
CODEX OF THE
FUTURE
SERIES
THE EMERGING TECHNOLOGY
STARBURST
COLLECTION
UNLIMITED THINKING . EXPONENTIAL POTENTIAL
BY MATTHEW GRIFFIN
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ABOUT THE AUTHOR

Matthew Griffin, an award winning futurist and author of the Codex of the Future series, is described as "The Adviser behind the Advisers" and a "Young Kurzweil." Matthew is the Founder of the 311 Institute, a global Futures and Deep Futures advisory, as well as the World Futures Forum and XPotential University, two philanthropic organisations whose mission it is to solve global inequality and the world's greatest challenges.

Regularly featured in the global media, including the Associated Press, BBC, CNBC, Discovery, Entrepreneur Magazine, Forbes, Netflix, RT, Sky, ViacomCBS, and WIRED, Matthew's ability to identify, track, and explain the impacts of hundreds of exponential emerging technologies and trends on global business, culture, and society, is unparalleled.

Recognised as one of the world's foremost futurists, innovation, and strategy experts Matthew is an international advisor and keynote speaker who helps many of the world's most respected brands, governments, investors, NGO's, and royal households, explore, envision, build, and shape the future of global business, culture, and society.

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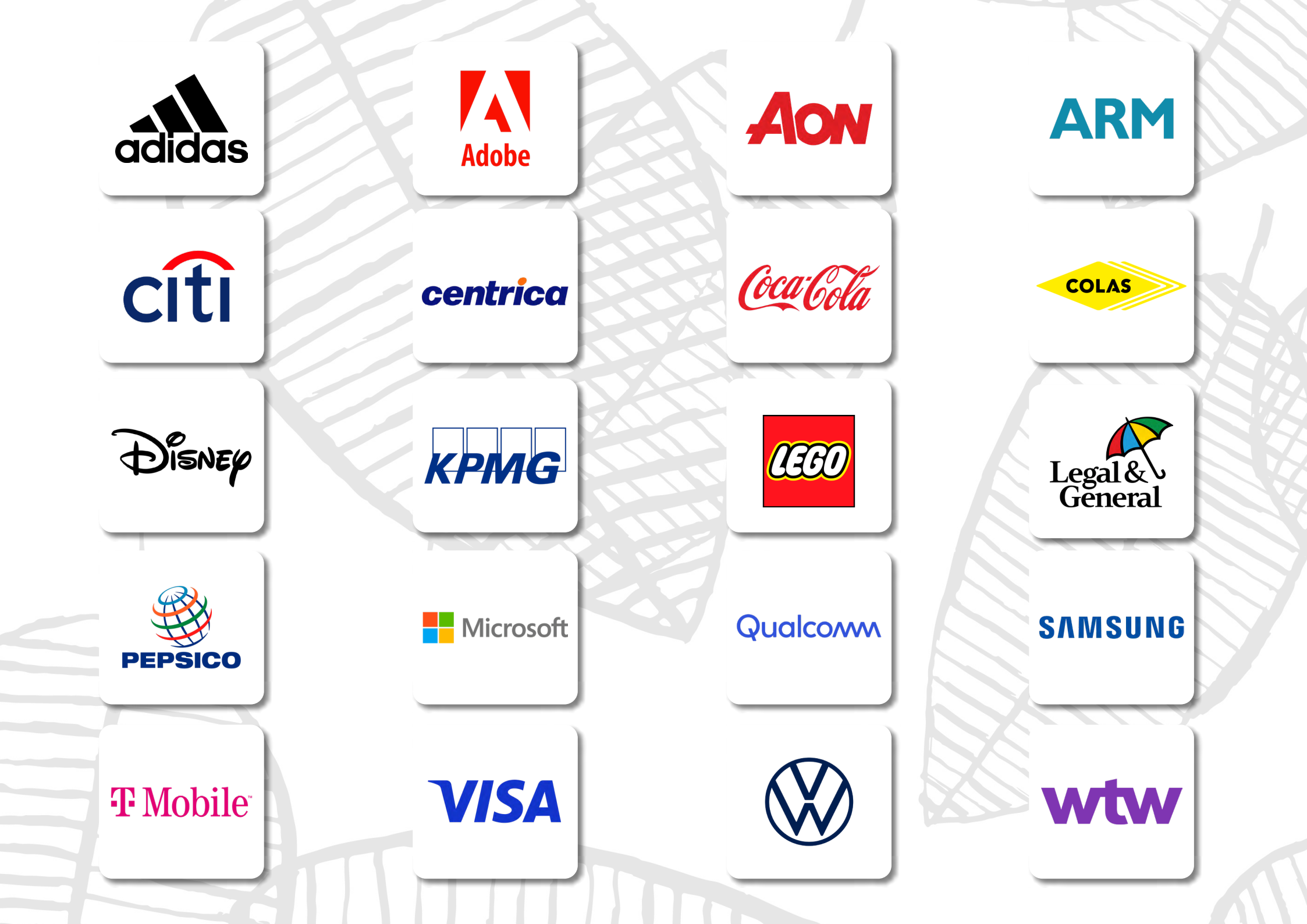
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A LETTER FROM OUR FOUNDER

MATTHEW GRIFFIN

WE LIVE in extraordinary times, in a world where individuals, organisations, and technology can impact the lives of billions of people and change the world at a speed and scale that would have been unimaginable just twenty years ago.

We also live in a world full of challenges, and a world where all too often negative news gets amplified at the expense of good news, and where tales of hope, inspiration, and positivity get drowned out and lost in the noise. It's no wonder therefore that today more people are more anxious about the future than ever before. And, arguably, a society which believes it's marching towards the darkness, rather than the light, has a poorer future than one that doesn't. Hope, however, is all around us and it's our purpose to light the way so all of us, people and planet, can prosper.

TESTIMONIALS

THANK YOU EVERYONE!

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Our **philanthropic university** working with academia, governments, and regulators to create and deliver accessible future focused curricula and educational content for business executives and students from around the world.

“THE FUTURE IS AN OPEN BOOK ... ”

- Matthew Griffin, Founder

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Explore the technologies and trends revolutionisning how content is made and consumed.

CODEX

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Fifth Edition published January 2023. To request this Codex in an alternative language please contact the author.

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Our annual Starbursts give you a quick birdseye view of the latest Megatrends and Exponential Technologies re-shaping our world, and in this section you can review them all at your leisure.

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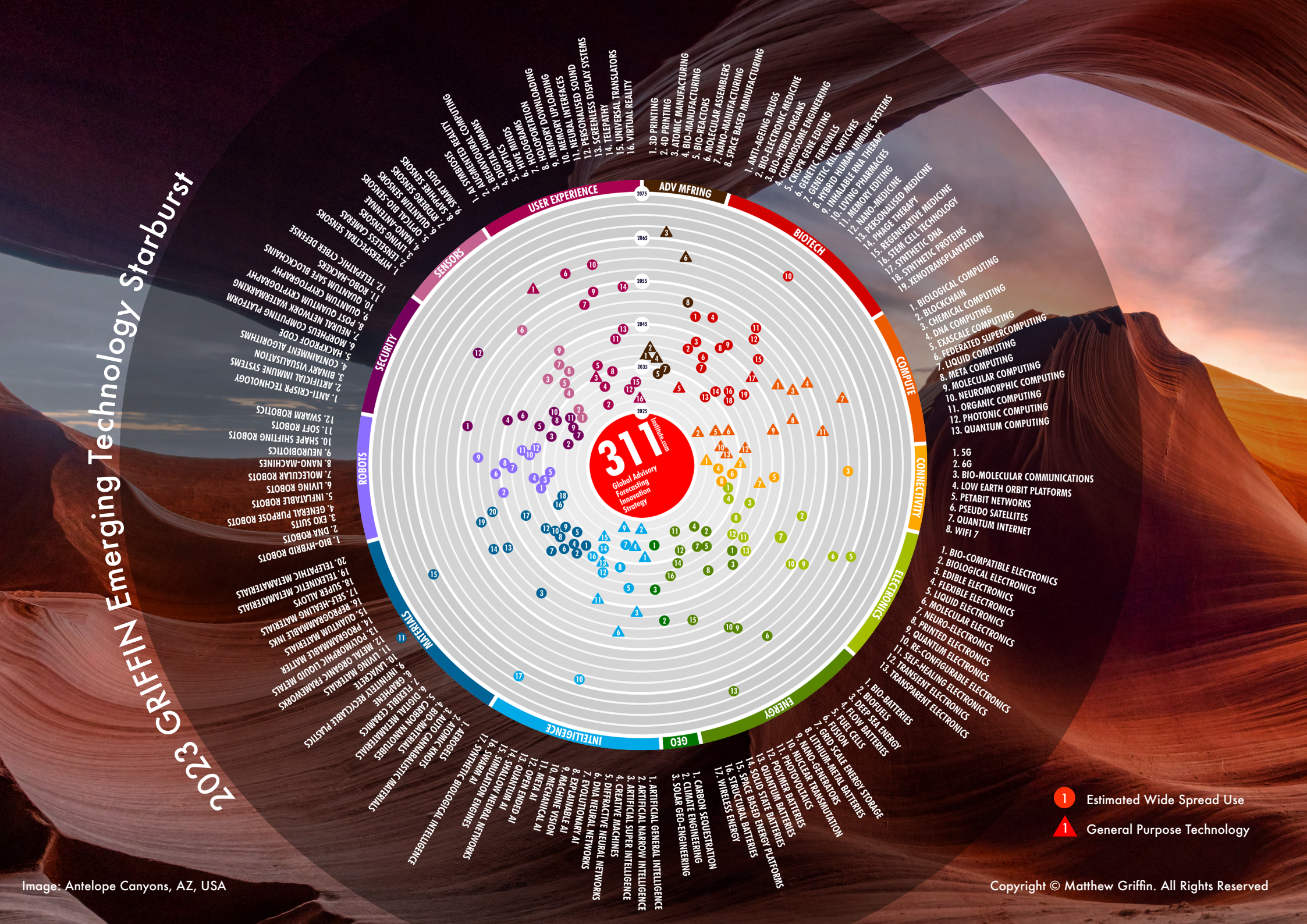
THE MUSEUM OF THE FUTURE

EVERY YEAR I publish a new Griffin Emerging Technology Starburst, and this year is no different. However, as the years change it would be all too easy just to consign all that hard work to the filing cabinet of history, never for them to be seen again. But that, in my opinion at least, would be a horrible waste so instead welcome to my Museum of the Future.

While the rest of this Codex looks to the future in this section we look to the present and the past, a kind of history of the future if you will, and put all those Starbursts proudly on display where you can scan and review them all at your leisure to see just how many powerful emerging technologies there are, and see first hand how difficult it is to keep up with them all and figure out the multitude of ways they can be combined together to create the products and paradigms that will shape our collective future.

Dive in to the wormhole ...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1 Estimated Wide Spread Use
1 General Purpose Technology
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2023 STARBURST REVIEW

IN THE 2023 Griffin Emerging Technology Starburst I extended the timeline to 2075, an increase from the 2022 Starburst which only extended to 2070, and tracked the development of 167 of the world's most promising emerging technologies, each with an addressable market value of over $500 Billion spread across 13 categories, I promoted 31 new emerging technologies and demoted 31.

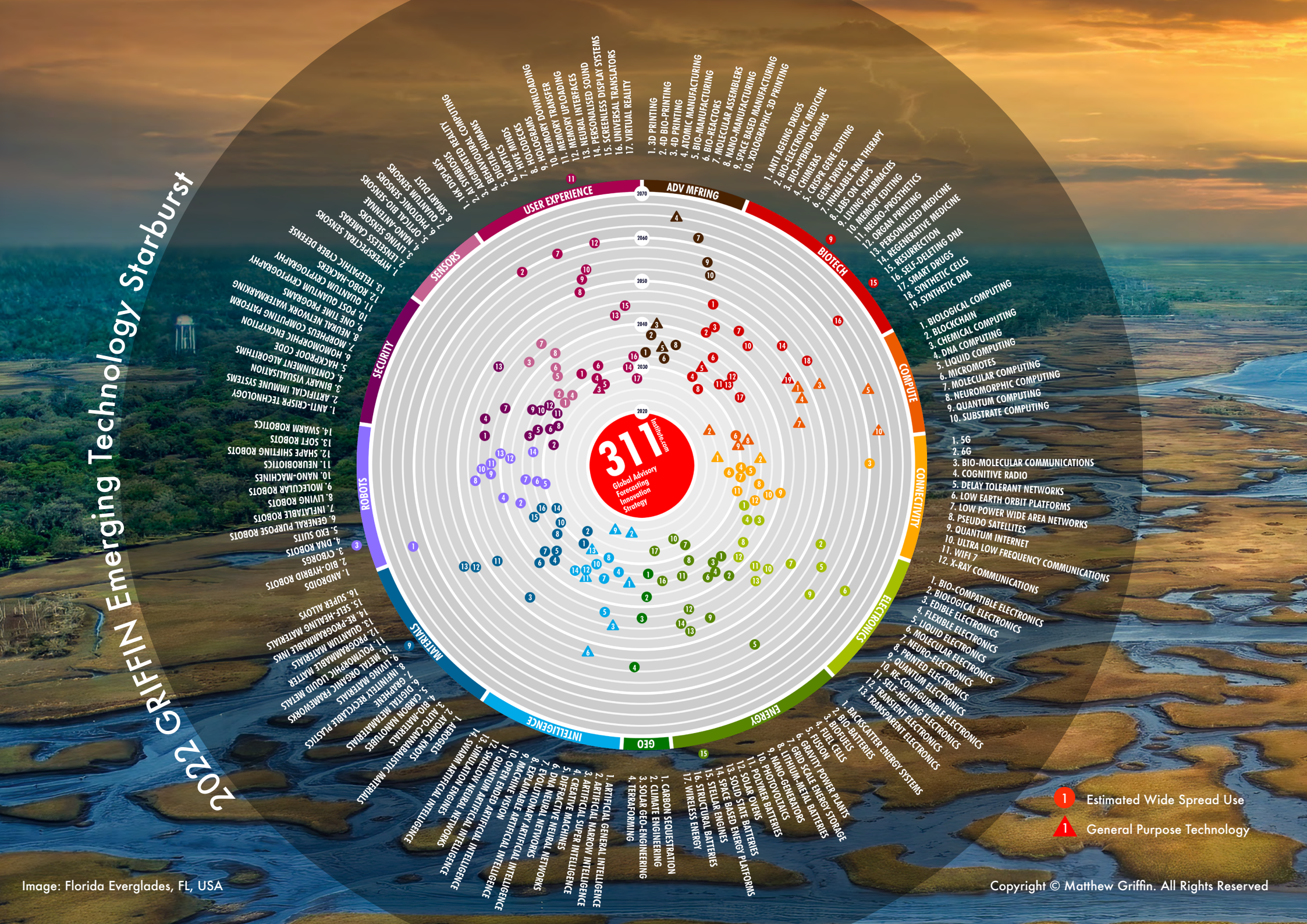
USING THE STARBURSTS

The Starbursts have been specifically designed to let you quickly see the estimated maturity of different technologies across different technology categories, and to get the most benefit from them I recommend you combine the information from this codex with that found in some of the other codexes in my Codex of the Future series, such as my 311 Trends Codex and How to Build Exponential Enterprises Codex.

By doing this you will have all the frameworks and information you need to quickly model future scenarios, assess their impact on your organisation, as well as global business, culture, and society, and everything you need to develop new products, roadmaps, and strategies.

TIMELINE:

2025 to 2075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1 General Purpose Technology
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2022 STARBURST REVIEW

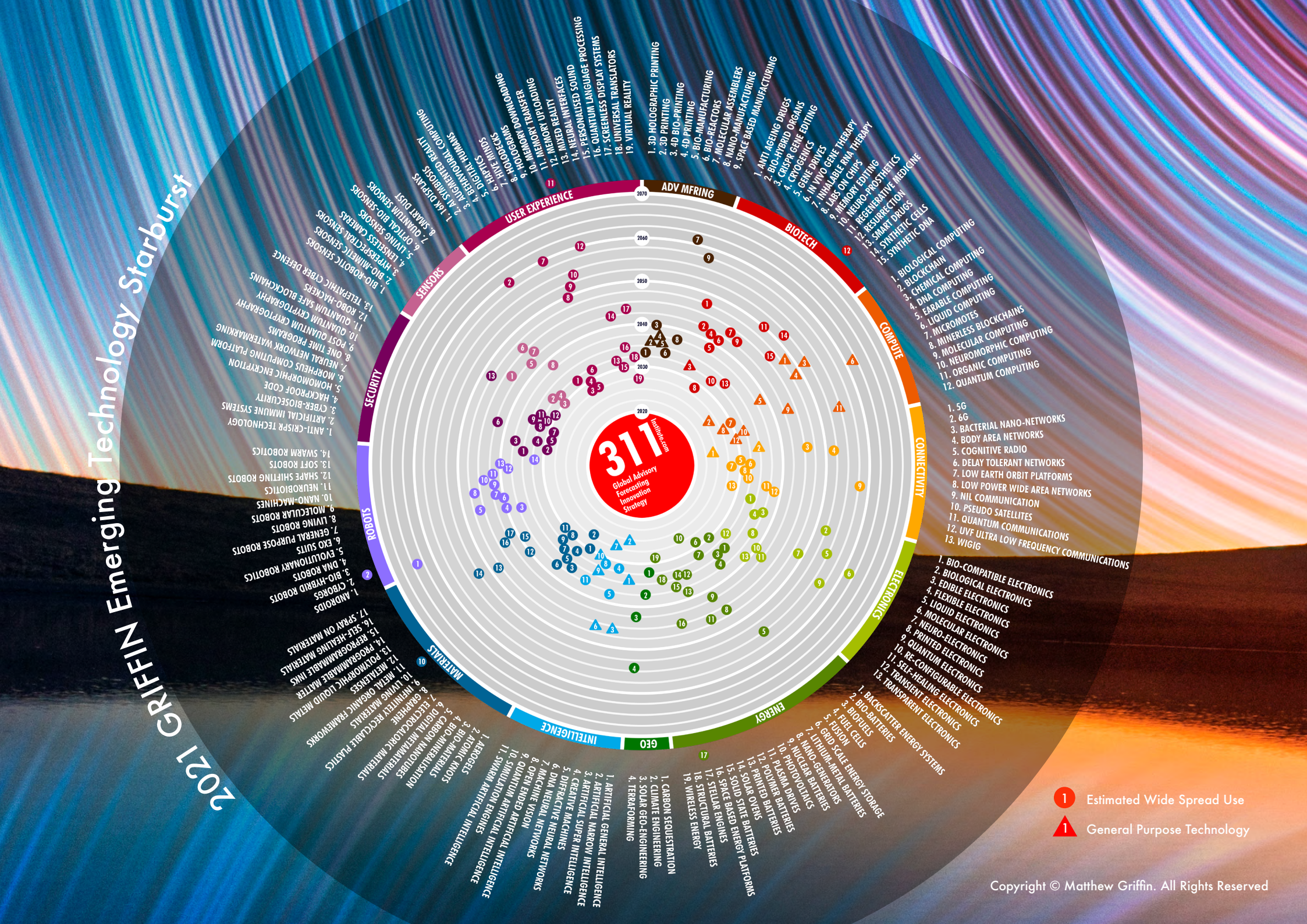
IN THE 2022 Griffin Emerging Technology Starburst, which displays 167 of the world's most significant emerging technologies, each with an addressable market value of over $500 Billion spread across 13 categories, up to a timeline of 2070, I promoted 28 new emerging technologies and demoted 28.

In 2022 there was an up tick in notable world firsts compared to 2021 which as the global pandemic faded wasn't unexpected as investment and R&D flows started returning to pre pandemic norms. Therefore, as expected, I saw an increase in the number of new emerging technologies which were double the number spotted in 2021. Biotech, Compute, Energy, Intelligence, and Materials saw the largest gains.

2022's breakthroughs and stand out world firsts included: 100% effective personalised cancer therapies • AI designs new chemical weapons and simulates all known proteins • AI redistributes wealth better than politicians • AI generated content and Digital Humans move mainstream • Chromosome Engineering accelerates biological evolution millions of years • First decentralised social network launches • First flexible ceramic • First lab grown blood cells • First Mechanical AI • First stress measuring wearable • First light based blood test • First tunnel dug by autonomous swarm robots • First telekinetic and telepathic materials • Google staffer claims AI is sentient • Lawyers drop NFTs to serve anonymous crims • Human mini-brains beat machine AI • Lab grown meat gains FDA approval • Military drone fleets emerge • Molecular computers break records • Russia first nation to use hypersonic weapons in wartime • Self-assembling space structures ace tests • Starlink achieves global network coverage. And many more.

TIMELINE:

2022 to 2070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8. LABS ON CHIPS
9. MEMORY EDITING
10. NEURO-PROSTHETICS
11. REGENERATIVE MEDICINE
12. RESURRECTION
13. SMART DRUGS
14. SYNTHETIC CELLS
15. SYNTHETIC DNA
COMPUTE
1. BIOLOGICAL COMPUTING
2. BLOCKCHAIN
3. CHEMICAL COMPUTING
4. DNA COMPUTING
5. EARABLE COMPUTING
6. LIQUID COMPUTING
7. MICROMOTES
8. MINERLESS BLOCKCHAINS
9. MOLECULAR COMPUTING
10. NEUROMORPHIC COMPUTING
11. ORGANIC COMPUTING
12. QUANTUM COMPUTING
CONNECTIVITY
1. 5G
2. 6G
3. BACTERIAL NANO-NETWORKS
4. BODY AREA NETWORKS
5. COGNITIVE RADIO
6. DELAY TOLERANT NETWORKS
7. LOW EARTH ORBIT PLATFORMS
8. LOW POWER WIDE AREA NETWORKS
9. NIL COMMUNICATION
10. PSEUDO SATELLITES
11. QUANTUM COMMUNICATIONS
12. UVF ULTRA LOW FREQUENCY COMMUNICATIONS
13. WIGIG
ELECTRONICS
1. BIO-COMPATIBLE ELECTRONICS
2. BIOLOGICAL ELECTRONICS
3. EDIBLE ELECTRONICS
4. FLEXIBLE ELECTRONICS
5. LIQUID ELECTRONICS
6. MOLECULAR ELECTRONICS
7. NEURO-ELECTRONICS
8. PRINTED ELECTRONICS
9. QUANTUM ELECTRONICS
10. RE-CONFIGURABLE ELECTRONICS
11. SELF-HEALING ELECTRONICS
12. TRANSIENT ELECTRONICS
13. TRANSPARENT ELECTRONICS
ENERGY
1. BACKSCATTER ENERGY SYSTEMS
2. BIO-BATTERIES
3. BIOFUELS
4. FUEL CELLS
5. FUSION
6. GRID SCALE ENERGY STORAGE
7. LITHIUM-METAL BATTERIES
8. NANO-GENERATORS
9. NUCLEAR BATTERIES
10. PHOTOVOLTAICS
11. PLASMA DRIVES
12. POLYMER BATTERIES
13. PRINTED BATTERIES
14. SOLAR OVENS
15. SOLID STATE BATTERIES
16. SPACE BASED ENERGY PLATFORMS
17. STELLAR ENGINES
18. STRUCTURAL BATTERIES
19. WIRELESS ENERGY
GEO
1. CARBON SEQUESTRATION
2. CLIMATE ENGINEERING
3. SOLAR GEO-ENGINEERING
4. TERRAFORMING
INTELLIGENCE
1. ARTIFICIAL GENERAL INTELLIGENCE
2. ARTIFICIAL NARROW INTELLIGENCE
3. ARTIFICIAL SUPER INTELLIGENCE
4. CREATIVE MACHINES
5. DIFFRACTIVE NEURAL NETWORKS
6. DNA NEURAL NETWORKS
7. MACHINE VISION
8. OPEN ENDED ARTIFICIAL INTELLIGENCE
9. QUANTUM ENHANCED ARTIFICIAL INTELLIGENCE
10. SIMULATION ARTIFICIAL INTELLIGENCE
11. SWARM ARTIFICIAL INTELLIGENCE
MATERIALS
1. AEROGELS
2. ATOMIC KNOTS
3. BIO-MATERIALS
4. BIO-MINERALISATION
5. CARBON NANOTUBES
6. DIGITAL MATERIALS
7. ELECTROCHROMIC MATERIALS
8. GRAPHENE
9. INFINITELY RECYCLABLE PLASTICS
10. LIVING MATERIALS
11. METAL ORGANIC FRAMEWORKS
12. METALENSES
13. POLYMORPHIC LIQUID MATTER
14. PROGRAMMABLE MATTER
15. REPROGRAMMABLE INKS
16. SELF-HEALING MATERIALS
17. SPRAY ON MATERIALS
ROBOTS
1. ANDROIDS
2. CYBORGS
3. BIO-HYBRID ROBOTS
4. DNA ROBOTS
5. EVOLUTIONARY ROBOTICS
6. EXO SUITS
7. GENERAL PURPOSE ROBOTS
8. LIVING ROBOTS
9. MOLECULAR ROBOTS
10. NANO-MACHINES
11. NEUROBIOTICS
12. SHAPE SHIFTING ROBOTS
13. SOFT ROBOTS
14. SWARM ROBOTICS
SECURITY
1. ANTI-CRISPR TECHNOLOGY
2. ARTIFICIAL IMMUNE SYSTEMS
3. CYBER-BIOSECURITY
4. HACKPROOF CODE
5. HOMOMORPHIC ENCRYPTION
6. MORPHEUS COMPUTING PLATFORM
7. NEURAL NETWORK WATERMARKING
8. ONE TIME PROGRAMS
9. POST QUANTUM CRYPTOGRAPHY
10. QUANTUM CRYPTOGRAPHY
11. QUANTUM SAFE BLOCKCHAINS
12. ROBO-HACKERS
13. TELEPATHIC CYBER DEFENCE
SENSORS
1. BIO-ROBOTIC SENSORS
2. BIO-MIMETIC SENSORS
3. HYPERSPECTRAL SENSORS
4. LENSELESS CAMERAS
5. LIVING BIO-SENSORS
6. OPTICAL BIO-SENSORS
7. QUANTUM SENSORS
8. SMART DUST
USER EXPERIENCE
1. 16K DISPLAYS
2. AI SYMBIOSIS
3. AUGMENTED REALITY
4. BEHAVIOURAL COMPUTING
5. DIGITAL HUMANS
6. HALF MINDS
7. HOLOGRAMS
8. HOLOGRAPHIC DOWNLOADING
9. MEMORY TRANSFER
10. MEMORY UPLOADING
11. MIXED REALITY
12. NEURAL INTERFACES
13. PERSONALISED SOUND
14. QUANTUM LANGUAGE PROCESSING
15. SCREENLESS DISPLAY SYSTEMS
16. UNIVERSAL TRANSLATORS
17. VIRTUAL REALITY
1 Estimated Wide Spread Use
1 General Purpose Technology
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2021 STARBURST REVIEW

IN THE 2021 Griffin Emerging Technology Starburst, which displays 167 of the world's most significant emerging technologies, each with an addressable market value of over $500 Billion spread across 13 categories, up to a timeline of 2070, I promoted 17 new emerging technologies and demoted 17 - the lowest of any year so far.

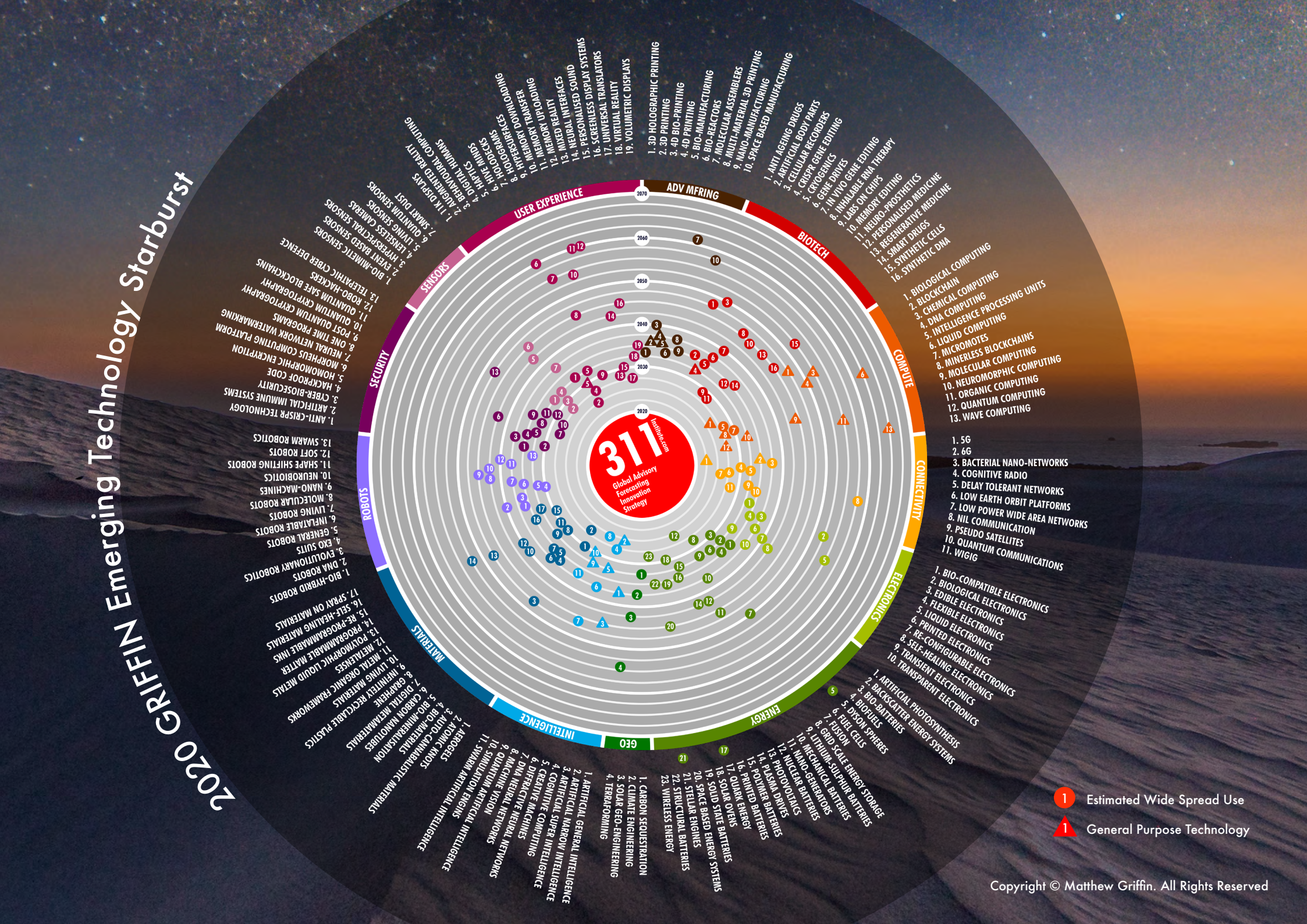
In 2021 there were fewer notable world firsts than in 2020 which, as in 2020, I again attribute to the fact that much of the worlds investment and R&D flows were re-aligned to fight the global pandemic, COVID-19. There was also a marked decrease, of approximately 23 percent year on year, in the number of new emerging technologies that appeared, and this marks the first consecutive year on year decline I've seen since I've been keeping records.

Unsurprisingly Biotech, Compute, and Energy saw the largest gains, and this was the year that many emerging technologies showed the world what they were capable of - whether it was using AI to develop vaccines or 3D printing to print out of stock parts for ventilators.

2021's stand out world firsts included: AI learning the art of "Diplomacy" • First 2nm computer chip • First 5G NR installation • First 5 minute EV charging system • First AI credited as an inventor • First autonomous Hunter-Killer drone kill • First Bio-Artificial Kidney • First empathetic first person VR surgery preview • First EV with 1,000km range • First green steel • First unethical Human burgers • First Internet of Electricity material • First mass biometric spoofing cyber attack • First Metaverse city • First re-programmable satellite • First spontaneously replicating living robot. And many more.

TIMELINE:

2021 to 2070


2020 GRIFFIN Emerging Technology Starburst
311
Global Advisory Forecasting Innovation Strategy
1stfinite.com
ADV MFRING
1. 3D HOLOGRAPHIC PRINTING
2. 3D PRINTING
3. 4D BIO-PRINTING
4. 4D PRINTING
5. BIO-MANUFACTURING
6. BIO-REACTORS
7. MOLECULAR ASSEMBLERS
8. MULTI-MATERIAL 3D PRINTING
9. NANO-MANUFACTURING
10. SPACE BASED MANUFACTURING
BIOTECH
1. ANTI AGEING DRUGS
2. ARTIFICIAL BODY PARTS
3. CELLULAR RECORDERS
4. CRISPR GENE EDITING
5. CRYOGENICS
6. GENE DRIVES
7. IN VIVO GENE EDITING
8. INHALABLE RNA THERAPY
9. LABS ON CHIPS
10. MEMORY EDITING
11. NEURO-PROSTHETICS
12. PERSONALISED MEDICINE
13. REGENERATIVE MEDICINE
14. SMART DRUGS
15. SYNTHETIC CELLS
16. SYNTHETIC DNA
COMPUTE
1. BIOLOGICAL COMPUTING
2. BLOCKCHAIN
3. CHEMICAL COMPUTING
4. DNA COMPUTING
5. INTELLIGENCE PROCESSING UNITS
6. LIQUID COMPUTING
7. MICROMOTES
8. MINERLESS BLOCKCHAINS
9. MOLECULAR COMPUTING
10. NEUROMORPHIC COMPUTING
11. ORGANIC COMPUTING
12. QUANTUM COMPUTING
13. WAVE COMPUTING
CONNECTIVITY
1. 5G
2. 6G
3. BACTERIAL NANO-NETWORKS
4. COGNITIVE RADIO
5. DELAY TOLERANT NETWORKS
6. LOW EARTH ORBIT PLATFORMS
7. LOW POWER WIDE AREA NETWORKS
8. NIL COMMUNICATION
9. PSEUDO SATELLITES
10. QUANTUM COMMUNICATIONS
11. WIGIG
ELECTRONICS
1. BIO-COMPATIBLE ELECTRONICS
2. BIOLOGICAL ELECTRONICS
3. EDIBLE ELECTRONICS
4. FLEXIBLE ELECTRONICS
5. LIQUID ELECTRONICS
6. PRINTED ELECTRONICS
7. RE-CONFIGURABLE ELECTRONICS
8. SELF-HEALING ELECTRONICS
9. TRANSIENT ELECTRONICS
10. TRANSPARENT ELECTRONICS
ENERGY
1. ARTIFICIAL PHOTOSYNTHESIS
2. BACKSCATTER ENERGY SYSTEMS
3. BIO-BATTERIES
4. BIOFUELS
5. DYSON SPHERES
6. FUEL CELLS
7. FUSION
8. GRID SCALE ENERGY STORAGE
9. LITHIUM-SULPHUR BATTERIES
10. MECHANICAL BATTERIES
11. NANO-GENERATORS
12. NUCLEAR BATTERIES
13. PHOTOVOLTAICS
14. PLASMA DRIVES
15. POLYMER BATTERIES
16. PRINTED ENERGY
17. QUARK ENERGY
18. SOLAR OVENS
19. SOLID STATE BATTERIES
20. SPACE BASED ENERGY SYSTEMS
21. STELLAR ENGINES
22. STRUCTURAL BATTERIES
23. WIRELESS ENERGY
GEO
1. CARBON SEQUESTRATION
2. CLIMATE ENGINEERING
3. SOLAR GEO-ENGINEERING
4. TERRAFORMING
INTELLIGENCE
1. ARTIFICIAL GENERAL INTELLIGENCE
2. ARTIFICIAL NARROW INTELLIGENCE
3. ARTIFICIAL SUPER INTELLIGENCE
4. COGNITIVE COMPUTING
5. CREATIVE MACHINES
6. DIFFRACTIVE NEURAL NETWORKS
7. DNA NEURAL NETWORKS
8. MACHINE VISION
9. QUANTUM ARTIFICIAL INTELLIGENCE
10. SIMULATION ENGINES
11. SWARM ARTIFICIAL INTELLIGENCE
MATERIALS
1. ABIOGELS
2. ATOMIC KNOTS
3. AUXETIC CANNABALISTIC MATERIALS
4. BIO-MINERALISATION
5. BIO-MIMETIC MATERIALS
6. CARBON NANOTUBES
7. DIGITAL METAMATERIALS
8. GRAPHENE
9. INHERITEX RECYCLABLE PLASTICS
10. LIVING MATERIALS
11. METALENSES
12. POLYMORPHIC LIQUID METALS
13. PROGRAMMABLE MATTER
14. PROGRAMMABLE INKS
15. RE-PROGRAMMING MATERIALS
16. SELF-HEALING MATERIALS
17. SPRAY ON MATERIALS
ROBOTS
1. BIO-HYBRID ROBOTS
2. DNA ROBOTS
3. EVOLUTIONARY ROBOTICS
4. EXO SUITS
5. GENERAL ROBOTS
6. INFLATABLE ROBOTS
7. LIVING ROBOTS
8. MOLECULAR ROBOTS
9. NANO-MACHINES
10. NEUROBOTICS
11. SHAPE SHIFTING ROBOTS
12. SOFT ROBOTS
13. SWARM ROBOTICS
SECURITY
1. ANTI-CRISPR TECHNOLOGY
2. ARTIFICIAL IMMUNE SYSTEMS
3. CYBER-BIOSECURITY
4. HACKPROOF CODE
5. HOMOMORPHIC ENCRYPTION
6. MORPHEUS COMPUTING PLATFORM
7. NEURAL NETWORK WATERMARKING
8. ONE TIME PROGRAMS
9. POST QUANTUM CRYPTOGRAPHY
10. QUANTUM CRYPTOGRAPHY
11. QUANTUM SAFE BLOCKCHAINS
12. ROBO-HACKERS
13. TELEPATHIC CYBER DEFENCE
SENSORS
1. BIO-MIMETIC SENSORS
2. EVENT BASED SENSORS
3. HYPERSPECTRAL SENSORS
4. LENSELESS CAMERAS
5. LIVING SENSORS
6. QUANTUM SENSORS
7. SMART DUST
USER EXPERIENCE
1. 1K DISPLAYS
2. AUGMENTED REALITY
3. BEHAVIOURAL HUMANS
4. DIGITAL HUMANS
5. HAPTICS
6. HIVE MINDS
7. HOLOGRAMS
8. HYPERSURFACES
9. MEMORY TRANSFER
10. MEMORY UPLOADING
11. MIXED REALITY
12. NEURAL INTERFACES
13. PERSONALISED SOUND
14. PERSONALISED DISPLAY SYSTEMS
15. SCREENLESS DISPLAY SYSTEMS
16. UNIVERSAL TRANSLATORS
17. VIRTUAL REALITY
18. VOLUMETRIC DISPLAYS
19. VOLUMETRIC DISPLAYS
2070
2060
2050
2040
2030
2020
1 Estimated Wide Spread Use
1 General Purpose Technology
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2020 STARBURST REVIEW

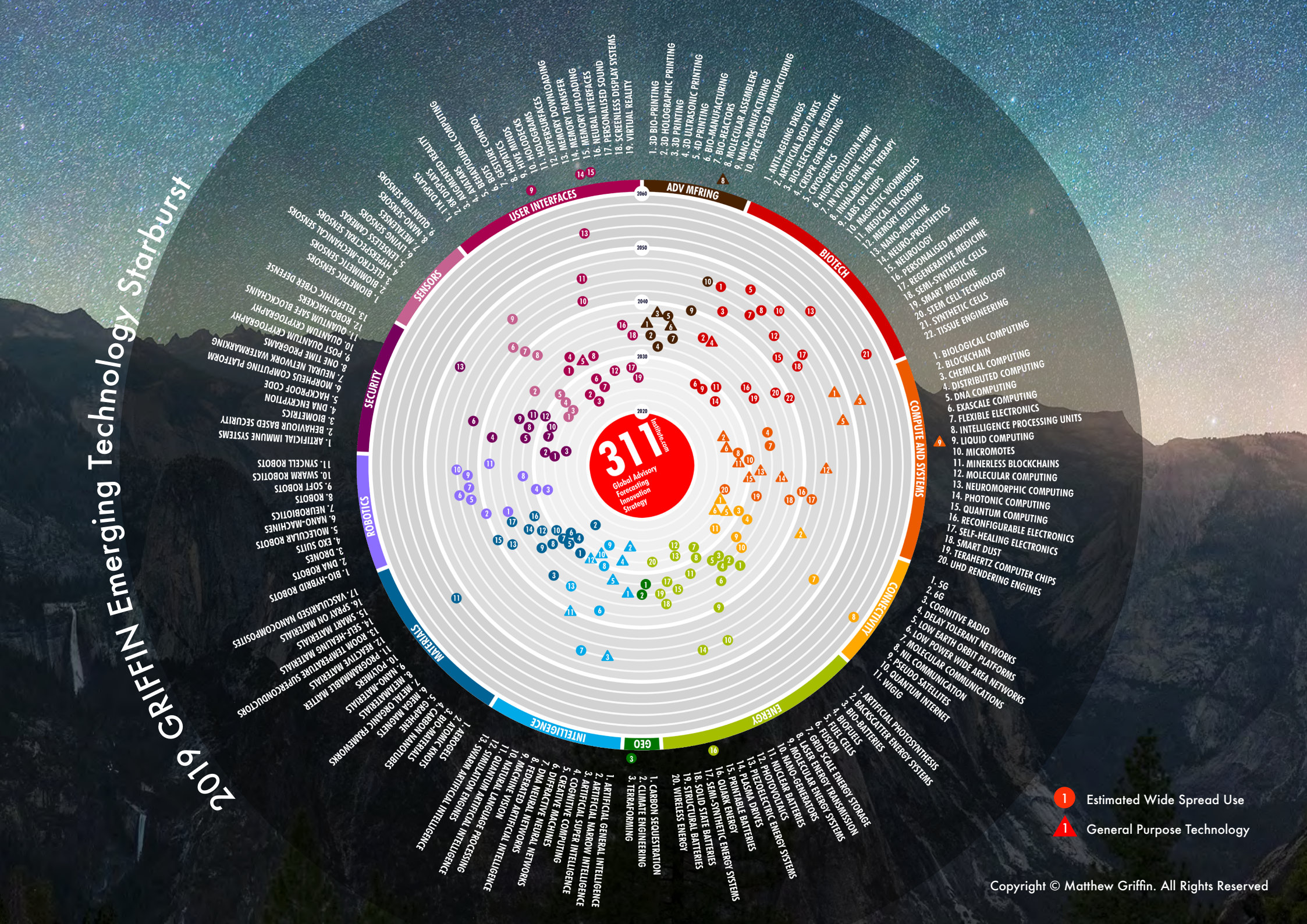
IN THE 2020 Starburst I extended the timeline to 2070, an increase from the 2019 Starburst which only extended to 2060, and tracked the development of 167 of the years most significant emerging exponential technologies, each with an addressable market value of over $500 Billion spread across 13 major categories, one of which "Electronics" was a new addition. I also promoted 44 new emerging technologies, and demoted 45.

In 2020 there were fewer notable world firsts than in 2019 which I attribute to the fact that much of the worlds investment and R&D flows were re-aligned to help the world conquer the debilitating global pandemic, COVID-19. There was also a marked decrease, of approximately 40 percent year on year, in the number of new emerging technologies that appeared this year and this is reflected in the 2021 Starburst that saw the lowest number of new entries since my records began. Unsurprisingly though the Biotech and Intelligence categories saw the largest gains.

2020's stand out world firsts included: Advanced DeepFakes • First 3D printed mini human heart • First 6G satellite test • First AI generated interactive procedural VR game • First AR smart contact lenses • First artificial living cells • First Bio-Synthetic network • First CRISPR in vivo gene editing • First hypersonic weapons deployment • First in vivo 3D Bio-Printing robot • First novel Cancer vaccine • First pilotless commercial aircraft • First protein folding AI • First reversal of human ageing • First room temperature superconductor • First virtual food. And many more.

TIMELINE:

2020 to 2070


2019 GRIFFIN Emerging Technology Starburst
311
Global Advisory
Forecasting
Innovation
Strategy
1stfinote.com
2060
2050
2040
2030
2020
ADV MFRING
BIOTECH
COMPUTE AND SYSTEMS
CONNECTIVITY
ENERGY
GEO
INTELLIGENCE
MATERIALS
ROBOTICS
SECURITY
SENSORS
USER INTERFACES
1. 3D BIO-PRINTING
2. 3D HOLOGRAPHIC PRINTING
3. 3D PRINTING
4. 3D ULTRASONIC PRINTING
5. 4D PRINTING
6. BIO-MANUFACTURING
7. BIO-REACTORS
8. MOLECULAR ASSEMBLERS
9. NANO-MANUFACTURING
10. SPACE BASED MANUFACTURING
1. ANTI-AGEING DRUGS
2. ARTIFICIAL BODY PARTS
3. BIO-ELECTRONIC MEDICINE
4. CRISPR GENE EDITING
5. CRYOGENICS
6. HIGH RESOLUTION FMRI
7. IN VIVO GENE THERAPY
8. INHALABLE RNA THERAPY
9. LABS ON CHIPS
10. MAGNETIC WORMHOLES
11. MEDICAL TRICORDERS
12. MEMORY EDITING
13. NANO-MEDICINE
14. NEURO-PROSTHETICS
15. NEUROLOGY
16. PERSONALISED MEDICINE
17. REGENERATIVE MEDICINE
18. SEMI-SYNTHETIC CELLS
19. SMART MEDICINE
20. STEM CELL TECHNOLOGY
21. SYNTHETIC CELLS
22. TISSUE ENGINEERING
1. BIOLOGICAL COMPUTING
2. BLOCKCHAIN
3. CHEMICAL COMPUTING
4. DISTRIBUTED COMPUTING
5. DNA COMPUTING
6. EXASCALE COMPUTING
7. FLEXIBLE ELECTRONICS
8. INTELLIGENCE PROCESSING UNITS
9. LIQUID COMPUTING
10. MICROMOTES
11. MINERLESS BLOCKCHAINS
12. MOLECULAR COMPUTING
13. NEUROMORPHIC COMPUTING
14. PHOTONIC COMPUTING
15. QUANTUM COMPUTING
16. RECONFIGURABLE ELECTRONICS
17. SELF-HEALING ELECTRONICS
18. SMART DUST
19. TERAHERTZ COMPUTER CHIPS
20. UHD RENDERING ENGINES
1. 5G
2. 6G
3. COGNITIVE RADIO
4. DELAY TOLERANT NETWORKS
5. LOW EARTH ORBIT PLATFORMS
6. LOW POWER WIDE AREA NETWORKS
7. MOLECULAR COMMUNICATIONS
8. NIL COMMUNICATION
9. PSEUDO SATELLITES
10. QUANTUM INTERNET
11. WIGIG
1. ARTIFICIAL PHOTOSYNTHESIS
2. BACKSCATTER ENERGY SYSTEMS
3. BIO-BATTERIES
4. BIOFUELS
5. FUEL CELLS
6. FUSION
7. GRID SCALE ENERGY STORAGE
8. LASER ENERGY TRANSMISSION
9. MOLECULAR ENERGY SYSTEMS
10. NANO-GENERATORS
11. NUCLEAR BATTERIES
12. PHOTOVOLTAICS
13. PIEZOELECTRIC ENERGY SYSTEMS
14. PLASMA DRIVES
15. PRINTABLE BATTERIES
16. QUARK ENERGY
17. SEMI-SYNTHETIC ENERGY SYSTEMS
18. SOLID STATE BATTERIES
19. STRUCTURAL BATTERIES
20. WIRELESS ENERGY
1. CARBON SEQUESTRATION
2. CLIMATE ENGINEERING
3. TERRAFORMING
1. ARTIFICIAL GENERAL INTELLIGENCE
2. ARTIFICIAL NARROW INTELLIGENCE
3. ARTIFICIAL SUPER INTELLIGENCE
4. COGNITIVE COMPUTING
5. CREATIVE MACHINES
6. DIFFRACTIVE NEURAL NETWORKS
7. DNA NEURAL NETWORKS
8. FEDERATED ARTIFICIAL INTELLIGENCE
9. MACHINE VISION
10. NATURAL LANGUAGE PROCESSING ARTIFICIAL INTELLIGENCE
11. QUANTUM ARTIFICIAL INTELLIGENCE
12. SIMULATION ENGINES
13. SWARM ARTIFICIAL INTELLIGENCE
1. AEROGELS
2. ATOMIC MAGNETS
3. BIO-MATERIALS
4. CARBON NANOTUBES
5. GRAPHENE
6. MEGA MAGNETS
7. METAMATERIALS
8. METAL ORGANIC FRAMEWORKS
9. NANO-MATERIALS
10. POLYMERS
11. PROGRAMMABLE MATTER
12. REACTIVE MATERIALS
13. ROOM TEMPERATURE SUPERCONDUCTORS
14. SELF-HEALING MATERIALS
15. SMART MATERIALS
16. SPRAY ON MATERIALS
17. VASCULARISED NANOCOMPOSITES
1. BIO-HYBRID ROBOTS
2. DNA ROBOTS
3. DRONES
4. EXO SUITS
5. MOLECULAR ROBOTS
6. NANO-MACHINES
7. NEUROBIOTICS
8. ROBOTS
9. SOFT ROBOTS
10. SWARM ROBOTICS
11. SYNCELL ROBOTS
1. ARTIFICIAL IMMUNE SYSTEMS
2. BEHAVIOUR BASED SECURITY
3. BIOMETRICS
4. DNA ENCRYPTION
5. HACKPROOF CODE
6. MORPHEUS COMPUTING PLATFORM
7. NEURAL NETWORK WATERMARKING
8. ONE TIME PROGRAMS
9. POST QUANTUM SAFE BLOCKCHAINS
10. QUANTUM CRYPTOGRAPHY
11. QUANTUM SAFE CRYPTOGRAPHY
12. ROBO-HACKERS
13. TELEPATHIC CYBER DEFENSE
1. BIOMETRIC SENSORS
2. BIOMIMETIC SENSORS
3. ELECTRO-MECHANICAL SENSORS
4. HYPERSPECTRAL SENSORS
5. LENSELESS CAMERAS
6. LIVING SENSORS
7. METALENSES
8. NANO-SENSORS
9. QUANTUM SENSORS
1. 1.1K DISPLAYS
2. 8K DISPLAYS
3. 4. AUGMENTED REALITY
4. 5. BEHAVIOURAL COMPUTING
5. BOTS
6. GESTURE CONTROL
7. HAPTICS
8. HIVE MINDS
9. HOLODECKS
10. HOLOGRAMS
11. HYPERSURFACES
12. MEMORY TRANSFER
13. MEMORY UPLOADING
14. NEURAL INTERFACES
15. PERSONALISED SOUND
16. SCREENLESS DISPLAY SYSTEMS
17. VIRTUAL REALITY
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2019 STARBURST REVIEW

IN THE 2019 Starburst I extended the timeline to 2060, an increase from the 2018 Starburst which only extended to 2040, and tracked the development of 169 of the years most significant emerging technologies, across 12 major categories, one of which "Intelligence" was a new addition. I also promoted 28 new emerging technologies, and demoted 28. For the first time the Starburst also visualised 25 General Purpose Technologies (GPT) that will drive innovation and disruption across multiple sectors.

In 2019 there were more notable world firsts than in 2018, especially in the field of Artificial Intelligence (AI). However, there were also noticeable breakthroughs in Advanced Manufacturing, Computing, Robotics, and Synthetic Biology.

2019's stand out world firsts included: Achieving Quantum Supremacy • AI beats superstar human gamers • An evolving AI that developed new tools • Beef 3D printed in space • First 8 base pair synthetic DNA organism • First aerosol based mRNA in vivo genetic engineering therapy • First AI counsellor • First AI designed vaccine • First AI signed by a record label • First AI strategy development platform • First AI written book • First fully autonomous EV energy grid • First fully autonomous vertical farm • First in vivo autonomous robot voyage • First lab grown fillet steak • First living metabolising material • First metamaterial invisibility cloak • First plasma light sabres • First programmable DNA computer • First programmable living robots • First replicating synthetic cells • First synthetic human genome designed by an AI • First ultrasound tractor beam. And many more.

TIMELINE:

2019 to 2060

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2018 STARBURST REVIEW

IN THE 2018 Starburst, which displays 169 of the world's most significant emerging technologies, each with an addressable market value of over $500 Billion spread across 11 categories, I expanded the timeline from 2035 to 2040, promoted 42 new emerging technologies and demoted 42.

In 2018 I saw a notable increase in the number of world firsts compared to 2017, especially in the fields of Computing and Materials. There were also note worthy breakthroughs in Advanced Manufacturing, Artificial Intelligence (AI), Computing, Neural Interfaces, and Synthetic Biology.

2018's stand out world firsts included: A million core Neuromorphic computer that simulated a whole mouse brain • An AI made out of DNA • An AI made out of glass • Development of the world's most durable material • Estonia becoming the first nation capable of re-booting itself • First 3D printed AI • First 5G robot remote surgery • First AI generated art sold at auction • First AI politician • First AI Robo-Coder • First AI Synthetic Content generators • First conscious robot • First game of human telepathic Tetris • First million core Neuromorphic computer • First Quantum Compass • First space elevator trials • First successful regenerative medicine trial to re-grow severed frog limbs • Living human memories edited for the first time • Memories transferred between living animals • Video's replayed from bacterial biological computers • Weaponisation of neural networks. And many more.

TIMELINE:

2018 to 2040


2017 GRIFFIN Emerging Technology Starburst
311
Institute.com
Global Advisory
Forecasting
Innovation
Strategy
2035
2030
2025
2020
ADV MFRING
- 3D PRINTING
- 4D PRINTING
- BIO-MANUFACTURING
- BIO-PRINTING
- BIO-REACTORS
- MOLECULAR ASSEMBLERS
- NANOMANUFACTURING
- RAPID LIQUID PRINTING
BIOTECH
- ANTI AGEING DRUGS
- ARTIFICIAL BODY PARTS
- BIOELECTRONIC MEDICINE
- BIOMECHANICAL SYSTEMS
- BIONIC IMPLANTS
- CHIMERAS
- CRYONICS
- EPIGENETICS
- GENE EDITING
- GENE THERAPY
- HI RESOLUTION FMRI
- LABS ON CHIPS
- MICROBIOME MEDICINE
- NANO MEDICINE
- NEUROPROSTHETICS
- OPTOGENETICS
- PERSONAL GENETIC SEQUENCING
- PERSONALISED MEDICINE
- REGENERATIVE MEDICINE
- SMART DRUGS
- SMART PILLS
- SONOGENETICS
- STEM CELL THERAPIES
- SYNTHETIC GENES
- TISSUE ENGINEERING
CONNECTIVITY
- 5G
- AIRBORNE NETWORKS
- COGNITIVE RADIO
- HIGH ALTITUDE PLATFORMS
- INTERPLANETARY INTERNET
- LIFI
- MESH NETWORKS
- MOLECULAR NETWORKS
- MULTEFIRE
- NANO SATELLITES
- NO POWER WIFI
- SELF HEALING NETWORKS
- SMALL CELL NETWORKS
- TERABIT NETWORKS
- WIGIG
- WIRELESS PERSONAL AREA NETWORKS
ENERGY
- 5D ELECTRONIC BLOOD
- ARTIFICIAL PHOTOSYNTHESIS
- BIOFUELS
- BIOMECHANICAL HARVESTING
- CONDUCTIVE ENERGY SYSTEMS
- ELECTROMAGNETIC DRIVES
- FILM BASED BATTERIES
- FUEL CELLS
- FUSION
- LIQUID METALS
- LITHIUM AIR BATTERIES
- MICROWAVE ENGINES
- MOLECULAR ENERGY SYSTEMS
- NANOGENERATORS
- NANOWIRE BATTERIES
- PIEZOELECTRIC POWER GENERATORS
- PLASMA ENGINES
- PHOTOVOLTAICS
- QUANTUM WIRES
- THERMOELECTRIC DRIVES
- THORIUM REACTORS
- TRAVELLING WAVE REACTORS
- WIRELESS ENERGY
GEO
- ARCHOLOGIES
- CARBON SEQUESTRATION
- CLIMATE ENGINEERING
- TERRAFORMING
MACHINE SYSTEMS
- 3D CHIPS
- ARTIFICIAL INTELLIGENCE
- BLOCKCHAIN
- CHEMICAL COMPUTING
- COGNITIVE COMPUTING
- DEEP LEARNING
- DNA COMPUTING SYSTEMS
- FOG COMPUTING
- MACHINE LEARNING
- MACHINE VISION
- MEMRESISTOR
- MICROMOTES
- NEUROMORPHIC CHIPS
- OPTICAL COMPUTING
- QUANTUM COMPUTING
- RECONFIGURABLE ELECTRONICS
- SENTIENT SOFTWARE
- SWARM INTELLIGENCE
MATERIALS
- AEROGELS
- BIO-MATERIALS
- GRAPHENE
- LIQUID ARMOUR
- LIQUID METALS
- LIVING METALS
- MEXA MATERIALS
- NANO MAGNETS
- NANO MATERIALS
- NANO-CERAMICS
- NANOFOAMS
- NANOFUSES
- NANOPHOTONIC MATERIALS
- PROGRAMMABLE MATTER
- REACTIVE HEALING MATERIALS
- SELF HEALING MATERIALS
- SEMICONDUCTORS
- SMART MATERIALS
- SPRAY ON MATERIALS
- STRETCHABLE ELECTRONICS
- SUPER ALLOYS
- SUPERCONDUCTORS
- SYNTHETIC MATERIALS
- THERMO BIMETALS
- THERMOELECTRIC MATERIALS
ROBOTS
- ARTIFICIAL IMMUNE SYSTEMS
- BEHAVIOUR BASED SECURITY
- BIOMETRIC SECURITY
- HACKPROOF CODE
- HIGH ASSURANCE PLATFORMS
- HOMORPHIC ENCRYPTION
- IDENTITY BASED SECURITY
- MICRO MOVEMENTS
- POST QUANTUM CRYPTOGRAPHY
- QUANTUM CRYPTOGRAPHY
- SELF PATCHING DEFENCE SYSTEMS
- VISUAL FINGERPRINTING
SECURITY
- BIOMARKERS
- BIOMETRIC SENSORS
- ELECTROMYOGRAPHY SENSORS
- HYPERSPECTRAL SENSORS
- MICRO ELECTRO-MECHANICAL SENSORS
- NANO SENSORS
- NOVEL SENSORS
- SENSOR FUSION
- SMART DUST
- TIME OF FLIGHT SENSORS
SENSORS
- 360 DEGREE VIDEO
- 3D IMAGING
- 8K RESOLUTION
- AUGMENTED REALITY
- AVATARS
- EMOTIVE TRACKING
- FLEXIBLE ELECTRONICS
- GESTURE CONTROL
- HAPTICS
- HOLOGRAMS
- NEURAL INTERFACES
- PERSONAL DIGITAL ASSISTANTS
- SCREENLESS DISPLAYS
- TELEPRESCENCE
- TOUCH
- ULTRA HI DEF RENDERING
- UNIVERSAL NATURAL LANGUAGE
- VIRTUAL REALITY
USER EXPERIENCE
- BIO-BOTS
- BOTS
- CO-BOTS
- DRONES
- EXO-SYSTEMS
- HARDWARE ROBOTS
- NANO-BOTS
- SOFT ROBOTS
- SWARM ROBOTICS
- UTILITY FOG
1 Estimated Wide Spread Use
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2017 STARBURST REVIEW

IN THE 2017 re-designed Starburst, which displays 169 of the world's most significant emerging technologies, each with an addressable market value of over $500 Billion spread across 11 categories, I expanded the timeline to 2035, promoted 38 new emerging technologies and demoted 38.

2017 lagged 2016 for technology world firsts which, but it has to be said that many of those world firsts were Artificial Intelligence (AI) related.

Despite this though unlike 2016 the world firsts I witnessed in 2017 were spread across a much broader range of themes including Advanced Manufacturing, AI, Computing, Creative Machines, Food Manufacturing, Holography, Nano-Medicine, Quantum technology, Robotics, and Synthetic Biology.

2017's stand out world firsts included: A biological teleporter • An AI created by another AI • An AI run autonomous organisation • Brain controlled drug delivery Nanobots • Designer babies • First human in vivo cancer vaccines and gene editing trials • First inter-continental Quantum network • First self-evolving self-fabricating robots • Self-coding and self-learning AI's • The creation of a six DNA base pair alien life form.

2017 was also the year we saw the first architectures, and prototypes, for the first Artificial General Intelligence (AGI) agent, a serious Blockchain competitor, and the emergence of the first viable DNA, Chemical, Liquid, and Photonic computing platforms. And I am just getting started!

TIMELINE:

2017 to 2035

CONCLUSION

PEOPLE SAY change is a constant, but in today's technology fuelled world this simple phrase is a deceiving, and often comforting, misnomer because change isn't constant, it's exponential, and the only boundaries to what we can achieve as individuals and as a global society are the ones that we invent for ourselves.

As researchers and scientists increasingly prove that nothing is impossible, that yesterdays science fiction is simply the future generations status quo, and as we all continue to bear witness to an increasingly rapid rate of change that's affecting and transforming every corner of global culture, industry, and society the future belongs to all of us equally, and we should never loose sight of that.

As you race into your own future I wish you well, and never forget you have all the friends and support you need around you as we all voyage through time and space together on this fragile living spacecraft we call Earth.

Explore More,

Matthew Griffin
Founder, 311 Institute

Notes:

THIS IS NOT THE END.
EXPLORE MORE.

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