, AST Gadget | 67 Attophysics, Ultra-precise time measurement for GPS applications VoIP | 86 Aquanaut technologies for hotels, Entering a sustainable underwater future |
| 6 Biological motion, Other sources (wind, heat, radio, chemical) | 27 Plastic-colonizing fungi, Micro-to-macro: plastic-munching worms | 47 Nanofiltration, New distillation solutions | 68 Acoustic holograms, Touchable/printable holograms | 87 Methane Hydrate Gas in China, Energy from methane hydrate gas on a large scale |
| 7 In-memory algorithms, Faster phase-shifting computer memory | 28 Exoskeleton, Upper limbs, Internal organs | 48 Pneumatic, Living muscle tissue, Hydrogel, Mechanical | 69 Electroencephalography (EEG, ECoG, fNIRS, fMRI) | 88 Community and indoor Gardening, Localised Food Systems, Permaculture |
| 8 Techno farming in extreme conditions | 29 Epigenetic technologies for diagnosis and other technologies | 49 Quantum systems, Quasiparticle control | 70 Breaking the Blood-Brain-Barrier, New- and nano-materials, Genetically-engineered devices | 89 Unconditional Minimum Basic Income, National Referendum on unconditional basic income |
| 9 Personal autonomous drones and rockets, Coordinated flying taxi services | 30 Nanotubes with fullerenes, On-chip light sources, Liquid biopsy chip | 50 Energy: 3D-printed turbine prototype, 3D-printing robots for building | 71 Cellular therapies, Tissue engineering and artificial tissues or organs | 90 Healthbank for Health information, Sharing scientific health data for money |
| 10 Production, Storage, Hydrogen-powered vehicles | 31 Electrochromic materials, Liquid crystal sandwich, Nanocrystals | 51 Interpreting facial expressions and text, voice, heartbeat, breathing | 72 Agrobots, Internet of Things in precision farming, In-field devices | 91 Large-scale investigative journalism |
| 11 Bones, tissue, skin, blood vessels and other human parts, 3D-printed models | 32 Nutrient recovery from wastewater, Biological phosphate removal | 52 Medical uses, Food/medication tracking, Environmental sensing | 73 Trust, Notarization, Smart contracts, Corporate blockchain networks | 92 Crypto-currencies traded world-wide, Giving up cash |
| 12 Microprocessors, Neuromorphic chips, Next-generation electronics | 33 Transistors, Displays, Energy storage, Sensors, Health monitoring, 3D printing | 53 The Swarm-Organ project, Unmanned Aerial Vehicles | 74 CRISPR as revolution in health, CRISPR in agriculture | 93 Live caching as an industry, Scrapbooking |
| 13 Optical computing, 5D optical data storage, Photonic chips | 34 Senses of plants, Parasites involved in plant communication | 54 Aluminium-ion batteries, Aluminium-air batteries | 75 Drug production, Fuel processing, Renewable energy, Air purification | 94 Banning cars from cities, New cities without cars |
| 14 Exposure to heat, Water contact | 35 Biochip, Biological computer, Biological computer parts, Bio interface | 55 Fused filament fabrication, Stereolithography | 76 Changing landscapes and climate, Climate Engineering: greenhouse gas removal | 95 Breakdown of established gatekeepers, Ownership disruption |
| 15 Clinical trials, DNA vaccines for animals, Better delivery pathways | 36 Testing and Influencing imagination and creativity | 56 New catalysts, Cheap material for electrodes, Wearable energy devices | 77 Gut bacteria and immunotherapy and gene activity, Probiotic bacteria and depression | 96 Online mediated sharing, Rise of the Commons, Based-peer production |
| 16 Disease areas, Treatments | 37 Brain electrical activity and biomarker mapping, Improving cognitive functions | 57 Medical technologies, Environmental monitoring, Marketing | 78 Low-cost carbon dioxide splitting | 97 Increase in diversity of actors in and forms of education |
| 17 Atomistors, ENODE, Junction-based artificial synaptic device, epiRAM | 38 Cloaking devices, Photovoltaic devices, Medical imaging | 58 Civil engineering, Protective clothing, Energy storage, Soft robotics | 79 Quantum key distribution from orbit, Faster data rates, Blockchain | 98 Makerspaces on the rise |
| 18 Targeting new pathways to trigger cell death | 39 Submarine (smart-)cable network, Robots & AI emergency response | 59 Exploring new storage solutions, New uses for CO ₂ | 80 New-generation sensors, Man-machine synergy, Legislation, Connectivity | 99 Tools for tracking common devices, Body 2.0 - monitoring at the workplace |
| 19 2D Semiconductors, 2D Magnets, Black phosphorous ink | 40 Duelling Networks, Capsule Networks, One Shot Image Recognition | 60 Portable diagnostic devices, Electrodiagnosis, Screening (medicine) | 81 Neuromorphic chips for object recognition | 100 Data generation combined with participation via gaming, Physical Education and Health |
| 20 Section of Hyperloop Track finalised in NL, Further tests under way at several sites | 41 Computational Creativity | 61 Ultrasonic gesture sensing, Optical cameras and sensors, Gesture decoding equipment | 82 New technologies for tidal and wave energy harvesting | |

