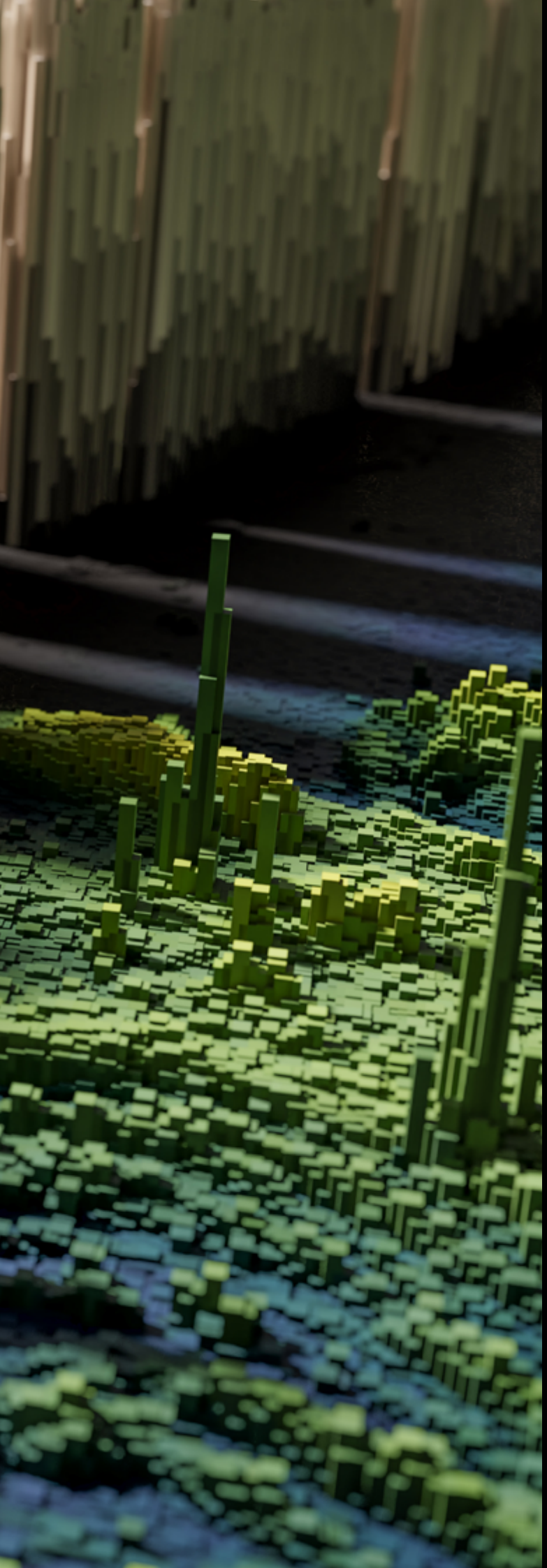

Clarivate™
Top 100
Global Innovators
2023



Contents

03
Foreword

04
At the edge of possibility

06
Measuring the lead

10
Navigating tomorrow

12
Top 100 Global Innovators 2023

16
The 2023 horizon

22
From the possible to the practical

30
The great tapestry

Roy Jakobs,
CEO Philips

At Philips, our purpose to improve people's health and well-being through meaningful innovation is the great driving force behind everything we do. It's why we exist and it's never been more relevant than in these challenging times.

Through innovation, we're empowering people to take care of their health and well-being and helping doctors and nurses to provide better, more sustainable and more convenient care – in hospitals, clinics and the home.

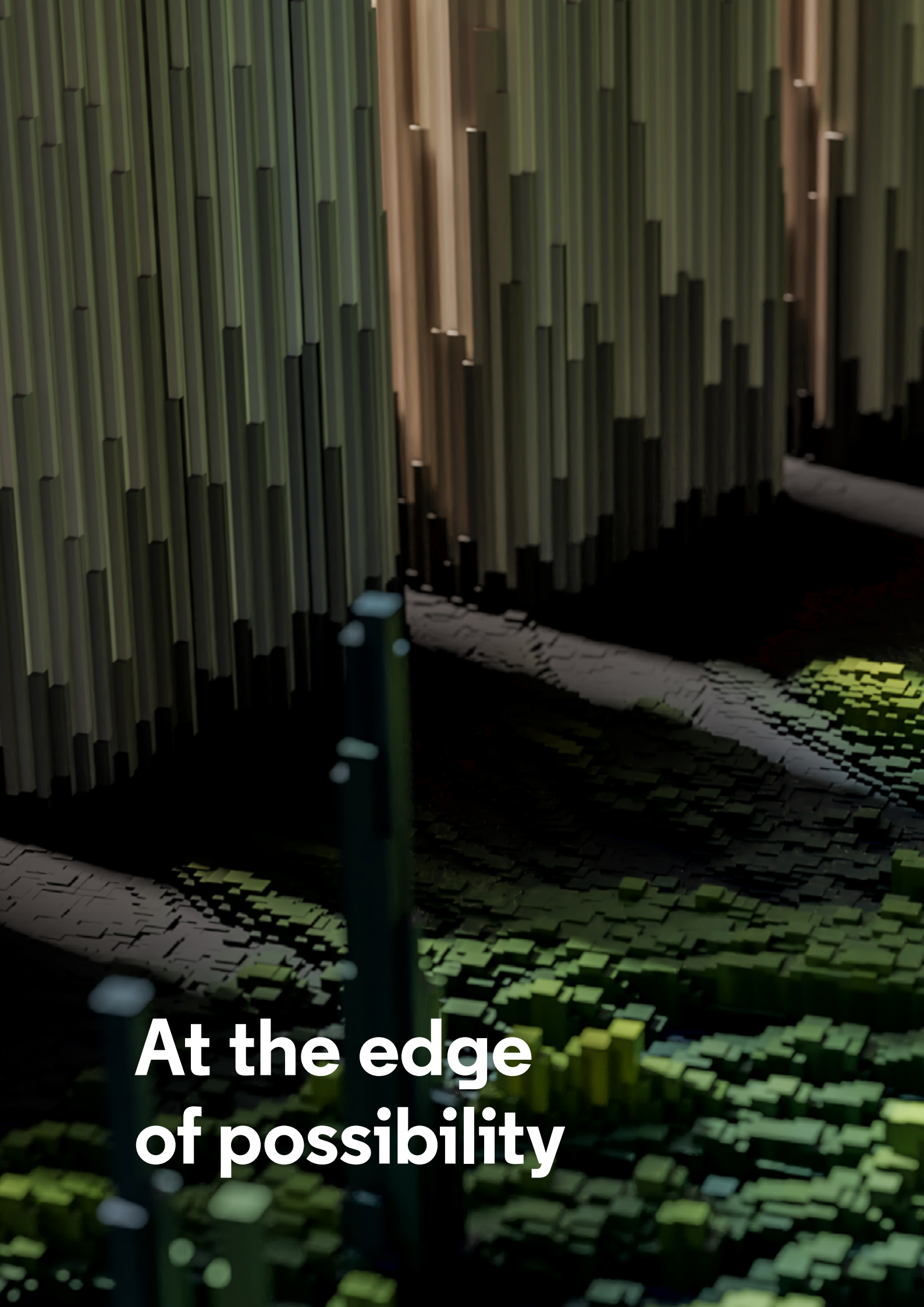
People are at the heart of how we innovate. We start with their experiences, their needs and their daily routines and then we work backwards.

For example, in the consumer domain, we develop innovative solutions that support healthier lifestyles, prevent disease and help people to live well with chronic illness, also in the home and community settings.

In clinics and hospitals, we are teaming up with healthcare providers to innovate and transform the delivery of care. We listen closely to our customers' needs and together we co-create solutions that help them improve health outcomes, patient and staff experience and productivity. We are embedding AI and data science in our propositions, for instance, applying the power of predictive data analytics and artificial intelligence to support workflows at the point of care.

It's a great honor to be recognized as a Top 100 Global Innovator for the 10th consecutive year, along with so many esteemed companies. And we are excited about the future and the potential of innovation to help solve the world's most pressing issues.

Building on our more than 130 years of delivering meaningful innovation, we will continue to innovate with great passion – creating value with sustainable impact – with our goal being to improve 2.5 billion lives a year by 2030.


At the edge
of possibility

What comes next matters more than what happens now.

'Next' can be changed;
it can be chosen.

But which next?

Which horizon?

Choosing a horizon involves taking a risk. It involves a tough call.

Marshalling the vast intellect reserve of companies and institutions means knowing where the cutting edge lies and imagining what could be beyond it.

Exploring that innovation edge, visualizing it, means understanding the state of technology today and its direction tomorrow.

It means following the pathway of scientific discovery to engineered design. From the pipeline of the possible, to thinking forward to the practical and sustainable.

From the current now to the chosen next.

Yet today, choosing your horizon is hard. The call is being made tougher; the number of horizons is increasing, their overlap ever more complex.

The hazards of repeat, of delay, of failure, of having pointed your ideation power at the wrong target; these weigh on the decision. They sit on the shoulders of the deciders. Often, they mean accepting a position of follower.

It doesn't have to be this way.

The information exists.

The possible can be found and discerned and the call made easier. The ideas that create new ground can be measured and the organizations that produced them identified.

The danger of misstep can be lowered and the power of intellect to build can be transformed.

Transformation is needed – our world and our wealth are challenged by scarcity, by disparity and by harm brought by humanity.

Our focus at Clarivate™ is to read the now, to pore over what humanity knows today and to put forward the intelligence that explores all possible horizons; that enables transition and transformation.

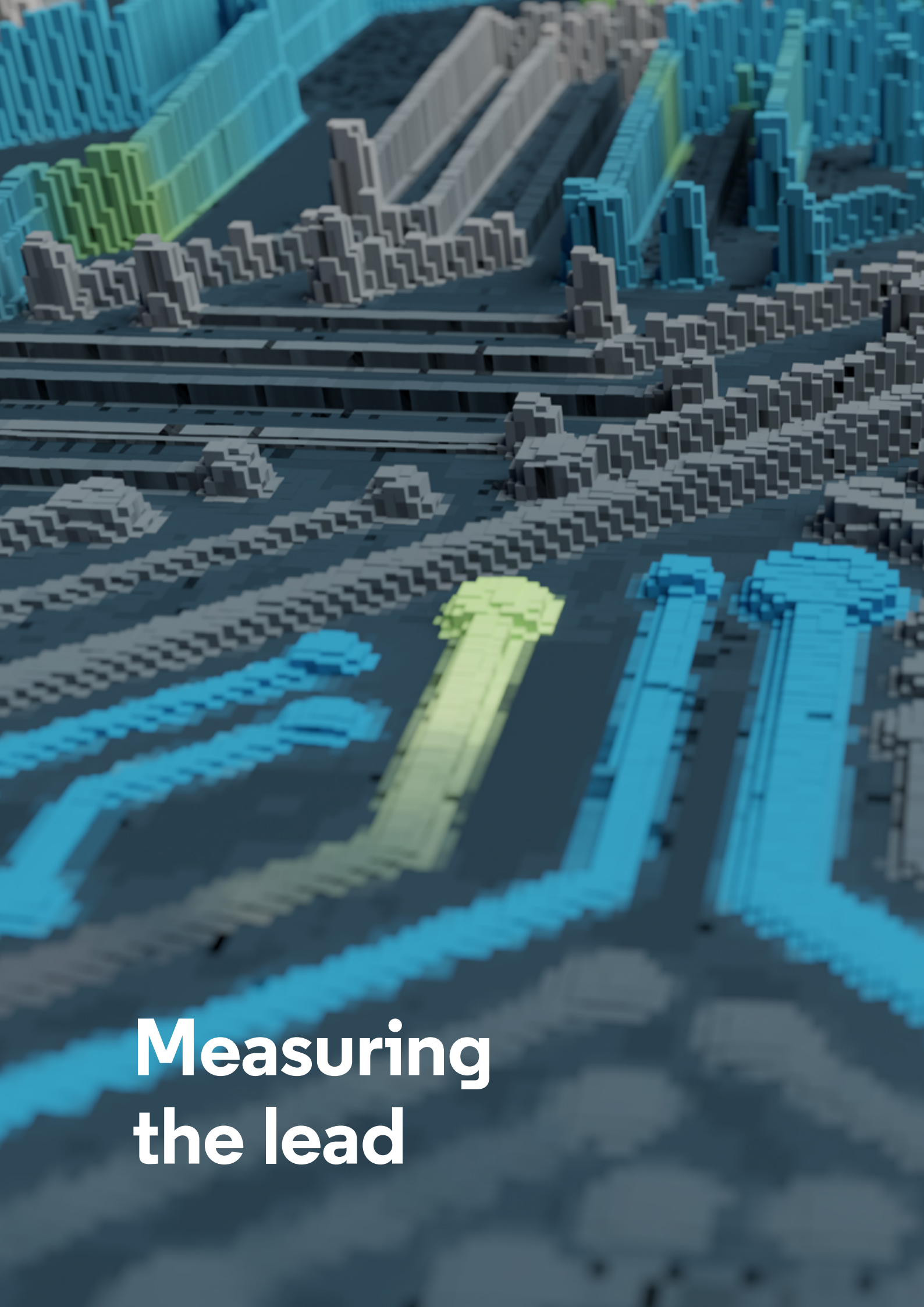
What the world has discovered is placed alongside what the world has designed, joining scientific principle to engineered solution.

For 12 years Clarivate has found those companies and institutions whose research and innovation don't just sit on the edge of possibility, but define it.

Whose talent and judgement chose not to follow, but to lead. That change our next.

Those who create their own horizons.

Introducing the Top 100 Global Innovators™ 2023 from Clarivate.



Measuring the lead

Measuring ideation and innovation leadership goes beyond volume. Ideas are not all born the same. Some are hugely impactful within their field, but hard to extract commercial value from.

57m
compared inventions

~3,200
qualifying organizations

100
places

Some are small in technical scale, but core to the business they were developed within. And some achieve at scale: impactful, global, early and fundamental.

The Top 100 Global Innovators program uses a complete comparative analysis of global invention data to assess the strength of every patented idea, using measures tied directly to their innovative power.

To move from the individual idea strength to identifying the organizations that create them more consistently and frequently, Clarivate sets two threshold criteria potential candidates must meet and then adds a measure of their patented innovation output over the last five years.

The Top 100 Global Innovators are those that sit at the very top of the candidate longlist, with the most consistently above-the-bar performance versus all other inventions in history.

Defining global

SCALE:

>500

filed inventions since 2000

ACTIVE:

>100

granted inventions in the 2023 five-year evaluation window

Benchmarking innovation

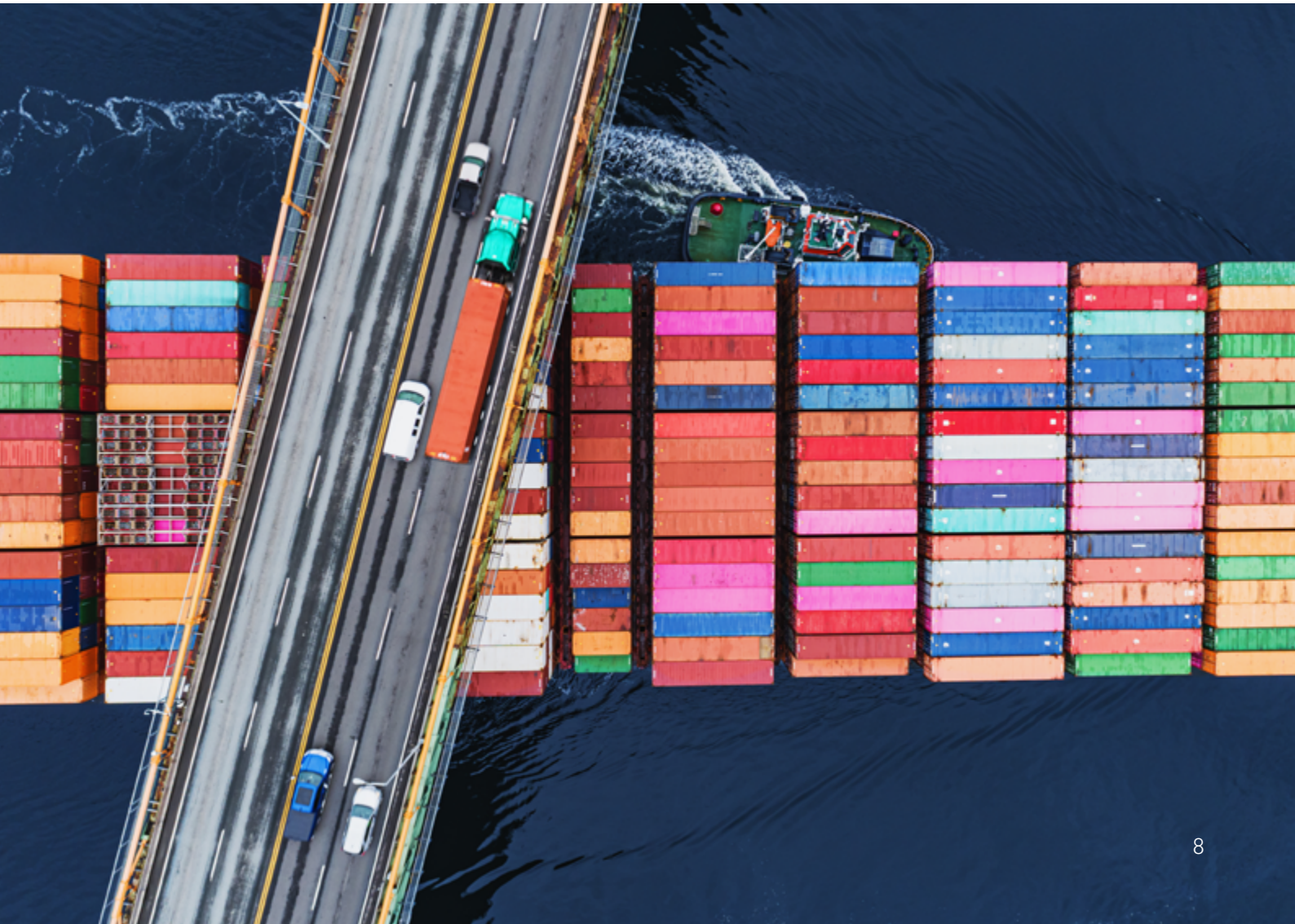
INFLUENCE – the level of technical leadership of the invention, via its effect on the ideas of others

SUCCESS – the level of economic asset the invention produced as a valid, novel idea

GLOBALIZATION – the level of monetary and geographic investment in the invention

RARITY – where the invention sits on the development curve

INVENTION STRENGTH – the combined score across the four factors for the invention



Identifying the leaders

MEDIAN INVENTION STRENGTH:
of the inventions in the evaluation window for the Top 100 Global Innovators 2023, the Invention Strength score in the middle of each qualifier's activity

INTERNATIONAL FACTOR:
how often and how many inventions are protected internationally

Median Invention Strength

×

International Factor

=

Global Innovator Score

Defining ideas

Behind any meaningful measure of innovation must sit authoritative and robust data. Top 100 Global Innovators is powered by deep analysis of core Clarivate research and innovation data that records and structures the available technical knowledge of humanity.

That adds layers of data science in measurement and that embeds diligence and expertise in its creation.

Our analysis of innovation in 2023 is built on enriched data used by research leaders, scientists, engineers and their advisors daily to help them navigate the complex and direct and guide their work.

Derwent World Patents Index™ (DWPI™)

A database of the patented ideas, DWPI records where and when inventions are protected across 60 patent-issuing states and authorities, with each idea distilled into English-language summaries and categorized into the industry, the technology and the need.

Created by thousands of Clarivate science and engineering expert editors, DWPI acts as the library of global human invention and patented problem solving.

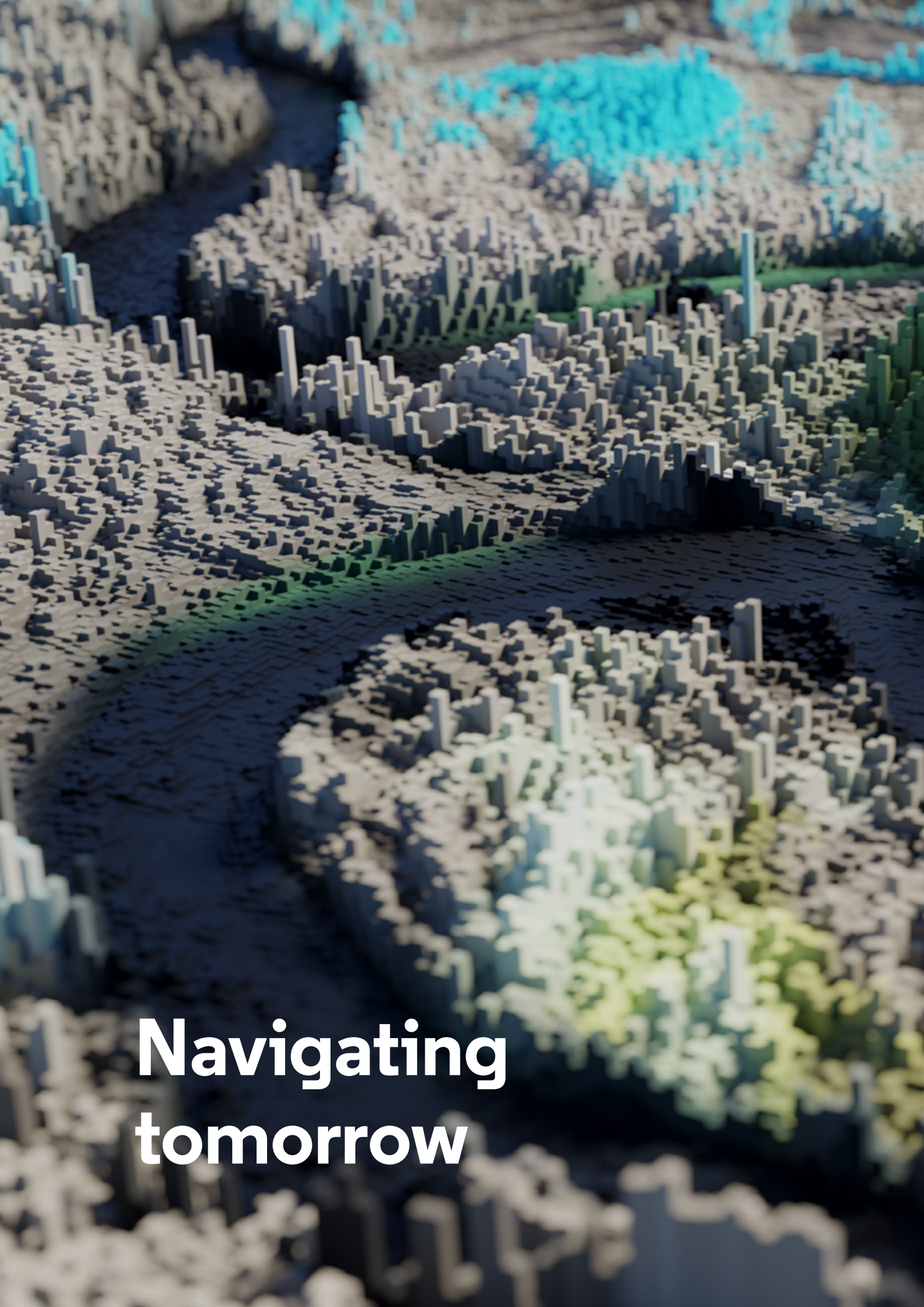
Derwent Patents Citation Index™

A sister database to DWPI, Derwent Patents Citation Index focuses on inventions that have been referenced by applicants and patent examiners in later, downstream patent applications.

Emulating DWPI invention-level structure, Derwent Patents Citation Index automatically removes double, triple (or more) counting of citation events between the same patented ideas. Accessing the same distillation of industry and technology, it provides a record of the links between ideas as they develop.

Web of Science™

Built on the bibliometric library science of Dr Eugene Garfield, the Web of Science enumerates and tracks more than 170 million journal articles and papers from 9,000 quality-evaluated research sources. With 1.9 billion interconnecting citation references curated by Clarivate experts over 60 years, the Web of Science acts as the world's most robust source of independently measured research.



Navigating tomorrow

Top 100 Global Innovators
2023

Leadership matters. It points to the mountain that needs climbing, to the direction others will follow.

How we will live in the 2030s is being defined now. Our health, our prosperity and our very world is built on the ideas created today.

What the future will look like and how we will experience it will rest on technologies and discoveries that enable – that take what is possible today and transform it to the practical of tomorrow.

Yet, improvement is not achieved if no one goes first.

Some go first. They go further. They do it at scale. They do so consistently, year after year.

Some, more than others, define our future and that experience to come.

Those who choose to employ thousands of researchers, who invest in science and engineering, who are happy to see results outside the current quarter, who practice the leadership that means the mountains are conquered.

Those that know that innovative new ideas and solutions to current problems influence not just their financials but foster genuine improvement in the human condition and the health of our habitats.

Those that choose to lead.

Here are the companies and research institutions we recognize as the **Top 100 Global Innovators 2023.**

Top 100 Global Innovators 2023

Company/Institution	HQ	Segment	Award year(s)	Highlights
3M	United States	Chemicals and materials	2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023	
AAC Technologies	Mainland China	Electronics and computing equipment	2023	
ABB	Switzerland	Industrial systems	2012, 2014, 2015, 2020, 2021, 2022,2023	
AGC	Japan	Chemicals and materials	2014, 2015, 2018, 2019, 2020, 2021, 2022, 2023	
Airbus	France	Aerospace and defense	2012, 2013, 2014, 2019, 2022, 2023	
Alphabet	United States	Software, media, fintech	2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2023	
Ant Group	Mainland China	Software, media, fintech	2022, 2023	
Applied Materials	United States	Semiconductors	2012, 2023	
ASML	Netherlands	Semiconductors	2012, 2022, 2023	
AUO	Taiwan	Electronics and computing equipment	2022, 2023	
BASF	Germany	Chemicals and materials	2012, 2015, 2016, 2017, 2018 2019, 2020, 2021, 2022, 2023	
BOE Technology	Mainland China	Electronics and computing equipment	2022, 2023	
Boeing	United States	Aerospace and defense	2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023	
Bosch	Germany	Industrial conglomerate	2015, 2022, 2023	
Brother Industries	Japan	Electronics and computing equipment	2012, 2013, 2014 2015, 2022, 2023	
Canon	Japan	Electronics and computing equipment	2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2022, 2023	
CEA	France	Government and academic research	2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2022, 2023	
CNRS	France	Government and academic research	2012, 2013, 2014, 2015, 2016, 2017, 2022, 2023	
Deere & Co	United States	Industrial systems	2013, 2022, 2023	
Delta Electronics	Taiwan	Electronics and computing equipment	2022, 2023	
Denso	Japan	Automotive	2012, 2013, 2015, 2022, 2023	
Dow	United States	Chemicals and materials	2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023	
DuPont	United States	Chemicals and materials	2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2022, 2023	
Emerson	United States	Industrial systems	2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2023	

12-Year Top 100 Global Innovator | Innovator to watch | Re-entry | New entrant

Top 100 Global Innovators 2023
Continued

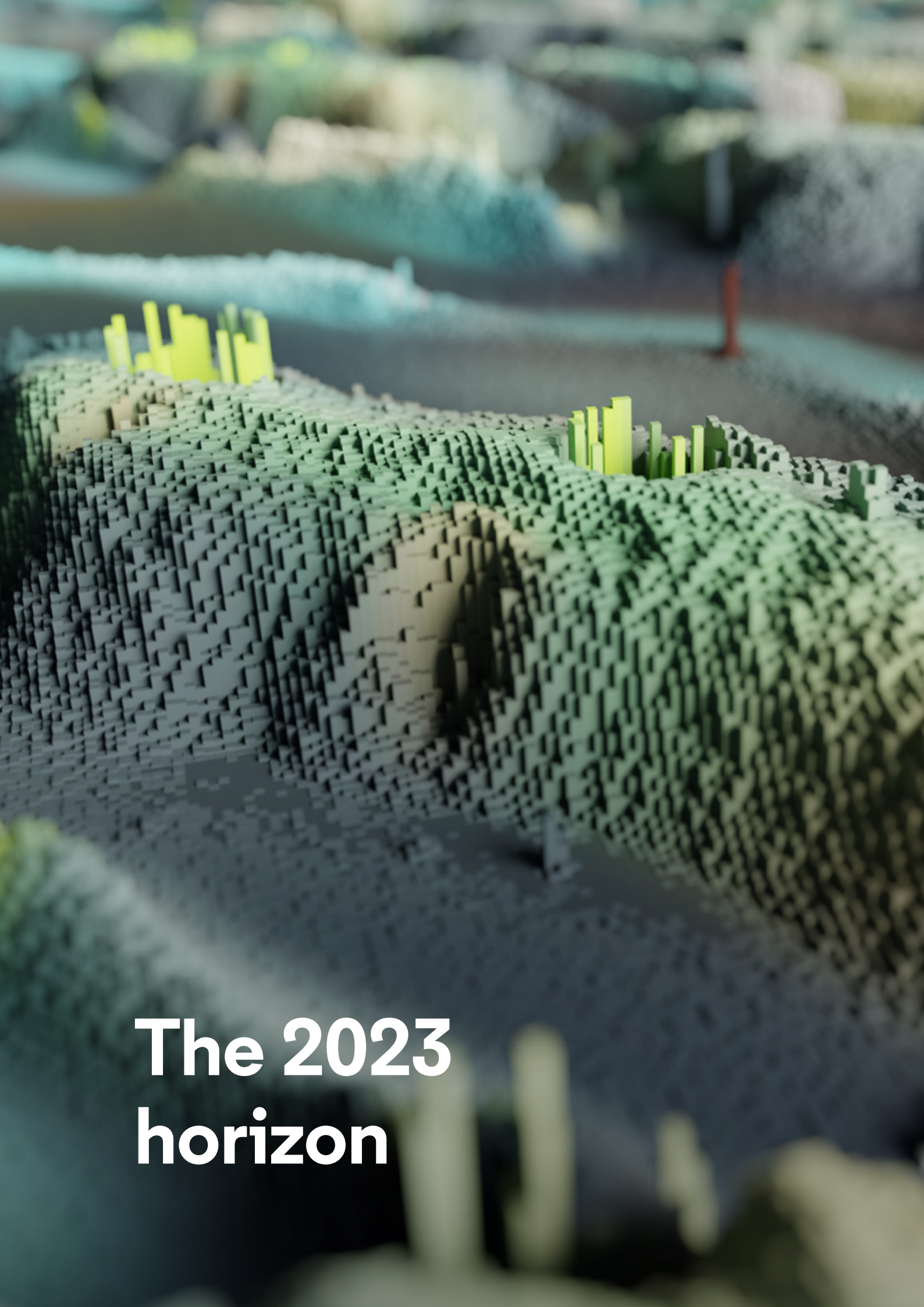
Company/Institution	HQ	Segment	Award year(s)	Highlights
Ericsson	Sweden	Telecommunications	2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023	
Evonik	Germany	Chemicals and materials	2022, 2023	
Fanuc	Japan	Industrial systems	2012, 2013, 2022, 2023	
Ford	United States	Automotive	2013, 2014, 2022, 2023	
Foxconn	Taiwan	Electronics and computing equipment	2018, 2019, 2020, 2021, 2022, 2023	
FujiFilm	Japan	Electronics and computing equipment	2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023	
Fujitsu	Japan	Electronics and computing equipment	2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023	
GE	United States	Industrial conglomerate	2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023	
General Motors	United States	Automotive	2022, 2023	
Halliburton	United States	Energy and electrical	2022, 2023	
Hitachi	Japan	Industrial conglomerate	2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023	
Honda	Japan	Automotive	2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023	
Honeywell	United States	Industrial systems	2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023	
Huawei	Mainland China	Telecommunications	2015, 2017, 2018, 2019, 2020, 2021, 2022, 2023	
Hyundai Motor	South Korea	Automotive	2022, 2023	
Infineon Technologies	Germany	Semiconductors	2014, 2022, 2023	
ITRI	Taiwan	Government and academic research	2015, 2018, 2019, 2020, 2021, 2022, 2023	
Johnson & Johnson	United States	Pharmaceuticals	2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023	
Kawasaki Heavy Industries	Japan	Industrial conglomerate	2016, 2017, 2018, 2019, 2020, 2021, 2023	
Kia	South Korea	Automotive	2022, 2023	
Kioxia	Japan	Semiconductors	2022, 2023	
Komatsu	Japan	Industrial systems	2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023	
Konica Minolta	Japan	Electronics and computing equipment	2022, 2023	
Kyocera	Japan	Electronics and computing equipment	2015, 2016, 2017, 2018, 2019, 2022, 2023	
LG	South Korea	Industrial conglomerate	2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023	

Top 100 Global Innovators 2023
Continued

Company/Institution	HQ	Segment	Award year(s)	Highlights
MediaTek	Taiwan	Semiconductors	2015, 2016, 2017, 2022, 2023	
Merck	Germany	Chemicals and materials	2017, 2018, 2020, 2022, 2023	
Michelin	France	Automotive	2012, 2013, 2014, 2022, 2023	
Mitsubishi Electric	Japan	Energy and electrical	2012, 2013, 2014, 2015, 2016, 2018, 2019, 2020, 2021, 2022, 2023	
Mitsubishi Heavy Industries	Japan	Industrial systems	2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023	
Murata Manufacturing	Japan	Electronics and computing equipment	2012, 2022, 2023	
Nanya Technology	Taiwan	Semiconductors	2023	
NEC	Japan	Electronics and computing equipment	2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023	
Nichia	Japan	Chemicals and materials	2018, 2019, 2020, 2021, 2023	
Nidec	Japan	Energy and electrical	2023	
Nitto Denko	Japan	Chemicals and materials	2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2022, 2023	
NXP Semiconductors	Netherlands	Semiconductors	2017, 2018, 2019, 2020, 2021, 2023	
Olympus	Japan	Electronics and computing equipment	2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2022, 2023	
Omron	Japan	Electronics and computing equipment	2014, 2017, 2018, 2019, 2020, 2021, 2022, 2023	
Otis Worldwide	United States	Industrial systems	2023	
Panasonic	Japan	Electronics and computing equipment	2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023	
Philip Morris International	United States	Consumer goods and food	2022, 2023	
Philips	Netherlands	Medical and biotechnology	2012, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023	
Procter & Gamble	United States	Consumer goods and food	2012, 2013, 2014, 2022, 2023	
Qualcomm	United States	Telecommunications	2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023	
Quanta Computer	Taiwan	Electronics and computing equipment	2019, 2020, 2021, 2022, 2023	
Raytheon Technologies	United States	Aerospace and defense	2012, 2013, 2019, 2020, 2021, 2022, 2023	
Realtek Semiconductor	Taiwan	Semiconductors	2022, 2023	
Ricoh	Japan	Electronics and computing equipment	2013, 2015, 2022, 2023	
Roche	Switzerland	Pharmaceuticals	2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023	
Rolls Royce	United Kingdom	Aerospace and defense	2022, 2023	

Top 100 Global Innovators 2023
Continued

Company/Institution	HQ	Segment	Award year(s)	Highlights
Safran	France	Aerospace and defense	2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2022, 2023	
Samsung	South Korea	Electronics and computing equipment	2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023	
Saudi Aramco	Saudi Arabia	Energy and electrical	2022, 2023	
SCREEN	Japan	Electronics and computing equipment	2022, 2023	
Seiko Epson	Japan	Electronics and computing equipment	2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2022, 2023	
Shimano	Japan	Consumer goods and food	2022, 2023	
Shin-Etsu Chemical	Japan	Chemicals and materials	2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023	
Siemens	Germany	Industrial conglomerate	2012, 2013, 2014, 2015, 2019, 2022, 2023	
SK Group	South Korea	Industrial conglomerate	2021, 2022, 2023	
Sony	Japan	Electronics and computing equipment	2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023	
STMicroelectronics	France	Semiconductors	2013, 2014, 2015, 2022, 2023	
Sumitomo Chemical	Japan	Chemicals and materials	2022, 2023	
Sumitomo Electric	Japan	Energy and electrical	2012, 2014, 2015, 2016, 2017, 2022, 2023	
Swatch Group	Switzerland	Consumer goods and food	2022, 2023	
TDK	Japan	Electronics and computing equipment	2013, 2014, 2015, 2018, 2019, 2020, 2021, 2022, 2023	
Thales	France	Aerospace and defense	2013, 2014, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023	
Tokyo Electron	Japan	Semiconductors	2015, 2022, 2023	
Toshiba	Japan	Electronics and computing equipment	2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023	
Toyota	Japan	Automotive	2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023	
TSMC	Taiwan	Semiconductors	2014, 2022, 2023	
Volkswagen	Germany	Automotive	2022, 2023	
Winbond	Taiwan	Electronics and computing equipment	2023	
Wistron	Taiwan	Electronics and computing equipment	2022, 2023	
Yamaha	Japan	Industrial conglomerate	2012, 2015, 2016, 2017, 2022, 2023	
Yazaki	Japan	Automotive	2016, 2017, 2021, 2022, 2023	



The 2023 horizon

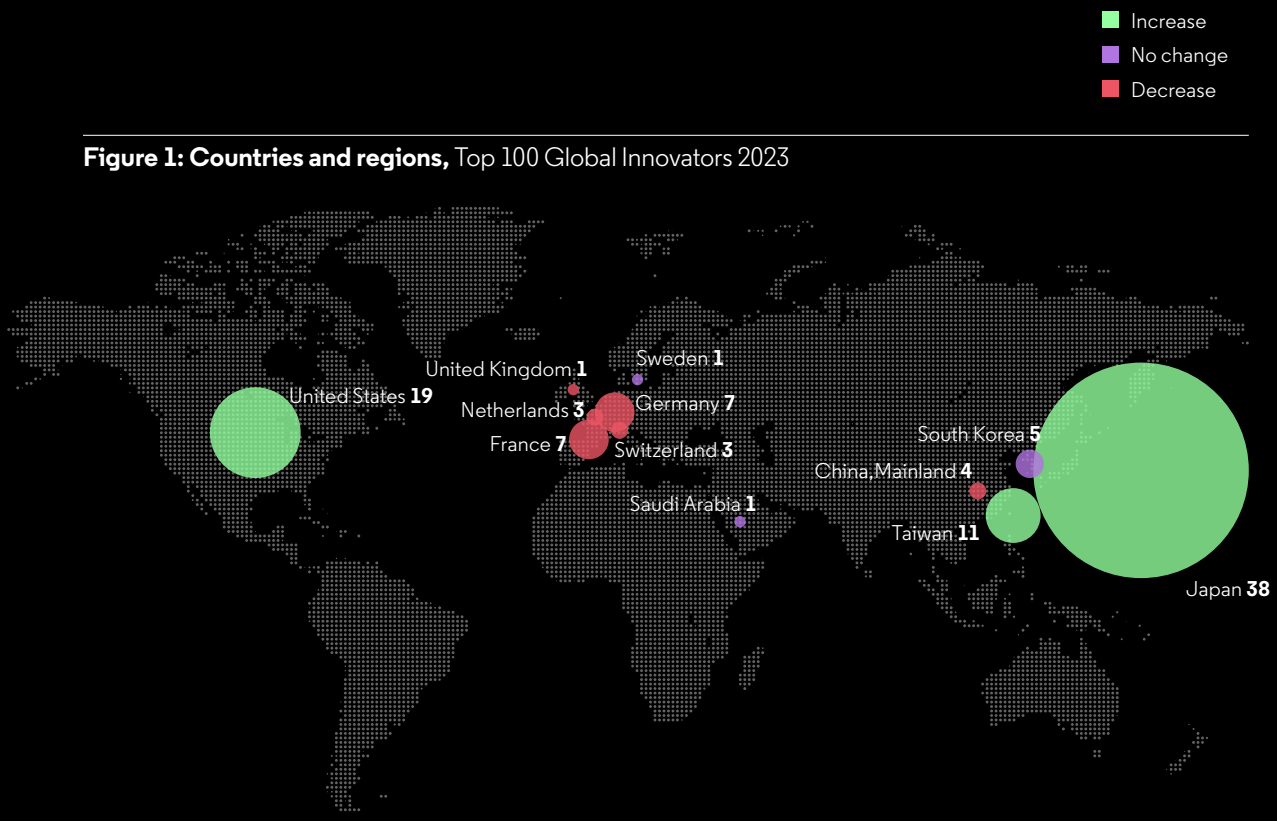


Figure 1: Countries and regions, Top 100 Global Innovators 2023

Figure 2: Industry sectors, Top 100 Global Innovators 2023

- Aerospace and defense **6**
- Automotive **10**
- Chemicals and materials **11**
- Consumer goods and food **4**
- Electronics and computing equipment **26**
- Energy and electrical **5**
- Government and academic research **3**
- Industrial conglomerate **8**
- Industrial systems **8**
- Medical and biotechnology **1**
- Mining and metals —
- Pharmaceuticals **2**
- Semiconductors **11**
- Software, media, fintech **2**
- Telecommunications **3**

6
companies re-enter the Top 100:

- From the United States, Alphabet (parent company of Google and sister companies), Applied Materials, Emerson are all awarded Top 100 status once more
- From Japan, Kawasaki Heavy Industries and Nichia return to the Top 100 for the first time since 2021
- European semiconductor firm NXP Semiconductor re-enters the Top 100

19
companies retain all-year Top 100 Global Innovator status:

- 3M
- Boeing
- Dow
- Ericsson
- Fujitsu
- GE
- Hitachi
- Honda
- Honeywell
- LG
- NEC
- Panasonic
- Qualcomm
- Roche
- Samsung
- Shin-Etsu chemical
- Sony
- Toshiba
- Toyota

3
industrial segments saw increases in Top 100 Global Innovators representation:

Semiconductors (+3), chemicals and materials (+1) and industrial conglomerates (+1), offset by decreases in automotive firm representation (-2), electronics and computing equipment (-2) and the energy and electrical segment (-1). All other industrial segments remained static to 2022 levels.

The trends within the Top 100 differ from wider trends across the broader Top 1,000 Global Innovators. Our over-the-horizon view of current average rankings by sector forecasts continued increases in rank of connectivity and sustainability focused industries: telecommunications, energy and electrical-focused entities and computing equipment.

5
companies awarded Top 100 Global Innovator status for the first time:

- Mainland Chinese electronics company AAC Technologies
- Taiwanese semiconductor firm Nanya Technology
- Also from Taiwan, Winbond Electronics
- From Japan, electric drive firm Nidec
- From the United States, elevator manufacturer Otis Worldwide

This year, we see a potential acceleration in the average ranking of government and academic institutions – currently ranked 15th out of 15 segments, but on a pathway to 12th place in future years, based on current ranking changes by organizations.

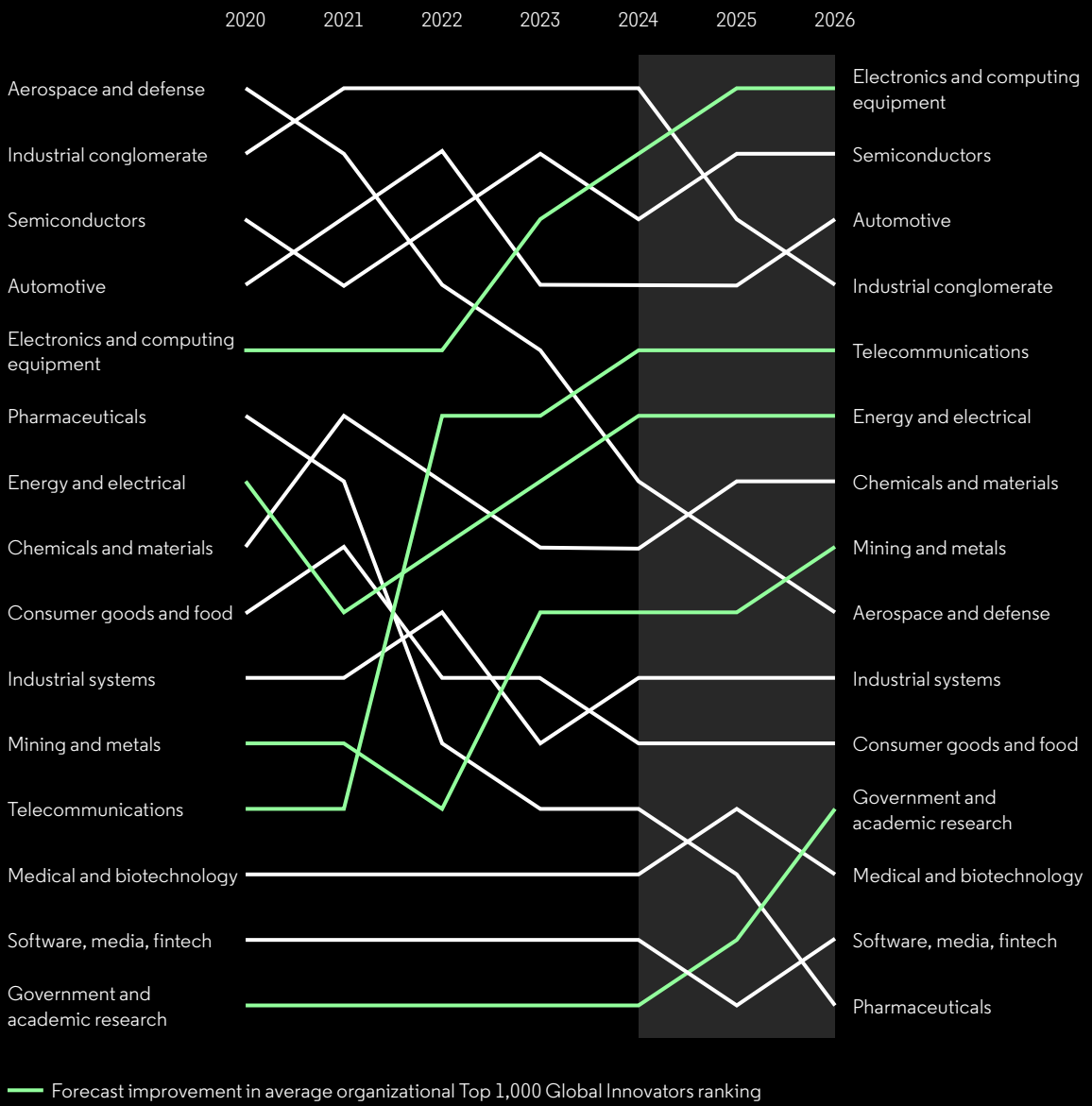
Geographically, while Mainland China saw a reduction in Top 100 representation this year, we did see an increase in the wider spread among a much broader pool of entities across the Top 1,000 rankings. This context better represents overall Mainland Chinese innovation trends, which continue to demonstrate average ranking improvement.

That signal is sharper in 2023, with a faster acceleration in innovation metrics even as volumes of invention activity from the region continue to increase.

Indeed, Asia Pacific regions and nations are showing similar performance increases: South Korea, Taiwan and Japan all show average entity ranking increases.

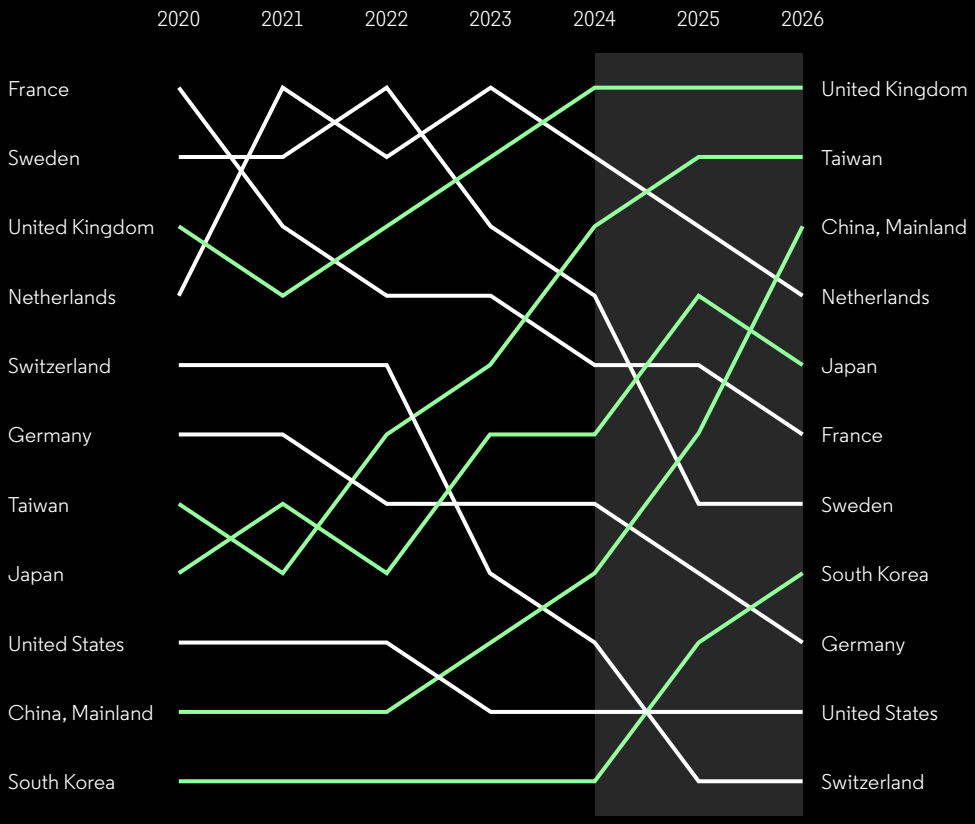
Forecast Global Innovator ranking, by segment

Average rank of organizations within the Top 1,000 Global Innovators; displayed as position

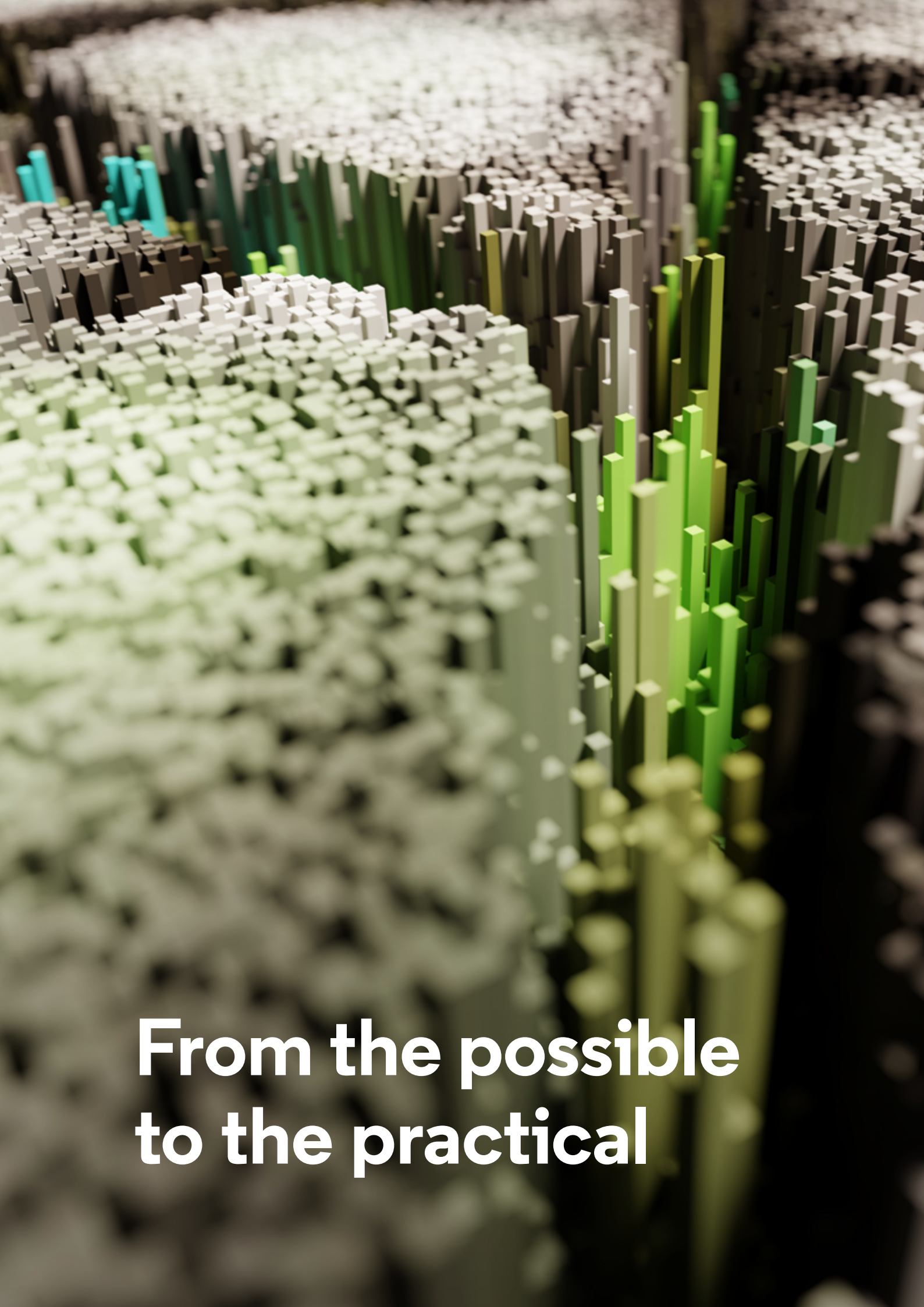


Forecast Global Innovator ranking, by country / region

Average rank of organizations within the Top 1,000 Global Innovators; only countries/regions with >10 entities in year; displayed as position



Forecast improvement in average organizational Top 1,000 Global Innovators ranking


From the possible
to the practical

The creation of new knowledge can feel like a complex river. Filled with switchbacks, pools, eddies and rapids, science and engineering development finds a path from the discoveries of the enlightenment to the horizon of what may be possible.

Today, that flow of innovation is fed by vast numbers of tributaries, contributing ideas from many distinct pockets of research discipline.

At Clarivate, we have the privilege of witnessing that great pathway, visualizing it and helping to open it for the decision makers and innovators that lean on ideation data.

In that great river system, ideas transform and change, they morph from discovery to understanding of effects and outcome. They leave enticing opportunity, opening new directions for innovation itself.

Bringing together the information Clarivate has on both the inventive activity of humanity alongside the scientific discovery information of the world means we can track how technology, and the knowledge created with it, transfers.

We can track how it graduates from what may be possible on to practical engineered solutions companies can build and supply.

Before the work and the ideas of the Top 100 Global Innovators sits the research that carved a path to the possible – research referenced in the inventions of the Top 100 itself.

Here, we look before the Top 100 to the more fundamental science and engineering that – at least in part – enabled their work. We identify the 50 research organizations whose work is most often cited by the Top 100 Global Innovators 2023. Those institutions whose store of intellect underpins the design of engineered solutions.

The source of the possible

The list of the Top 50 most cited institutions by the Top 100 Global Innovators is diverse. It is global.

Most prolific is the work of the institutions that make up the Chinese Academy of Sciences, while looking at the number of institutions across the Top 50, the pre-eminence of United States institutions is clear with half of the Top 50 being from the U.S.

The research landscape enabling downstream inventions is relatively concentrated geographically, with just four countries or regions with more than two organizations in the list: the United States, Mainland China, the United Kingdom and South Korea.

The United States, Mainland China and South Korea all have multiple corporations in the Top 100 Global Innovators this year, while the United Kingdom has only one entry: Rolls Royce. This difference speaks to the power of the British research base, as it exports research and ideas around the world.

The spectrum of research

When we broaden the review of invention-to-research paper links beyond the Top 100, to the Top 1,000 Global Innovators, we can see the intensity of research links, where bringing ideas to market are more tightly interwoven with the science and research within academia.

The top segment, as a function of citations to research per invention, is the pharmaceutical sector – reflecting the fundamental importance of life sciences research on the development of new drugs and therapies. It shows the need for broader thinking and the role of research in discovering new approaches. It also likely demonstrates the roughly 20-year trend towards academic-commercial research partnerships.

With the medical and biotechnology sector ranked fifth out of 15 in the same analysis, this effect clearly crosses into the wider life sciences industry.

Viewed at a higher level, the intensity of research linkage per sector shows a split between those that are more engineering related (automotive and aerospace, electronics and semiconductors, telecommunications) versus heavier science sectors (chemistry and materials science). One field which sits outside this general split is the energy and electrical sector, potentially reflecting the ongoing importance of academic research in the transition to more sustainable energy sources.

Finally, the entities in the Top 1,000 Global Innovators which are themselves research institutions demonstrate their direct transfer of ideas generated by their faculty members to commercially available inventions – with government and academic research ranked second in research link intensity.

Crossing boundaries

Interwoven in this analysis is the dissemination of research and innovation globally. Ideas do not see international borders. We can track the headquarters location of the Top 1,000 Global Innovators and the country/region location of the organization of the authors of the papers they cite. We can track when ideas cross those borders.

Doing so shows us how research ideas spread from region to region and the strength of the links between research in one region to the development of inventions in another.

This analysis primarily demonstrates the deep research links between Europe and the United States, with 5% of European inventions citing U.S. research papers and almost 11% of U.S. inventions citing European research.

The cross-border nature of research and developed idea flow has a good example in the Chinese Academy of Sciences, with 95% of the citations to the institutions that make up the academy coming from organizations not based in Mainland China.

Indeed, within this data, U.S. organizations that are members of the Top 1,000 Global Innovators cite Mainland Chinese research (2.7% of inventions) more often than the other way round (1% of inventions) – underscoring the emergence of Mainland China today as a new and net source of ideas and innovation.

Organization cited by the Top 100 Global Innovators 2023	Country/Region	Number of papers referenced by inventions of Top 100 Global Innovators 2023
Chinese Academy of Sciences	China, Mainland	2,134
MIT	United States	1,790
Stanford University	United States	1,669
University of California, Berkeley	United States	1,424
Harvard University	United States	1,286
Tsinghua University	China, Mainland	1,075
Nanyang Technological University	Singapore	1,013
University of Michigan	United States	973
University of California, San Diego	United States	961
University of Toronto	Canada	931
Seoul National University	South Korea	887
Georgia Tech	United States	865
University of Illinois	United States	819
TU Munich	Germany	819
University of Washington	United States	808
Carnegie Mellon University	United States	801
UCLA	United States	794
Alphabet	United States	762
University of Texas, Austin	United States	761
University of Melbourne	Australia	760
University of Florida	United States	754
National University of Singapore	Singapore	753
Monash University	Australia	715
University of Wisconsin	United States	693
KAIST	South Korea	693
Microsoft	United States	688
University of Oxford	United Kingdom	685
University College, London	United Kingdom	670
Swiss Federal Institute of Technology Lausanne	Switzerland	656

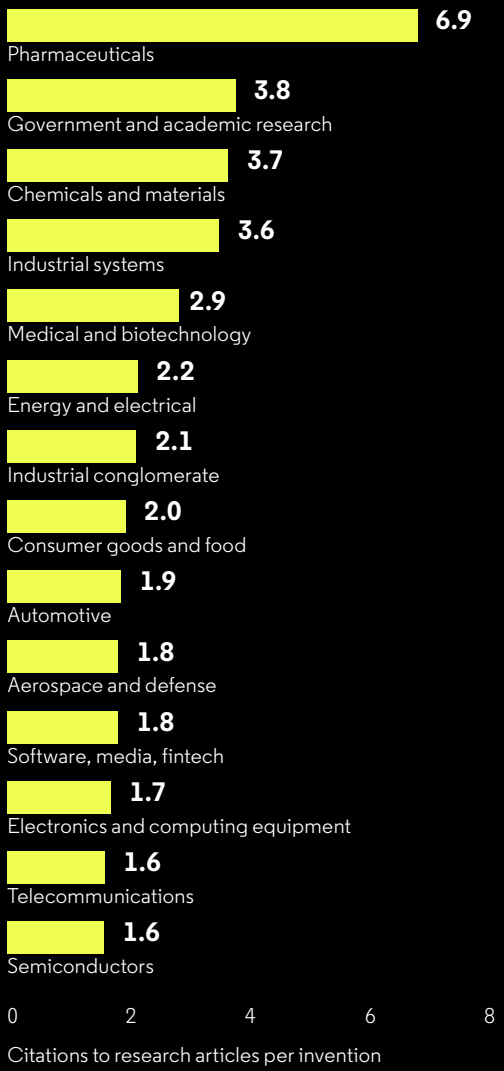
Organization cited by the Top 100 Global Innovators 2023	Country/Region	Number of papers referenced by inventions of Top 100 Global Innovators 2023
Rensselaer Polytechnic Institute	United States	653
University of Maryland	United States	641
Zhejiang University	China, Mainland	635
Cornell University	United States	631
University of Tokyo	Japan	629
University of Cambridge	United Kingdom	627
National Taiwan University	Taiwan	624
Autonomous University of Barcelona	Spain	612
Imperial College, London	United Kingdom	608
University of California, Santa Barbara	United States	607
Johns Hopkins University	United States	604
Korea University	South Korea	602
CNRS	France	598
NYU	United States	573
University of Pennsylvania	United States	572
Peking University	China, Mainland	565
RWTH Aachen University	Germany	558
Hong Kong University of Science and Technology	Hong Kong	556
Shanghai Jiao Tong University	China, Mainland	542
Columbia University	United States	540
Yale University	United States	526

Most cited research, number of institutions by country / region

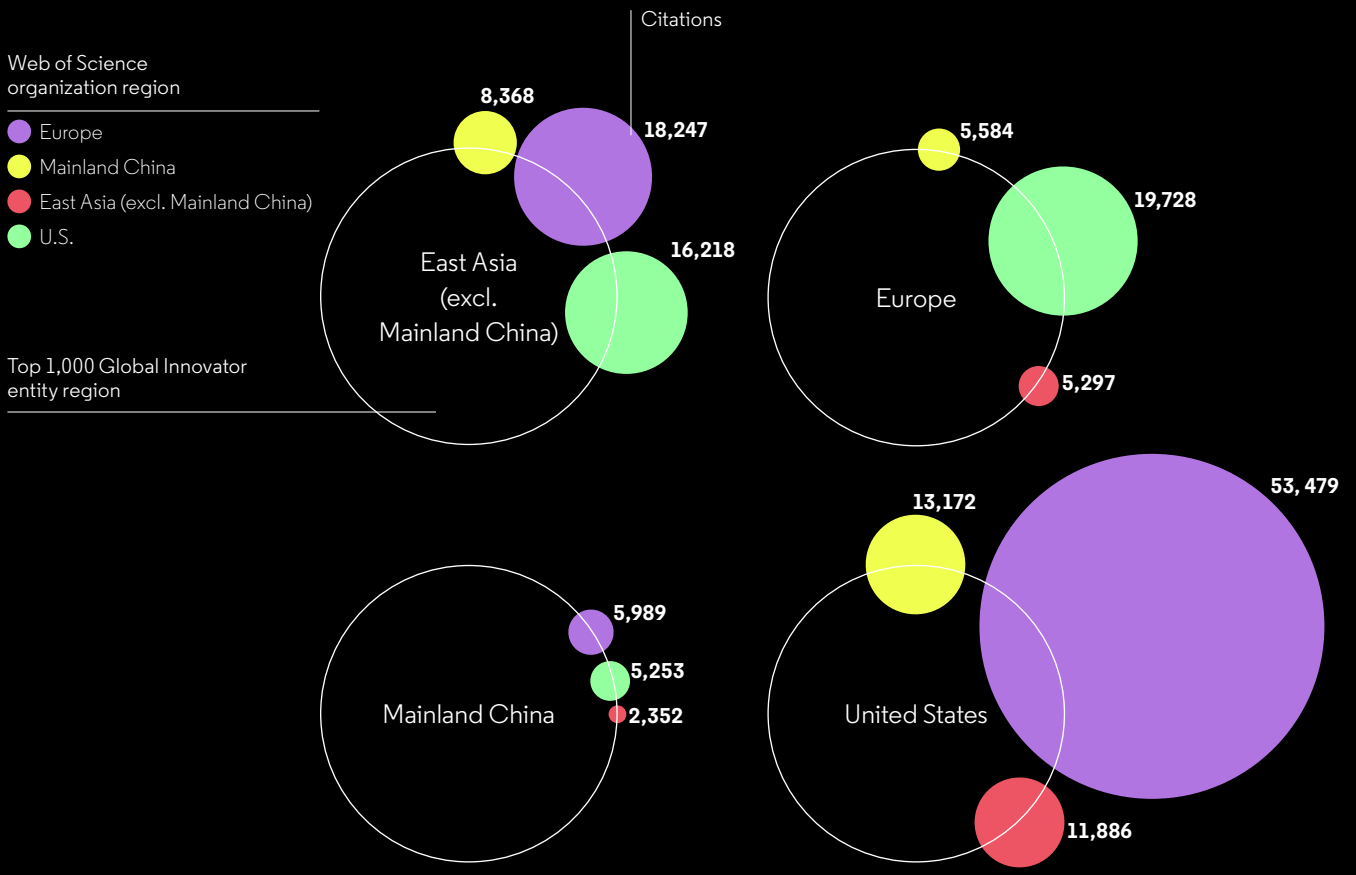
Number of institutions in the Top 50 most cited (tracking inventions from Top 100 Global Innovators 2023 to research articles)

Reliance on scientific research, by segment

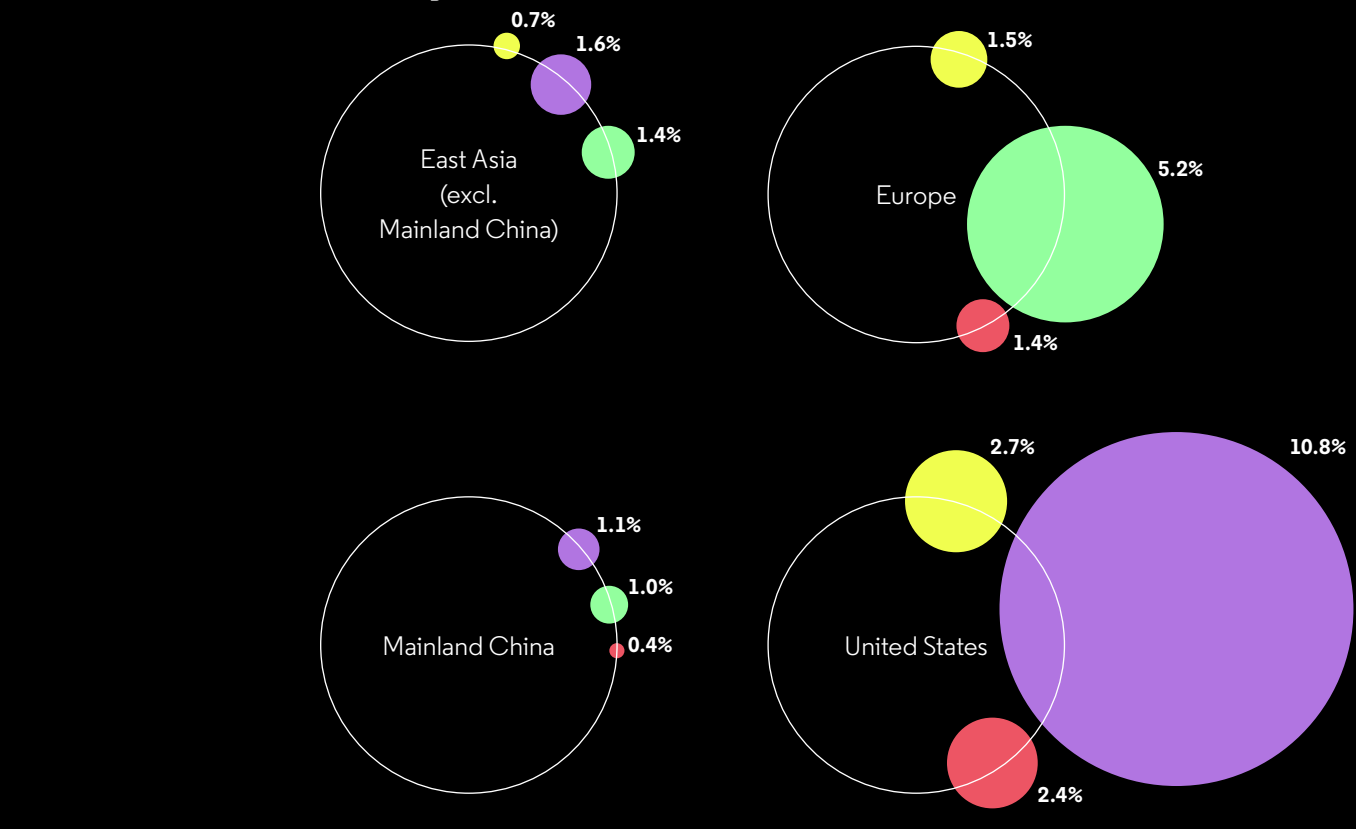
Normalized citations to research articles per invention, by industry segment from Top 1,000 Global Innovators 2023



Total times research is cited



% of all Top 1,000 inventions with reference to research in other regions



The great tapestry

With hundreds of millions of research papers, tens of millions of inventions and billions of interlinks between them, science and engineering represent an enormous and complex tapestry of individual innovation threads.

What is commercial, practical and works as ideas now and in the near future is built on the research and discovery of the near past.

That means innovation and idea data across boundaries of basic and applied research are fundamental requirements for innovation decision making, whether academic or commercial.

It means those whose eyes stay fixed on the future horizon of the possible must consider both the scientifically possible and the invented solution. Their expanded view means they more often transform ideas to knowledge and on to solution. Doing so changes the horizons they can see. It changes the horizons they can imagine. It changes the nature of our world and the solutions within it.

Where the threads go next are laid out at the edge of the great tapestry.

At the edge of what is possible.

At Clarivate, we aim to provide the guidance and the clarity to understand and take advantage of the complex. To use the techniques, the information and the expertise behind the Top 100, contact us today: clarivate.com/top-100-innovators/contact-us

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Ed is a thought leader in innovation measurement and forecasting and is the head author of the Top 100 Global Innovators and Top 100 Best Protected Global Brands programs from Clarivate.

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Mihnea has a track record in delivering data and analytics products that help both corporations and governments accelerate innovation and change the future.

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