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Where is science heading?
The main challenges before today's scientists

Professor Seeram Ramakrishna, FREng, Everest Chair

National University of Singapore (NUS)

https://www.linkedin.com/in/seeram-ramakrishna/

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Left: Uzbekistan President Shavkat Mirziyoyev with Singapore President Halimah Yacob during the orchid naming ceremony at the Istana on Tuesday.

Right: Mr Mirziyoyev with Prime Minister Lee Hsien Loong at the agreement signing ceremony in the Istana.
ST PHOTOS: KUA CHEE SIONG

S'pore and Uzbekistan ink 8 pacts to deepen cooperation

Both nations will work together in areas such as transport, trade, education and healthcare

Rosalind Ang

Eight agreements were signed on Tuesday aimed at deepening cooperation between Singapore and Uzbekistan, in areas such as transport, trade, education and healthcare capabilities.

Prime Minister Lee Hsien Loong and Uzbek President Shavkat Mirziyoyev, who is here on his first state visit to Singapore, witnessed the exchange of the pacts at the Istana.

Among the agreements is one between Uzbekistan's Ministry of Health and Singapore's Nanyang Polytechnic International aimed at boosting the healthcare and information technology capacity and capability of Uzbekistan.

A memorandum of understanding was also signed between Enterprise Singapore and the Investment Promotion Agency under Uzbekistan's Ministry of Investments, Industry and Trade to work on the promotion of bilateral economic relations.

President Mirziyoyev, who began his visit here on Monday, received a ceremonial welcome at the Istana on Tuesday morning.

He then paid a courtesy call on President Halimah Yacob. He also had a new orchid hybrid named in his honour, *Dendrobium Shavkat Mirziyoyev*, at the Istana.

The two leaders reaffirmed the friendly ties between Singapore and Uzbekistan during the call. President Halimah welcomed closer connectivity between Singapore and Uzbekistan, including people-to-people ties and parliamentary exchanges. She also encouraged Uzbekistan to use Singapore as the gateway to engage South-east Asia.

She said in a Facebook post of the Uzbek President's trip: "The visit is timely as 2022 marked the 25th anniversary of diplomatic relations."

SHARED INTERESTS

While our countries differ in size and geography, we do share common interests such as supporting women development, providing quality education, and enhancing trade and parliamentary ties.

PRESIDENT HALIMAH YACOB, on Singapore-Uzbekistan relations.

She added: "While our countries differ in size and geography, we do share common interests such as supporting women development, providing quality education, and enhancing trade and parliamentary ties. With President Mirziyoyev's support, I am confident that Singapore-Uzbekistan relations will continue to strengthen in the years ahead."

During his meeting with the Uzbek leader, PM Lee welcomed Uzbekistan's interest to learn from Singapore's experience in areas such as education, public administration and civil service training. He was updated on Uzbekistan's development strategy, and President Mirziyoyev welcomed Singapore companies to explore opportunities in Uzbekistan.

PM Lee said in a Facebook post on Tuesday that Singapore and Uzbekistan face a complex geopolitical environment.

"While our circumstances are different, we share a common interest to promote peace and stability in Asia. We exchanged views on regional and global developments, including Singapore's experience in human capital development, which is a key pillar of our nation's development," he said, adding that he was pleased to see President Mirziyoyev.

President Halimah, speaking at a state banquet she hosted for the Uzbek leader on Tuesday evening, also highlighted Singapore and Uzbekistan's common goal to promote inter-faith dialogue and harmony among different races, and the two countries' mutual interest in promoting peace and stability in Asia.

She said: "As we look forward to a post-pandemic world, a key lesson from the last three years is the importance of forging trust and cooperation among partners... Singapore looks forward to deepening its ties with Uzbekistan in the years ahead. We welcome Uzbekistan's interest in Singapore's experience in areas such as education, transport, public administration, and civil service training."

"I hope that Singapore can play a small part in Uzbekistan's development as it strives to achieve its development strategy of the new Uzbekistan" under President Mirziyoyev's leadership, she added.

rosang@sph.com.sg

Uzbekistan & Singapore

Perspectives of Uzbekistan and Singapore's interaction in the international arena

From the first days of its independence, the Republic of Uzbekistan has paid attention to its relations with the countries of the Asia-Pacific region. The countries that demonstrated impressive economic progress and the capability to actively promote their interests in the international arena were especially attractive to Uzbekistan. In this regard, the experience of Singapore, which has achieved tremendous results in the economy in a short historical period while maintaining political stability and cultural identity, attracted Uzbekistan.

As of today, Singapore's economy is one of the most innovative and stable in the world. The city-state is the world's fourth-largest financial centre with over 200 banks. Singapore has signed free trade agreements with more than 20 countries and more than 80 agreements on the avoidance of double taxation, which increases Singapore's attractiveness as an international business centre.

Singapore is located in the heart of Southeast Asia and serves as an important transportation hub serving fast-growing markets not only in the Asia Pacific but also in other regions.

In turn, the geographical location of Uzbekistan and Central Asia, located between Asia, Europe, and the Middle East, is attractive for Southeast Asian countries, including Singapore, from the point of view of developing trade and economic relations and finding new trade routes.

The process of large-scale reforms, openness and active international cooperation launched in 2016 in Uzbekistan by President Sh.M. Mirziyoyev creates favourable conditions for promoting broad regional and inter-regional trade, investment, transport, and logistics cooperation with Singapore and other countries of the Association of Southeast Nations Asia (ASEAN).

Since the establishment of diplomatic relations in 1997, the two countries have established a political dialogue; a system of inter-ministerial consultations; and relations in trade, economic, cultural, and humanitarian, and there have been consistent developments in other areas.

The coincidence of positions of the two countries on most key issues and the absence of political differences create an environment for more active cooperation between Tashkent and Singapore in the international arena.

First, the two countries conduct a multi-vector, open, mutually beneficial, and pragmatic foreign policy that takes into account the dynamic changes in the world. Singapore maintains close diplomatic and economic ties with all partners in the Asia-Pacific region. The country's top foreign policy priorities are developing regional cooperation within ASEAN, and maintaining security and peace in Southeast Asia and around the region, especially in the Asia-Pacific.

The main priority of Uzbekistan's foreign policy is the Central Asian region and the development of good neighbourliness and cooperation with neighbouring countries. Tashkent attaches key importance to promoting cooperation with the world's leading countries and multilateral diplomacy within the UN, SCO, CIS, Organization of Turkic States, Organization of Islamic Cooperation, and others.

The policy of good neighbourliness and mutually beneficial cooperation promoted by Uzbekistan and supported by the countries of the region lay the foundation for transforming Central Asia into a unified trade, economic and transport-logistics platform for expanding inter-regional contacts and cooperation.

The country's foreign policy prioritises active participation in international efforts to restore peace and stability in Afghanistan, which is essential to the sustainable development of Central Asia and the entire Asian continent.

Second, Tashkent and Singapore are similar in their proactivity on regional and global platforms, in the mutually beneficial nature of their initiatives, and in their orientation toward addressing issues of collective interest.

Uzbekistan and Singapore share similar positions on a number of issues, such as peace and stability, as well as the promotion of tolerance, non-discrimination, and religious tolerance. The Singapore government has fully supported Uzbekistan's initiative to establish a Central Asian Nuclear-Weapon-Free Zone (CANWFZ).

Singapore has been actively engaged in the negotiation of the Global Agreement on Climate Change: Namely, the Minister of Foreign Affairs of the Republic of Singapore, V. Balakrishnan, has for several years, acted as a facilitator at the ministerial level and become one of the initiators of the Paris Agreement. The government of Uzbekistan officially signed the Paris Agreement on April 19, 2017, and ratified it in November 2018. In 2021, Uzbekistan increased its quantitative commitments under the Paris Agreement and intends to reduce specific greenhouse gas emissions per unit of GDP by 35% by 2030 from 2010 levels, instead of the 10% previously envisioned.

Third, both countries advocate global stability and support the principle of consensus in resolving conflicts. Regular consultative meetings of the heads of Central Asian states, initiated by President Mirziyoyev, have become an important factor in deepening regional cooperation and provided an effective platform for trusted and constructive discussion and resolution of common problems in the region.

Though Singapore does not officially adhere to neutrality in its foreign policy, the country's de facto impartiality has made it a popular venue for events of international significance. The first-ever U.S.-North Korea summit was held in Singapore in June 2018. The country's regular Shangri-La Dialogue International Security Summit has become one of the world's key platforms for discussing Asian and global security issues with defence leaders and experts from Asia-Pacific and leading countries around the world.

Based on these factors, cooperation between the countries can develop in the following directions.

First, the intensification of interaction within the framework of international economic organisations: Singapore is a member of the Working Group on Uzbekistan's accession to the World Trade Organization (WTO). Further acceleration of the negotiation process on Uzbekistan's accession to the WTO will allow more effective cooperation with Singapore, taking into account the country's economic weight in the international arena.

The Asian Development Bank (ADB) is an important financial and investment partner for Uzbekistan. In July 2022, Singapore signed a memorandum with the ADB on promoting investment in the Bank's member countries, providing for trilateral cooperation in implementing private company development projects in third-world Asian countries in infrastructure, finance, and social sectors, as well as assistance in achieving the Sustainable Development Goals. This kind of cooperation will be important for promoting both bilateral trade and investment exchanges and strengthening the position of Singapore businesses in the Central Asian and Eurasian markets as a whole.

Second, cooperation in the development of inter-regional transport connectivity: The development of inter-regional transport infrastructure and freight transportation between South-East Asia and Central Asia in a number of ways can contribute to the formation of long-term commercial ties between countries and regions.

Singapore has considerable potential and experience in financing major infrastructure projects and management in the fields of transport and logistics. Singaporean companies are actively involved in the implementation of Belt and Road projects in China and in recent years have shown interest in the potential of transportation through Central Asia and the Caspian Sea to the countries of the South Caucasus and Europe.

Uzbekistan has now stepped up cooperation with Kyrgyzstan and the People's Republic of China to build the Uzbekistan-Kyrgyzstan-China railroad, which creates good prospects for cooperation with Singapore companies in the development of Central Asian transport infrastructure architecture and trans-Asian connectivity in general.

In addition, Uzbekistan's initiative to promote connectivity between Central and South Asia and the construction of the Termez-Mazar-e-Sharif-Kabul-Peshawar railroad opens up prospects for the development of multimodal transportation between South-East Asia and Eurasian and European countries. Singapore is also a major aviation hub of the Asia-Pacific region and can contribute on a mutually beneficial basis to the development of civil aviation infrastructure and freight transportation of Uzbekistan and Central Asian countries.

Third, the development of inter-regional dialogue and interaction in the Central Asia-ASEAN format: One of the successful areas of regional interaction between the countries of Central Asia has been the promotion of a system of dialogues with the world's leading states and associations on mutually beneficial cooperation. The states of the region have established such interaction in the 'Central Asia plus' format with such countries as Japan, the Republic of Korea, the USA, India, Russia, and China; the European Union; and the Cooperation Council of the Arab States of the Gulf.

The creation of such a format with ASEAN countries in the future could give impetus to the expansion of the Association's global diplomacy and intensify cooperation between Singapore and other Southeast Asian countries and Uzbekistan, Central Asian, and Eurasian countries in general.

Thus, there is an indisputable potential for the development of cooperation between Uzbekistan and Singapore in the international arena. This interaction can be an important additional driver of bilateral relations in political, financial, trade-economic, and cultural-humanitarian spheres and promote inter-regional connectivity and mutually beneficial ties between the regions of Central Asia and South-East Asia.

This article was written by D. Kurbanov, Director of the Center for International Relations Studies (CIRS) of the Ministry of Foreign Affairs of Uzbekistan, and Sh. Khoshimova, chief researcher at CIRS.

CONTENT PROVIDED BY
THE EMBASSY OF THE REPUBLIC
OF UZBEKISTAN TO SINGAPORE

New Uzbekistan
Global recognition of politics

Development Strategy of New Uzbekistan for 2022-2026

In the solemn ceremony of the inauguration of the newly elected President of the Republic of Uzbekistan, seven priority areas and tasks were outlined for the next five years.

The main idea put forward in the Development Strategy of New Uzbekistan for 2022-2026 in terms of ensuring consistency and continuity of transformations is the implementation of the principle "From the Action Strategy to the Development Strategy". Moreover, the Development Strategy, which marked the beginning of a new stage of our national development, defines dignity, rights, and freedoms, the legitimate interests of a person, the introduction of a new development paradigm - the principle 'man - society - state' as the highest value.

As the main criterion and leitmotif of the activities of all branches of state power - the strict implementation of the requirements of the Constitution and laws of the country, the full implementation of the priority principle "In the name of the honor and dignity of the human being".

Summarising the characteristics of the "New Uzbekistan" outlined by the President, we can define it as a people's, social, humane, democratic, and legal state, in which the basic principles are also implemented: "It is not the people that serve state bodies, but state bodies must serve the people"; "Leaders must serve not only the state but above all the individual and his family, ensuring their legitimate interests"; justice and the rule of law; the priority of private property; and the development of the national economy. New Uzbekistan is a state with high human capital and intellectual potential.

Today, humanity is going through an extremely difficult period in its history - it is facing new, previously unknown threats and challenges; an increase in confrontation and conflicts between various forces; an intensification of a merciless struggle for resources; and is entering an era of globalisation and fierce competition. With this in mind, the head of state outlined urgent, extremely important and urgent tasks to ensure peace and security on a global and regional scale. He put forward a decisive principle - "We must be open to the world, and the world must be open to us", which today is confidently turning into the rule of our life.

The priorities of Uzbekistan in the sphere of foreign policy and economic area, defined in the Development Strategy, are:
• Strengthening good neighbourly relations and strategic partnerships, primarily with the countries of Central Asia;
• providing all possible assistance in restoring peace and stability in Afghanistan, preventing an economic and humanitarian crisis in that country, and implementing major interregional transport and communication projects;
• expansion of mutually beneficial and multifaceted relations with our partners in all regions of the world, as well as filling with new practical content relations with international institutions and regional organisations.

From the very beginning, we emphasise the enormous efforts and personal role of the head of state in the development and implementation of an active foreign policy and foreign economic policy of Uzbekistan. In just a year, the President of Uzbekistan Sh.M. Mirziyoyev made 18 visits to the states of Central Asia, China, the United Arab Emirates, Saudi Arabia, Pakistan, Turkey, South Korea, Hungary and other countries. In turn, 17 official visits of heads of foreign states, and 38 visits of high-ranking officials of foreign countries and international organisations to Uzbekistan were organised (73 visits in total). In meetings alone, in the format of the UN, OSCE, SCO, CIS, and Central Asia, more than 30 important initiatives were put forward to resolve topical problems on regional and global agendas.

Thanks to the open and good-neighbourly policy of Tashkent, today the countries of Central Asia, for the first time, began to discuss topical regional issues so openly and sincerely. A new term "Central Asian Spirit" has appeared in the political vocabulary of the world, reflecting the qualitatively new political atmosphere of cooperation and mutual understanding created in the region, demonstrating the optimistic attitude of the leaders of our countries to play a paramount role in solving the most pressing problems of the region, which hinder the disclosure of its rich economic and human potential, based on the principles of good neighbourliness, mutual trust, equality, respect and consideration of mutual interests.

The annual Consultative Meetings of the Heads of State of Central Asia have become an important factor in deepening regional cooperation, an effective platform for confidential and constructive discussion, and coordinated solutions to common problems faced by the countries of Central Asia.

Today, the world community considers New Uzbekistan as a stable and dynamically developing state of democratic transformations, a country of great opportunities and practical deeds. Thus, UN Secretary-General António Guterres stated that "Under the leadership of the President of Uzbekistan, the country is contributing to international efforts related to climate change, environmental protection and regional interconnectedness, while carrying out a significant reform process. Uzbekistan, as a member of the UN Human Rights Council, has taken on a special obligation to promote and protect human rights. The UN will continue to count on the Republic of Uzbekistan to promote the values and principles enshrined in the UN Charter."

Firstly, in 2018-2021, at the initiative of the President of Uzbekistan, five important special resolutions of the UN General Assembly were adopted aimed at strengthening regional and international cooperation in order to ensure peace, stability, and sustainable development in the Central Asian region, promoting tolerance, non-discrimination and respect for the rights based on the implementation of the principle of "Enlightenment against ignorance"; protection and promotion of the rights of young people; support for sustainable tourism and sustainable development of our region; the transformation of the Aral Sea region into a zone of environmental innovation and technology; and the creation of the UN Multi-Partner Trust Fund for Human Security for the Aral Sea region in Uzbekistan.

Secondly, in 2022 alone, six documents prepared by the Uzbek side are distributed as UN documents. These are, in particular, the Bukhara Declaration of the international forum "Dialogue of Declarations"; the Tashkent Declaration of the international conference dedicated to the tenth anniversary of the joint implementation of the UN Global Counter-Terrorism Strategy in Central Asia, on the creation of an International Multifunctional Transport and Logistics Hub for Humanitarian Aid; and documents of the Samarkand SCO Summit on dialogue and cooperation in an interconnected world, as well as solidarity for the sake of common security and prosperity.

Thirdly, also at the initiative of Uzbekistan, supported by 40 countries, at the 76th session of the UN General Assembly, the resolution "Strengthening interconnectedness between Central and South Asia" was adopted. In particular, it recommends:
• to continue and develop cooperation between Central and South Asia by expanding the infrastructure of transport and information and communication technologies and the formation of new international transport corridors that provide convenient, sustainable, commercially viable, low-cost, accessible, inclusive, and safe routes to seaports;
• to take into account the importance of Afghanistan's potential role in establishing links between Central and South Asia, as well as its economic development and integration into inter-regional economic processes to ensure lasting peace and stability;
• to consider the importance of intermodal transport for links between Central and South Asia and, in this context, increase infrastructure compatibility to improve air, land, and sea links between countries.

Fourthly, the UN Office on Drugs and Crime signed in Tashkent with the ministries of foreign affairs of the states of the region a new Cooperation Program in Central Asia for 2022-2025 with a budget of $90 million, covering such areas of cooperation as the fight against transnational organised crime and terrorism; treatment of drug use disorders; and HIV/AIDS prevention.
In December 2022 the UN General Assembly adopted the resolution "Increasing the role of parliaments in achieving the Sustainable Development Goals and ensuring human rights", initiated by the President of Uzbekistan.

The chairmanship of Uzbekistan in the SCO in 2021-2022 fell into a dynamic period, very full of various events and trends - a period of 'historical break', when one era ends and another, still unpredictable and unknown, begins. Nevertheless, under the direct leadership and control of the President, over 80 events were held in all areas of SCO cooperation, which is highly appreciated by the world community.

The summit of the organisation was held in the city of Samarkand, recognised as a storehouse of ideas and knowledge since ancient times. Here a common goal was forged - to live better, be more successful and become happier. At the summit, it was emphasised that this fact itself initially gave a certain 'new Samarkand spirit' to cooperation within the SCO, the implementation of the organisation's slogan "The SCO is strong if each of us is strong." The successful development of each member state will steadily contribute to the sustainable development of all partners and ultimately serve as the basis for the prosperity of the common space of the SCO.

The summit is recognised as one of the most important international events. For the first time in three years, the heads of 14 states met face to face in Samarkand, where a record 44 documents were signed, including the Samarkand Declaration. In it, the heads of state highly appreciated the results of our country's chairmanship in the SCO. They, in particular, welcomed the Samarkand initiative of solidarity for the sake of common security and prosperity, put forward by Sh.M. Mirziyoyev, aimed at ensuring peace and stability, broad international cooperation and promoting the sustainable development of mankind, as well as a number of his other international initiatives within the framework of the SCO and the UN.

Under the chairmanship of Sh.M. Mirziyoyev, the leaders of the SCO member states, for the first time, also adopted statements by the SCO Council of Heads of State in the following areas of both regional and global significance:
• Action to respond to climate change;
• ensuring reliable, sustainable, and diversified supply chains;
• ensuring global food security;
• ensuring energy security.
In addition, the heads of the SCO states supported the efforts and initiatives of Uzbekistan in the field of:
• Creation in Central Asia under the auspices of the UN of the Regional Center for the Development of Transport and Communication Interconnection;
• development of cooperation in the field of industry and production cooperation within the framework of the SCO, stimulation of industrial cooperation between the business circles of the SCO member states and the opening of the industrial zone "Uzbekistan - SCO";
• further development of cooperation with the UN; interested states and structures in solving the problems of the Aral Sea basin in connection with the large-scale problems of its drying up, including within the framework of the implementation of the provisions adopted at the initiative of Uzbekistan of the resolution of the UN General Assembly on declaring the Aral Sea region a zone of environmental technologies and innovations; and UN Multi-Partner Trust Fund for Human Security in the Aral Sea Region.

Over the past year, the President of Uzbekistan took part in the first summit in the "Central Asia - European Union" format, held a number of meetings and negotiations with the EU leadership, in particular with the President of the European Council Charles Michel. 16 political consultations were held with Austria, Belgium, Hungary, Germany, Greece, and other EU countries. The parliamentary vector of cooperation is also developing dynamically and in every possible way.

Charles Michel confirmed the firm "support of the European side for the policy of reforms in New Uzbekistan", and expressed the hope that "they will be sustainable and irreversible." He noted with satisfaction "the growing attention of the leadership of Uzbekistan to the issues of ensuring gender equality, and supporting the rights and interests of women, youth and children." He also assured of "the EU's readiness to continue comprehensive assistance in the implementation of projects and programmes in these areas." At the same time, he paid priority attention to the issues of "attracting direct investment, the latest technologies, best practices and high standards of EU companies to Uzbekistan."

The Presidents welcomed the dynamic development of cooperation between Uzbekistan and the EU in the field of economy, trade, and investment. An important step in this direction was granting Uzbekistan the status of a beneficiary country of the GSP+ system in April last year, which opened up access to duty-free supplies of a wide range of Uzbek products to the EU countries.

The legal framework for interaction has been significantly strengthened: In July this year, a new Enhanced Partnership and Cooperation Agreement (EPCA) between Uzbekistan and the EU was initiated in Brussels. Unlike previous agreements, the EPCA expands the areas of interaction by including new areas: the human dimension; democratic reforms; human rights; religious freedoms; child and forced labor; foreign policy; security; conflict prevention and crisis management issues; protection of personal information; asylum and border management; combating illegal migration; organised crime and corruption; and countering terrorism. Most importantly, this agreement is no longer a framework agreement but creates a full-fledged mechanism for comprehensive interaction between Uzbekistan and the EU.

The parties emphasise the need for joint efforts in order to accelerate the implementation of the EU Strategy for Central Asia, and also welcomed the holding in Samarkand of the EU-Central Asia Conference on Interconnectivity: "Global Gateway" for Sustainable Development".

During the visit of the President of Uzbekistan to Saudi Arabia, ways to expand cooperation with the Islamic Development Bank were considered. A separate programme has been adopted, providing for the approval of the IDB by the end of 2022 for the financing of major projects and programmes in the amount of $1.6 billion. This is an important step towards bringing relations with the IDB to a qualitatively new level and adopting a country cooperation programme for 2023-2026. The importance of the earliest organisation of the activities of a full-fledged representative office of the Islamic Development Bank in Tashkent was noted.

Over the past period, the President of Uzbekistan has met more than 55 times with the heads and leaders of foreign countries from different regions of the world, which not only gave a new powerful impetus but also raised Uzbekistan's relations with these states to a qualitatively new level. As a result, in particular, in the economic sphere, certain agreements were reached.

First, the country will further develop the Uzbek-Hungarian strategic partnership; set a targeted plan for bringing bilateral trade to $500 million in the near future; and create a joint Fund in the near future to finance priority projects. Support was emphasised for the successful outcome of the business forum with the conclusion of investment and trade agreements worth more than a billion dollars, which is a concrete and practical result of the productive interaction between the two countries.

Second, it will raise Uzbek-Turkish relations to the level of a comprehensive strategic partnership. In particular, there are plans to expand cooperation in the field of modernisation of the energy sector of Uzbekistan. So, if only over the past year, five large energy projects have been implemented together with Turkish companies, with the total capacity of the stations set to reach 1.4 thousand megawatts, then in the coming years, the launch of 20 projects worth $12 billion will provide an additional 71 billion kilowatt-hours of electricity while saving 12 billion cubic meters of natural gas per year.

There is a dynamic development of trade and investment ties between Uzbekistan and Turkey: In recent years, the volume of bilateral trade has increased by 2.5 times, and the number of joint ventures has grown five times. The volume of Turkish investments in Uzbekistan has increased 70 times.

Third, it will focus on "creating a wonderful future for Chinese-Uzbek relations" based on the proposals put forward by the President of the People's Republic of China Xi Jinping and the President of Uzbekistan Sh.M. Mirziyoyev.

At the same time, Xi Jinping highly appreciated the ongoing program of large-scale reforms in New Uzbekistan, which is demonstrating impressive results in all spheres of the life of the state and society. He noted that thanks to regular contacts at the highest level, they came to a historic agreement on the start of construction of the China-Kyrgyzstan-Uzbekistan railway, which is of strategic importance for strengthening transport connectivity and developing the region, and an unprecedented level of interstate cooperation has been achieved.

In particular, last year the trade turnover reached a record eight billion dollars. Over the past five years, the volume of investments in the economy of Uzbekistan has exceeded $10 billion. The five-year programme of full-scale economic cooperation is being successfully implemented. Agreements were signed in the field of trade, economics, investment, and financial and technical cooperation on the implementation of priority projects totalling $15 billion.

Fourth, there is an unprecedented interaction between the Uzbek-Saudi Business Council, as a result of which agreements were signed on the implementation of projects totalling more than $14 billion.

Fifth, if agreements were reached on bringing the volume of bilateral trade between Uzbekistan and India to a billion dollars in the coming years, then trade and the number of joint ventures with South Korea have almost doubled in recent years, and the volume of Korean investments in the economy of Uzbekistan exceeds seven billion dollars.

Sixth, a high level of political dialogue and cooperation with Pakistan has been achieved, as well as a steady growth in mutual trade, building strong partnerships not only between the two countries but also between strategically important regions - Central and South Asia. The common views and aspirations of the two states are also confirmed by the commonality of the national programmes for the long-term development and economic well-being of "New Uzbekistan" and "Naya Pakistan". The goal of increasing the trade turnover to 500 million dollars in the coming years, and in the long term - up to a billion, was outlined.

If the people of Uzbekistan acted as the initiator of the constitutional reform, then its main ideological inspirer is President Sh.M. Mirziyoyev. In the light of the priorities of the constitutional reform identified by him, the Constitutional Commission for the formation of proposals for amendments and additions to the Constitution and the implementation of organisational measures, together with national and foreign, international partners, carry out, in particular, the following work.

1. Over 400 global and regional conventions, declarations, and resolutions adopted within the framework of such international organisations as the UN, SCO, OSCE, EU, OIC, UTC, and many others have been studied. The international experience in the development of constitutionalism is analysed, as well as the experience of more than 193 countries of the world in updating the Constitution and implementing constitutional reforms.

2. Based on a comparative analysis, more than ten books have been prepared, including the monographs "Constitutions of the SCO Member States" and "World Constitutions", as well as the five-volume book "Constitutional Reforms: Experience of the World Countries".

3. In order to ensure a broad national and international discussion of certain provisions and novelties of the draft Constitutional Law, as well as to organise public discussions, over 100 national and over 40 international forums were held. Some took place in such foreign countries as the USA, Great Britain, Korea, Poland, Russia, Saudi Arabia, Switzerland, Japan, India, and others.More than 500 international and foreign experts, parliamentarians, state, and public figures, political scientists, and representatives of legal science took part in important large-scale events, and gave their positive feedback and practical recommendations on the draft Constitutional Law and reforms.

4. Public, gender, anti-corruption, linguistic expertise, and expertise on the rights of the child, human rights, women, persons with disabilities, and other vulnerable segments of the population were received.

It should be noted that for the first time in the history of independent Uzbekistan, official comments and proposals on the draft Constitutional Law were received from the Office of the UN High Commissioner for Human Rights. The adoption of the Constitutional Law on the basis of a national referendum was also proposed.

At the same time, a number of international organisations and experts believe that the nationwide discussion of the draft Constitutional Law was held in full accordance with the recommendations of the United Nations on the implementation of constitutional reforms, with the documents of other international and regional organisations, with certain trends in modern constitutional development in the world, as well as with the priority principle that "The people are the only source of power".

In a word, according to the estimates of the leaders of foreign countries and international organisations, the head of New Uzbekistan Sh.M. Mirziyoyev is one of the rare statesmen and politicians of our time who consistently defends the right to go his own way, and has a huge impact on ensuring the sustainable development of the state, region, and world generally. The qualities of the leader of our country are noted: devotion to the Motherland and people, common sense, high morality, the iron will of a politician who is confident in the correctness of the chosen strategic course, as well as the full dedication of his life and work to maintaining peace and ensuring the well-being of his native country and development.

Today, the world community considers Shavkat Miramonovich Mirziyoyev not only as the chief architect, whose priority is the construction of New Uzbekistan, but also as the initiator of the formation of New Central Asia, and new regional and global relationships. This is also an international recognition of his active domestic and foreign policy pursued within the framework of the Development Strategy of New Uzbekistan for 2022-2026.

This article is written by academician Akmal Saidov.

Two exhibitions from Uzbekistan will become the main museum attraction of Paris for the next months

During the official visit of the President of Uzbekistan Shavkat Mirziyoyev to France, at the invitation of the President of France Emmanuel Macron, the heads of the two states opened two major exhibitions: "The Splendours of Uzbekistan's Oases. At the Crossroads of Caravan Routes" in the Louvre and "The Road to Samarkand. Miracles of Silk and Gold" at the Arab World Institute.

Both exhibitions are dedicated to Uzbekistan's history and culture. The exhibition in the Louvre covers the 5th-6th centuries BC to the reign of the Timurids, and the Arab World Institute presents exhibits of the 19th – mid-20th centuries, as well as paintings of the Turkestan avant-garde from the collection of Uzbekistan state museums.

"The Splendours of Uzbekistan's Oases. At the Crossroads of Caravan Routes"
The exhibition "The Splendours of Uzbekistan's Oases. At the Crossroads of Caravan Routes" covers the period from the 5th-6th centuries BC to the era of the Timurids, narrating the history of the Great Silk Road, which passed through the southern part of present-day Uzbekistan. It presents objects of monumental art, wall paintings, carved details of palaces, objects of arts and crafts, and others. The exhibition includes 169 museum exhibits, in particular 138 items from 16 museums of the Republic of Uzbekistan, as well as 31 exhibits from the world's leading museums. Among them are the Louvre Museum, the National Library of France, the British Museum and the British Library, the Victoria and Albert Museum in London, the Cabinet of Medals in Paris, the Guimet Museum and the Languages and Civilizations University Library (BULAC), the Calouste Gulbenkian Foundation in Lisbon.

The curators of the exhibition are Yannick Lintz and Rocco Rante. Uzbekistan has always been a place of cultural exchange and trade, and the Great Silk Road has become, in a sense, the first global economic project. Covering about two thousand years, the exhibition at the Louvre will provide a multifaceted view of the culture of various civilisations that existed on the territory of present-day Uzbekistan, as well as show the country's unique heritage in the global cultural context, which is one of our main tasks.

In turn, Rocco Rante noted that the exhibition has two main goals. First, it is to show the civilisation and culture of Central Asia in Europe. And Paris is the best place for this because here is one of the leading museums in the world – the Louvre.

The second goal is to show the close historical connection between Central Asia and Europe. After all, these two regions have a lot of common historical moments. In addition, the exhibition has an educational meaning for European and French societies to get to know Central Asia better. After all, its culture has an important place in human civilisation and is rich in significant historical figures. Rante also noted that the exhibition "The Splendours of Uzbekistan's Oases. At the Crossroads of Caravan Routes" in the Louvre will become unique over the next 30-40 years.

In addition to the Katta Langar Quran, especially unique exhibits include a charred wooden panel from the settlement of Kafir-Kala, a statue of Buddha "Garland-bearer" (1st century BC – 1st century AD), the head of a Kushan prince from the settlement of Dalverzin-Tepe (1st-2nd centuries), the famous wall painting of the 7th century, depicting a hunting scene, found in the ancient settlement of Varakhsha in Bukhara region, a copy of the book of Marco Polo of the 14th century about his wanderings in Asia. At the same time, taking into account that many archaeological discoveries, as well as significant restoration work, have been made over the past three years, part of the exposition will be shown to the public for the first time.

"The Road to Samarkand. Miracles of Silk and Gold"
The exposition of this exhibition, consisting of more than 300 exhibits from nine museums of the Republic of Uzbekistan, includes objects of applied art, which are important elements of Uzbek identity and diversity. Visitors can become acquainted with samples of national textiles, costumes, hats, jewellery of the 19th – mid-20th centuries, gold-embroidered chapans of the era of the Bukhara Emirate, carpets, and much more, made in various techniques.

The exhibition also presents 23 paintings, including works of the Turkestan avant-garde from the collection of the State Museum of Arts of the Republic of Karakalpakstan named after I. V. Savitsky in Nukus. Between 1917 and 1932, Turkestan was a particularly popular geographical destination among Russian avant-garde artists. At the time when Matisse was discovering Morocco, avant-garde artists in search of "local colour" found for themselves a unique source of inspiration in the richness of landscapes, forms, and faces of Central Asia.

One of the most interesting exhibits here can be a tobelik, a traditional headdress of a Karakalpak woman in the 17th-18th centuries. Tobelik has a cylindrical shape, assembled from silver plates with coral and turquoise inserts. It is believed that it served as an additional decoration, a kind of crown, which was worn on a saukele – a wedding headdress.

Kimesheks are also presented here. This is also a women's national headdress. Kimeshek completely covers the head, while the face remains open. It looks like a hood. Married women wore kimesheks of specific colors, thereby emphasising their status.

Undoubtedly, the attention of visitors will be attracted by arebeks – small nose rings. They were made of gold and decorated with spiral curls, and small turquoise, and coral beads. Arebeks were worn on the right wing of the nose by young Karakalpak women, and these decorations are not found anywhere else on the territory of Uzbekistan. If you draw parallels, they can be recognised as an analog of modern piercing.

Among the selected paintings are paintings by Ural Tansikbayev, Victor Ufimtsev, and Nadejda Kashina. There are paintings by Alexander Volkov, Alexei Isupov, and others. Despite the unique style of writing each of them, all the paintings are inspired and united by one theme – the East and its colour. So, having seen, for example, the picture of Nikolai Karakhan's "Teahouse near the house under the elms", the viewer can immediately understand how people of that time dressed and how they rested; their way of life; and the surrounding nature.

A very interesting painting by Victor Ufimtsev "Oriental Motif". A native of Siberia, the artist, as he became acquainted with Central Asia, gradually mastered the traditional art of Islam. This work is a free modernist stylisation of a Muslim miniature, which reproduces the classic banquet scene. The painting depicts two women at rest, towards which a man with a vessel is moving. It seems that the Western viewer, looking at this canvas, will be able to appreciate how high the respect for women has always been in the East.

In general, it should be noted that the entire collection as a whole, presented by the Savitsky Museum, is designed to reveal all the diversity, originality, and charm of oriental culture and Uzbekistan in particular. And it is very symbolic that it will be presented at the Arab World Institute, located in the famous European capital. This once again proves that the West and the East can perfectly coexist and enrich each other.

One of the curators of the exhibition, the head of the French publishing house Assouline Publishing, Yaffa Assouline, and photographer Laziz Hamani, provided great assistance in creating the exposition. For three years, they travelled across the region to search and collect materials for publications about Uzbekistan. The exhibition "The Road to Samarkand. Miracles of Silk and Gold" became a living illustration of these books. Most of the exhibits presented at the exhibition have never left Uzbekistan. But even those who are well acquainted with, for example, chapans, suzani, and other works presented in the country's museums, will see them in a new light and perspective – in 3D, and this is an unprecedented experience.

Another valuable part of the exhibition is that all regions of Uzbekistan are presented at once with their differences, schools, and techniques for manufacturing products.

Partnership with the Arab World Institute allows for a more thorough exploration of the cultural context of Uzbekistan, to emphasise the significance and richness of its national heritage. The Culture Foundation attaches great importance to the exhibition since one of its important missions is to raise awareness about the history and cultural heritage of Uzbekistan on a global scale. It is expected that the exhibition will be of interest to a wide range of people who are fond of art, handicraft and the history of the region. Certainly, this project, successfully created jointly with the Arab World Institute, will serve to further develop mutual understanding and cooperation between people.

At the opening ceremony of the exhibition, the ballet performance "Lazgi – Dance of Soul and Love" by German choreographer Raimondo Rebeck was presented. The Khorezmian Lazgi dance is more than 3000 years old. It is included on the Representative List of the Intangible Cultural Heritage of Humanity of UNESCO.

On a final note
The territory covered by the Silk Road contains traces and treasures of a huge number of civilisations and ethnic groups representing a wide variety of cultures and ways of life. This is a place of intersection of many trade routes, exchange between East and West, nomadic and sedentary ways of life, and synthesis of cultures of various civilisations – Iranian, Hellenistic, Turkic, Chinese, Indian, Arab Muslim, Mongolian, and others.The exhibitions presented by Uzbekistan in Paris will allow millions of people from all over the world to see the artifacts of this great history with their own eyes.

Experts believe that these exhibitions will be very effective because cooperation in a culture very quickly acquaints the country and people with the world. 60 million tourists visit France a year. More than 10 million people visit the Louvre. The fact that Uzbekistan will be represented at such a large-scale exhibition will make the country more recognisable, and increase interest in it, its culture, and its history. This will serve as a great advertisement for the development of tourism. The better people get to know each other through exhibitions, and mutual communication, the stronger mutual trust. And trust opens the door to other cooperation areas.

Uzbekistan
A journey of transformation

MESSAGE FROM HE AMBASSADOR K. SHAKIROV, REPUBLIC OF UZBEKISTAN, TO SINGAPORE

In the year of 2022, we celebrated the 25th anniversary of the establishment of Diplomatic relations (April 8, 1997) between the Republic of Uzbekistan and the Republic of Singapore.

Over the last 26 years, both countries have enjoyed mutually beneficial and fruitful cooperation, successfully established at the Government and business levels—and most importantly, between the peoples of our countries. Both Singapore and Uzbekistan have been rigorous in supporting the initiatives within international institutions and sharing the values of upholding the international rule of law, while paying close attention to the issues of combating international terrorism and extremism, as well as preventing the spread of Covid-19.

We particularly wish to express our appreciation to the Ministry of Foreign Affairs of Singapore, Temasek Foundation International, Management Development Institute of Singapore for the 5,000 PCR tests and the 30 Oxygen Concentrators provided to Uzbekistan in 2020 in its efforts in combating the coronavirus pandemic.

One cannot emphasise strongly enough our deep appreciation of Singapore as a valuable partner in South-east Asia and it is our endeavour to continue to strengthen this cooperation, based on mutual respect and trust going forward. The positive outcome of the Covid-19 pandemic, despite the havoc it has caused globally, has been its bringing the world closer together.

Singapore's significant role as an influencer, not only in the region, but also in the international arena, is pivotal to the development of Uzbek-Singapore co-operation and collaborations on many fronts, including joint programmes and projects with your country in trade-economic, investment and cultural-humanitarian spheres.

Herewith I have the privilege to announce the State visit of H.E. Shavkat Miromonovich Mirziyoyev, the President of the Republic of Uzbekistan to Singapore on January 17 and 18, 2023, under the invitation of H.E. Madam Halimah Yacob, the President of the Republic of Singapore.

During the forthcoming state visit, meetings in accordance with the programme are anticipated.

Additionally, both sides are going to hold Uzbekistan-Singapore Business Forum where around 30 bilateral agreements will be sealed on expanding economic, trade and investments partnerships on such strategic sectors as cities infrastructure development, expanding and deepening cooperation on education (training government servants), healthcare, chemical and textile industry, agriculture, transport logistics (overland, railroad, airports, subway), renewable energies, further modernisation of tourism infrastructure.

I strongly believe that the State visit of our Uzbekistan leader will be a game changer in Singapore-Uzbekistan relations, as it creates the impetus for even greater achievements together in the years to come.

Our main goal is to further expand and strengthen our long-term and mutually beneficial cooperation with the Republic of Singapore—which is based not just on the principles of trust and transparency alone, but also on the principles of a win-win situation, where each partner achieves their set goals.

Aligned with the constant support by our Governments, and the comprehensive socio-economic reforms taking place in Uzbekistan, particularly over the last five years, we are witnessing the opening up of new directions for collaboration within government and business circles — particularly between small and medium-size enterprises (SMEs) of Uzbekistan and Singapore.

Creating the fundamental pillars of strength for further deepening of our cooperation has been the existing legal framework between our two countries, which comprises five inter-governmental documents on promotion and protection of investments, air service, economic and humanitarian cooperation, avoidance of double taxation and visa exemptions for diplomats. And the number of such documents is going to be expanded.

President Shavkat Mirziyoyev once described "New Uzbekistan" as "a state developing in strict compliance with the universally recognised norms in the field of democracy, human rights and freedoms, on the basis of the principles of friendship and cooperation with the international community, the ultimate aim of which is to create a free, comfortable and prosperous life for our people".

The "New Uzbekistan" is primarily about the new economic relations, the new economic vision. It has witnessed how the economic system of our country has been completely restructured and even if it is difficult, we have put into practice the market mechanisms.

Today, we are also implementing the new Strategy of Development of New Uzbekistan for 2022-2026. It has already witnessed the acceleration of moves from foreign investors, including from Singapore, to develop our economy, which is being revamped and is now brimming with business opportunities for large companies and SMEs. The most attractive sectors for investment are tourism, textiles, food processing, education, information technology (IT) banking and finance, mineral resources, new energies, urban development and others.

Uzbekistan's investment scenario has brightened with the likes of Singaporean companies, which have invested nearly half a billion US dollars in such sectors as education, food, agriculture, and the chemicals and textile industries.

Also rising in numbers are Uzbek companies which are using Singapore as a base to explore the Southeast Asia market. This also gives me a great sense of satisfaction about the progress in strengthening the ties between Uzbekistan and Singapore.

I am confident that this positive trend of bilateral cooperation amongst government and business circles will continue to increase furthermore in the years to come!

THE PRESIDENTIAL ADDRESS AS THE TRAJECTORY FOR ACTION IN 2023

On December 20, President of Uzbekistan Shavkat Mirziyoyev delivered an Address to the Oliy Majlis (Parliament) and the people of Uzbekistan, in which he summed up the results of the outgoing year and outlined the priorities of the policy in 2023. In the Address that has become traditional since December 2017, the President summarises the results of the outgoing year, suggests the course for the next year and puts forward priority policy directions for the coming year.

The President proposed to name the year 2023 "The Year of Caring for People and Quality Education," while pointing out that "improving the quality of education is the only right way to develop the New Uzbekistan."

In the economic sphere, for the first time, Uzbekistan's gross domestic product exceeded $80 billion, $8 billion of foreign direct investment was attracted, and exports reached $19 billion.

For the first time in the history of our country, pensions and social benefits were increased to a level not lower than minimum consumer spending in 2022. In 2017, only 500 thousand low-income families received social assistance. Today, there are more than 2 million. The volume of allocated funds increased 7 times and reached 11 trillion sums per year.

At the same time, it should be taken into account that the country's population is increasing annually by 900 thousand people and in 2021, exceeded 36 million. This increases the demographic and social burden on the economy. But despite this, as the figures show, it has been possible to significantly strengthen the social protection of the population in recent years.

The international authority of Uzbekistan is also growing, which is becoming one of the centres of world politics. Thus, in 2022, Uzbekistan hosted the Summits of the Shanghai Cooperation Organization and the Organization of Turkic States, as well as dozens of high-level international conferences.

In the Address, special attention was paid to the issues of constitutional reform. Today more than 220 thousand proposals have been received from citizens to amend the Constitution, and the draft of the new Constitution will be submitted to a national referendum. The President's Address also identified the priorities of the policy in certain areas of activity.

Public administration reform
This reform is about the transition from 'manual' management to a systematic one aimed at a specific result, which will increase the efficiency of the public administration system and make it more compact.

The state machine has accumulated a lot of duplicate functions. There is a high centralisation of management and overmanning. Therefore, a Presidential Decree was signed on the implementation of a new administrative reform.

The number of Ministries and departments will be reduced from the current 61 to 28. The political status of each Minister will be increased, as well as his accountability to the President, Parliament and the public. The number of state workers will be gradually reduced by 30-35%, and the saved funds will be used to solve social issues. The collective responsibility of the relevant committee, commission and members of Parliament for the effective organisation of the Minister's activities will be determined.

The principle of the 'social state'
One of the main tasks in 2023 will be to improve the quality of school education and the authority of teachers in society. The Presidential schools have already implemented the 'A-Level' educational programme, approved in 130 countries around the world.

There are also important tasks in the field of preschool education. If the coverage of children with preschool education has increased from 27 to 70% over the past six years, then it is necessary to create 600 thousand more new places in kindergartens in order to achieve 80% coverage in the next five years. In the field of higher education in recent years, the number of universities in the country has increased 2.5 times – up to 198, and the coverage of higher education has increased from 9 to 38%. Forty-one universities have already received academic and financial independence. Next year, the resources allocated for preferential educational loans for university students will double and amount to a total of 1.7 trillion sums. In 2023, 1.8 trillion sums will be allocated for science and innovation.

In the field of primary healthcare of the population, another 140 family medical centres and polyclinics will be created in 2023, and compact medical centres will be created in 520 hard-to-reach and remote makhallas. A three-year maternal and child health programme will also be launched, under which all maternity complexes will be completely renovated and equipped, and the number of beds will increase by 35%. Also in 2023, projects will be launched to establish radiological centres in Samarkand, Ferghana and Khorezm.

All state investment programmes will be formed in the context of makhallas. In 2023, almost 3 times more funds, or 8 trillion sums, will be allocated for the implementation of projects initiated by the population. To increase the independence of makhallas in financial terms, as part of the implementation of the 'Makhalla Budget' system, from January 1, 2023, part of the proceeds from property tax and land tax will remain for the makhalla's disposal.

To solve the housing problem, the volume of construction of new housing will increase by 1.5 times and reach 90 thousand apartments and individual residential buildings.

Water problems and agriculture
A transparent water metering system will be introduced, and in the next three years, about 13 thousand water facilities will be digitalised. On the basis of a public-private partnership, 16 large pumping stations will be modernised and transferred to alternative energy sources. For this purpose, part of the proceeds from the tax on the use of water resources will be additionally directed to the development of irrigation in the districts. Efforts in the field of ecology and environmental protection will also be intensified.

Reforms in agriculture will also continue. If 100 thousand hectares of acreage were transferred to 400 thousand dehkans, another 100 thousand hectares of irrigated land will be allocated to the population in 2023. About 350 thousand new dehkan farms will be created and many social problems in rural areas will be solved. The state will also support cooperation and develop infrastructure of small and medium capacity for storage, sorting and processing of agricultural products. In total, $1 billion will be allocated for projects to create a high-value chain in the agricultural sector in 2023.

Development of market relations and business support
Next year, the introduction of free market mechanisms, ensuring healthy competition, inviolability of private property and support for entrepreneurship will be actively continued. As the President noted, these issues should take a special place in the new Constitution.

In 2023, new approaches will be introduced to reduce economic inequality between regions and the balanced development of all districts and cities, which, based on their potential, will be divided into five categories, and the course of economic development of the district will now be determined depending on its category. Based on the specific category of the district or city, entrepreneurs will be allocated subsidies, loans and compensation. Tax rates will also be differentiated.

Due to the reduction of the value-added tax rate from 15 to 12% from January 1, entrepreneurs will have at least 14 trillion sums at their disposal per year. Tax and customs administration will be significantly reformed, and a system for assessing the quality of services provided to entrepreneurs will be introduced in all state bodies.

Energy problems
Serious problems in energy supply continue to persist due to the fact that over the past six years, the country's population has increased by 13%, the number of industrial enterprises has doubled – from 45 to 100 thousand, respectively, and the demand for electricity has increased by at least 35% and continues to grow. For the sustainable development of the economy, it is necessary to invest $25-30 billion in energy, for which it is necessary to attract private investment into the industry.

Over the past three years, $8 billion of direct investments have been directed to the energy sector. In 2022, seven power plants with a capacity of 1.5 thousand megawatts were commissioned. In 2023, the construction of 11 large projects with a capacity of 4.5 thousand megawatts, including solar and wind power plants, will be completed, which will allow an additional 14 billion kilowatts of electricity to be generated and increase the supply of electricity to households by 50%. A ten-year exploration program will be adopted to increase natural gas reserves.

In the next three years, solar panels and hot water collectors will be installed in all state organisations. For this purpose, investments in the amount of $2 billion will be attracted. Due to this, 60% of electricity and gas consumption will be transferred to 'green energy'. For households, the number of subsidies allocated for the installation of solar panels will be increased by two times.

Attracting investment and export opportunities
In order to maintain sufficiently high rates of economic growth required to improve the standard of living of a rapidly growing population, it is necessary to actively attract investment to the economy and increase exports.

Over the past six years, the inflow of investments to Uzbekistan has increased to a level exceeding 30% of GDP, as the President noted in his Address, "we will continue to improve conditions for the growth of private local and foreign investments in the economy." Thus, in 2023, about $30 billion of investments will be attracted, of which $25 billion will be private investments, due to which over 300 projects with a total value of $8 billion as well as 40 new large projects will be launched.

Due to the implementation of these projects, the capacity of the Almalyk Mining and Metallurgical Complex will increase from the current 40 million to 100 million tonnes. The construction of a complex for processing gold ore with a capacity of 4 million tonnes will be completed at the 'Pistali' deposit in Navoi region. This will increase the production of copper by three times in the next five years, and gold by up to 150 tonnes per year. Large-scale projects will also be launched in the chemical, automotive, and agricultural engineering industries.

In 2023, a large privatisation will be launched, and about one thousand enterprises will be put up for sale. At the same time, for the active participation of the population in the privatisation processes, the shares of the 10 largest companies and commercial banks of the country will be put up for open and transparent auctions (IPO), in which all citizens of the country will be able to participate.

Obid Khakimov,
Director of the Center for Economic Research and Reforms under the Administration of the President of the Republic of Uzbekistan

Another task set by the President in the Address is to increase exports of finished products by $4 billion in 2023. He noted that thanks to the programme "New Uzbekistan – a country of competitive products" launched in 2022, about two thousand entrepreneurs entered foreign markets for the first time in one year. And in 2023, the practice of compensating exporters for transportation and other expenses provided for by the programme will continue.

This will at least double the supply of textiles, electrical equipment, leather and footwear and other finished products to European markets. At the same time, the current nine-stage customs clearance procedure for exporting products will be reduced by three times. And in general, the volume of exports in 2023 will exceed $23 billion for the first time in the history of Uzbekistan.

Conclusion
Analysing the President's Address, we can confidently assume that 2023 will be a breakthrough year in the implementation of reforms.

Social policy depends on economic development since it is the economy that generates budget revenues that can be used for social purposes. And it is precisely the economic successes of recent years that have allowed us to accumulate enough funds in the budget to move on to the formation of a truly 'social state'.

The issues of privatisation of state-owned enterprises have also not been effectively resolved for a long time. On the one hand, this was hindered by the insufficient capacity of the domestic market, which limits the development potential of enterprises in the event of their privatisation. And on the other hand, there is an insufficient level of personal savings, both of the population and domestic business, for the acquisition of enterprises at a sufficiently high price to ensure sufficient budget revenues. However, in the course of economic development over the past five years, the situation has changed on both sides, the capacity of markets has increased, as well as the savings of businesses and the population. That is, all the necessary conditions have been created for a large privatisation, which will begin next year.

And finally, the problem of energy supply has recently become acute due to a reduction in gas production against the background of population and economic growth. The tasks set in the Address allow it to be solved in the most effective way today without a sharp increase in electricity prices for the population and having prepared a serious basis for eliminating this problem in the future.

Thus, we must assume that the tasks set out in the President's Address will be successfully completed in 2023.

The Center for Economic Research and Reforms (CERR) under the Administration of the President of the Republic of Uzbekistan is both a research center and an Accelerator of socio-economic reforms. CERR provides comments and advice on suggestions for socio-economic programming and policies by the Ministries to solve the main development issues in a swift, operational and efficient way. CERR is in the Central Asian Top-10 by the «Global Go To Think Tank Index Report 2020» (USA).

CONTENT PROVIDED BY
THE EMBASSY OF THE REPUBLIC
OF UZBEKISTAN TO SINGAPORE

S'pore, Uzbekistan sign 18 MOUs to strengthen economic collaboration

Deals cover areas such as urban development, transport and ICT

Rosalind Ang

Uzbekistan and Singapore deepened their collaboration on Monday with 18 new memorandums of understanding (MOU) signed between Singapore companies and Uzbek organisations.

The agreements were signed at the Uzbekistan-Singapore Business Forum, which was held at the Singapore Business Federation Centre.

Minister for Trade and Industry Gan Kim Yong and Mr Laziz Kudratov, Uzbekistan's Minister of Investments, Industry and Trade, were guests of honour at the forum.

"(Uzbekistan has) strong macroeconomic foundations, sustained GDP growth, a large domestic market of 34 million people, a young population of rising middle class and abundant natural resources... Uzbekistan is (also) strategically located between Europe and Asia," said Mr Gan in his speech.

These advantages present opportunities for businesses, with diversification becoming increasingly crucial amid global challenges, he added.

The forum was held as part of Uzbek President Shavkat Mirziyoyev's state visit to Singapore on Monday and Tuesday.

More than 180 Singapore business leaders with interest in Uzbekistan, as well as 30 Uzbekistan government officials and chief executives of Uzbek corporations, attended the forum.

Minister for Trade and Industry Gan Kim Yong and Mr Laziz Kudratov, Uzbekistan's Minister of Investments, Industry and Trade, at the Uzbekistan-Singapore Business Forum on Monday where the MOUs were signed. ST PHOTO: ALPHONSUS CHERN

KEY PARTNER

(Uzbekistan has) strong macroeconomic foundations, sustained GDP growth, a large domestic market of 34 million people, a young population of rising middle class and abundant natural resources... Uzbekistan is (also) strategically located between Europe and Asia.

MINISTER FOR TRADE AND INDUSTRY GAN KIM YONG, on Uzbekistan's advantages, which present opportunities for businesses.

The MOUs cover areas such as urban development, transport infrastructure, information and communications technology, healthcare and education.

They include an agreement by chemical company Indorama and Uzkimyosanoat Joint Stock Company to implement chemical and fertiliser investment projects in Uzbekistan.

Uzkimyosanoat is an integrated corporate structure that combines chemical enterprises in Uzbekistan.

Mr Eric Kuan, president of private education institution MDIS, and Mr Komiljon Karimov, Ukbekistan's Deputy Minister of Higher Education, Science and Innovation, signed a pact to establish English language-training centres and a centre for professional development in tourism, hospitality, business and management in Tashkent and other regions in the Central Asian country.

Under another MOU, Singapore infrastructure consultancy Surbana Jurong and Tashkent will cooperate to further develop industrial zones, technoparks, small industrial zones and innovative research centres in the Uzbek capital.

At the forum, Uzbek business leaders and officials gave presentations on investment and trade opportunities in Uzbekistan. The speakers included Deputy Minister of Transport Jasurbek Choriyev and Mr Ulugbek Kasimkhodjaev, director of the Investment Promotion Agency under the Ministry of Investments, Industry and Trade.

Singapore business leaders also took part in a fireside chat about the challenges and advantages of doing business in Uzbekistan.

Those in the chat included port operator PSA International regional CEO for Middle East and South Asia Wan Chee Foong, Indorama Group director Prakash Kejriwal and MDIS' Mr Kuan.

One of the challenges of running a business overseas involves building up familiarity with the culture, lands and directions of the country, said Mr Wan.

"We will also have to work hand in hand with the country's government to ensure that we are in line with master plans that tie in closely with industry developments."

rosang@sph.com.sg

Nature: Institution research output from 1 December 2021 - 30 November 2022

#	Institution	Count
1	National University of Singapore (NUS)	660
2	Nanyang Technological University (NTU)	523
3	Singapore University of Technology and Design (SUTD)	59
4	INSEAD, Asia Campus	2
5	National University Cancer Institute (NCIS)	27
6	Singapore Polytechnic	1
7	Singapore Management University (SMU)	1
8	Nanyang Polytechnic	1
9	National Junior College (NJC)	1

https://www.nature.com/nature-index/institution-outputs/generate/all/countries-Singapore/all


Architecture / Built Environment
#7
Chemistry
#8
Chemical Engineering
#6
Civil &Structural Engineering
#4
Computer Science & Information Systems
#6
Environmental Sciences
#10
Electrical & Electronic Engineering
#10
Geography
#5
*History of Art
#4
*Marketing
#9
Mechanical, Aeronautical & Manufacturing Engineering
#10
Pharmacy & Pharmacology
#10
Social Policy & Administration
#6
Sociology
#7
Global
TOP 10
IN 14 SUBJECTS
2023 QS World University Rankings by Subject

How universities stack up

QUACQUARELLI SYMONDS

Rank	Institution	Location
1	Massachusetts Institute of Technology	United States
2	University of Cambridge	Britain
3	Stanford University	United States
4	University of Oxford	Britain
5	Harvard University	United States
6	California Institute of Technology	United States
6	Imperial College London	Britain
8	University College London	Britain
9	ETH Zurich	Switzerland
10	University of Chicago	United States
11	**National University of Singapore**	**Singapore**
12	Peking University	China
13	University of Pennsylvania	United States
14	Tsinghua University	China
15	University of Edinburgh	Britain
16	Ecole polytechnique federale de Lausanne	Switzerland
16	Princeton University	United States
18	Yale University	United States
19	**Nanyang Technological University**	**Singapore**
20	Cornell University	United States

TIMES HIGHER EDUCATION

Rank	Institution	Location
1	University of Oxford	Britain
2	Harvard University	United States
3	University of Cambridge	Britain
3	Stanford University	United States
5	Massachusetts Institute of Technology	United States
6	California Institute of Technology	United States
7	Princeton University	United States
8	University of California, Berkeley	United States
9	Yale University	United States
10	Imperial College London	Britain
17	Peking University	China
18	University of Toronto	Canada
19	**National University of Singapore**	**Singapore**
20	Cornell University	United States
21	University of California, Los Angeles	United States

THE STRAITS TIMES

SHANGHAI RANKING

Rank	Institution	Location
1	Harvard University	United States
2	Stanford University	United States
3	Massachusetts Institute of Technology	United States
4	University of Cambridge	Britain
5	University of California, Berkeley	United States
6	Princeton University	United States
7	Oxford University	Britain
8	Columbia University	United States
9	California Institute of Technology	United States
10	University of Chicago	United States
69	Aarhus University	Denmark
70	Heidelberg University	Germany
71	**National University of Singapore**	**Singapore**
71	The University of Texas MD Anderson Cancer Center	United States
73	McGill University	Canada
83		
87		
88		
89		
90		

THE STRAITS TIMES

Friday, March 24, 2023

NUS, NTU retain top spots in Asia on subject rankings

The 2023 instalment of the QS World University Rankings by Subject ranked 91 programmes at five Singaporean universities. The National University of Singapore had 14 subjects ranked in the top 10 and 40 in the top 50. The Nanyang Technological University had five subjects in the top 10. ST PHOTO: JASON QUAH

Both rank higher than Chinese, Japanese, HK unis in number of top 10 programmes

Sandra Davie
Senior Education Correspondent

The National University of Singapore (NUS) and Nanyang Technological University (NTU) have again emerged as the top universities in Asia based on global rankings by subjects.

The 2023 instalment of the QS World University Rankings by Subject ranked 91 programmes at five Singaporean universities. The league tables were released on Wednesday.

NUS had 14 subjects ranked in the top 10 and 40 in the top 50. Among the subjects in the top 10 were history of art, civil and structural engineering, and geography.

NTU had five subjects in the top 10, including materials science, communications and media studies, and three engineering disciplines.

In the 2022 subject rankings, NUS and NTU had 23 courses – 16 from NUS and seven from NTU – that made it to the global top 10 lists.

Singapore Management University (SMU) achieved two top 50 rankings – business and management studies (ranked 43) and accounting (49).

The Singapore University of Technology and Design was ranked for three subjects. Architecture and art and design were both placed in the 151-200 band.

The rankings, compiled by global higher education analysts QS Quacquarelli Symonds, are based on an analysis of more than 15,700 individual academic programmes at 1,594 universities in 93 countries and territories, including 388 universities in Asia.

In a repeat of the 2022 rankings, NUS and NTU ranked higher than Chinese, Japanese and Hong Kong universities, in terms of the number of top 10 programmes.

However, QS cautioned Singapore universities on the decline in rankings for 49 of their 91 programmes that were evaluated.

QS senior vice-president Ben Sowter said: "Singapore's universities have become used to operating at the very top of the global higher education ecosystem, which is both a testament to its success but also exposes it to the same vulnerabilities faced by well-established elite tertiary education sectors the world over – that of maintaining exceptional quality in the face of rising global competition – often posed by emergent economies looking to follow in its footsteps."

Globally, universities in the United States had the highest number of top 10 programmes (256), followed by the United Kingdom with 145 and Switzerland with 32.

Universities in the United States took the top spot in 32 subjects, with Harvard University ranking first in 14, and the Massachusetts Institute of Technology claiming the lead in 11.

British universities topped 14 subject tables, with Oxford and Cambridge leading in four and two subjects, respectively.

sandra@sph.com.sg

University departments in Singapore ranked among the world's top 10

National University of Singapore

History of Art	Architecture/Built Environment
Civil and Structural Engineering	Sociology
Mechanical, Aeronautical and Manufacturing Engineering	Chemistry
Geography	Marketing
Computer Science and Information Systems	Electrical and Electronic Engineering
Chemical Engineering	Environmental Sciences
Social Policy and Administration	Pharmacy and Pharmacology

Nanyang Technological University

Materials Science	Civil and Structural Engineering
Communication and Media Studies	Chemical Engineering
Electrical and Electronic Engineering	

Source: QS WORLD UNIVERSITY RANKINGS BY SUBJECT 2023 STRAITS TIMES GRAPHICS

Saturday, February 18, 2023

NTU, NUS among world's top 50 research bodies most cited by key global innovators

Aqil Hamzah

Nanyang Technological University (NTU) and the National University of Singapore (NUS) are among the world's top 50 research organisations whose work underpins solutions created by major global innovators, says scientific intelligence firm Clarivate.

The ranking is based on the number of research papers referenced in inventions by organisations in the 2023 edition of the Top 100 Global Innovators list released by the UK-based analytics firm on Thursday.

NTU ranked seventh, with 1,013 papers referenced, while NUS was placed 22nd with 753 papers.

Topping the list of research organisations was the Chinese Academy of Sciences in China, followed by the Massachusetts Institute of Technology and Stanford University in the United States.

This is the first time that Clarivate has ranked institutions whose research was referenced by global innovators. These innovators include 3M, Airbus and Rolls-Royce.

Clarivate has separately published its Highly Cited Researchers list for about a decade.

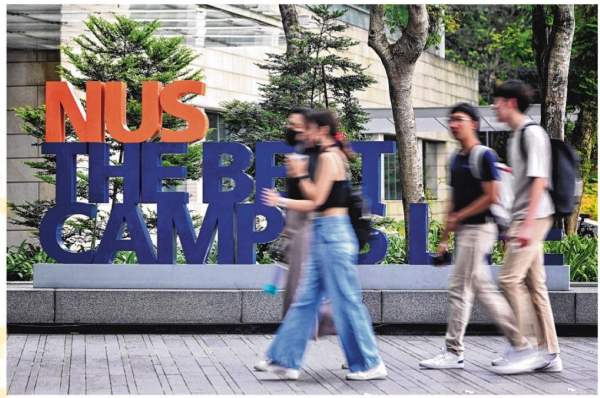
Professor Luke Ong, vice-president for research at NTU, said the university's placing was a testament to its commitment to deepening interdisciplinary research that benefits mankind.

"Catalysing high-impact research and translating it into enterprising innovations that benefit industry and society are core tenets of the NTU 2025 five-year strategic plan," he said.

Professor Chen Tsuhan, deputy president for research and technology at NUS, said the university is committed to staying the course in delivering research excellence that brings about tangible impact.

"We are proud that our research proves to have strong translational impact in pushing boundaries of innovation, and is making a positive difference on a global scale," he said.

haqil@sph.com.sg



In a ranking of research organisations whose work underpins solutions created by major global innovators, Nanyang Technological University was seventh with 1,013 papers referenced, while the National University of Singapore (above) was 22nd with 753 papers. ST PHOTO: CHONG JUN LIANG

Is science important?

Where is science heading?

The main challenges before today's scientists

Martin Cooper (94 years), father of the cellphone said "in the future, we can expect the cellphone to revolutionize education and healthcare"

American engineer Martin Cooper helped create the first mobile phone while working for Motorola in the 1970s. Today, he makes sure that he has the latest iPhone model, and always gives it a thorough road test. PHOTO: AFP

Monday, April 03, 2023

THE STRAITS TIMES

Barcode turns 50, but its days might be numbered

PARIS – The patch of irregular vertical lines that revolutionised checking out at the supermarket and facilitated the globalisation of retail is turning 50.

But as the barcode celebrates its birthday on Monday, its days might be numbered as it faces competition from the younger QR code, the information-filled squares used in smartphones.

The trademark beep as a product is scanned is heard about six billion times per day across the world as around 70,000 items are sold each second.

It has become so integrated in the shopping experience that it is easy to forget how much the technology revolutionised retail by speeding up the checkout process and giving retailers the ability to trace products and better manage inventory.

The barcode not only identifies a product, but also "gives professionals in stores access to other functionalities", said Ms Laurence Vallana, head of France de SES-Imagotag, a company that specialises in electronic tagging.

Barcodes were initially patented by Mr Norman Joseph Woodland and Mr Bernard Silver in the United States in 1952.

But it was not until nearly two decades later, in 1971, that US engineer George Laurer perfected the technology, and moves towards its commercialisation began.

On April 3, 1973, the standard to identify products was agreed by a number of large retailers and food companies. It later became known as EAN-13, which stands for European Article Number and the number of digits in the barcode.

The following year, on June 26 in the US state of Ohio, the first product was scanned: a pack of chewing gum that is now in the National Museum of American History in Washington, DC.

Today, the non-governmental organisation Global Standard 1 manages the barcode system and counts about two million firms as members.

It provides companies with a unique "global trade item number" for each product, which is then translated into the barcode. Each firm must pay an annual fee based on their sales, up to nearly US$5,000 (S$6,650) per year.

But the humble barcode will soon give way to another standard developed by the organisation, said Mr Renaud de Barbuat and Mr Didier Veloso, the respective heads of GSI Global and GSI France.

The new standard, based on QR, or Quick Response code, will be introduced around 2027.

If barcodes have been compared to prison bars by critics of the over-commercialisation of society, the Chinese game Go with its white and black pieces on a square board was the inspiration for the QR code's Japanese creator, Mr Masahiro Hara.

Developed in 1994, QR codes can hold much more information as they are read both horizontally, like barcodes, and vertically.

Instead of having to search a database for information to go along with a product, the QR code can integrate information directly, such as the composition of the product and recycling instructions.

GSI believes moving to the QR code format allows the sharing of far more information about products as well as content, enabling new uses that will be accessible to consumers as well as retailers.

As smartphones can read QR codes, they are an easy way to send people to websites to get additional information, leading to their widespread adoption by companies, artists and even museums. They are even used by payment systems.

But barcodes are likely to remain in place for years to come as the world gradually transitions to QR codes. AFP

Less air pollution worth the higher costs of new electric buses

They are costly to acquire and have lower capacities, but the new buses will improve health and environment outcome

Christopher Tan

Senior Transport Correspondent

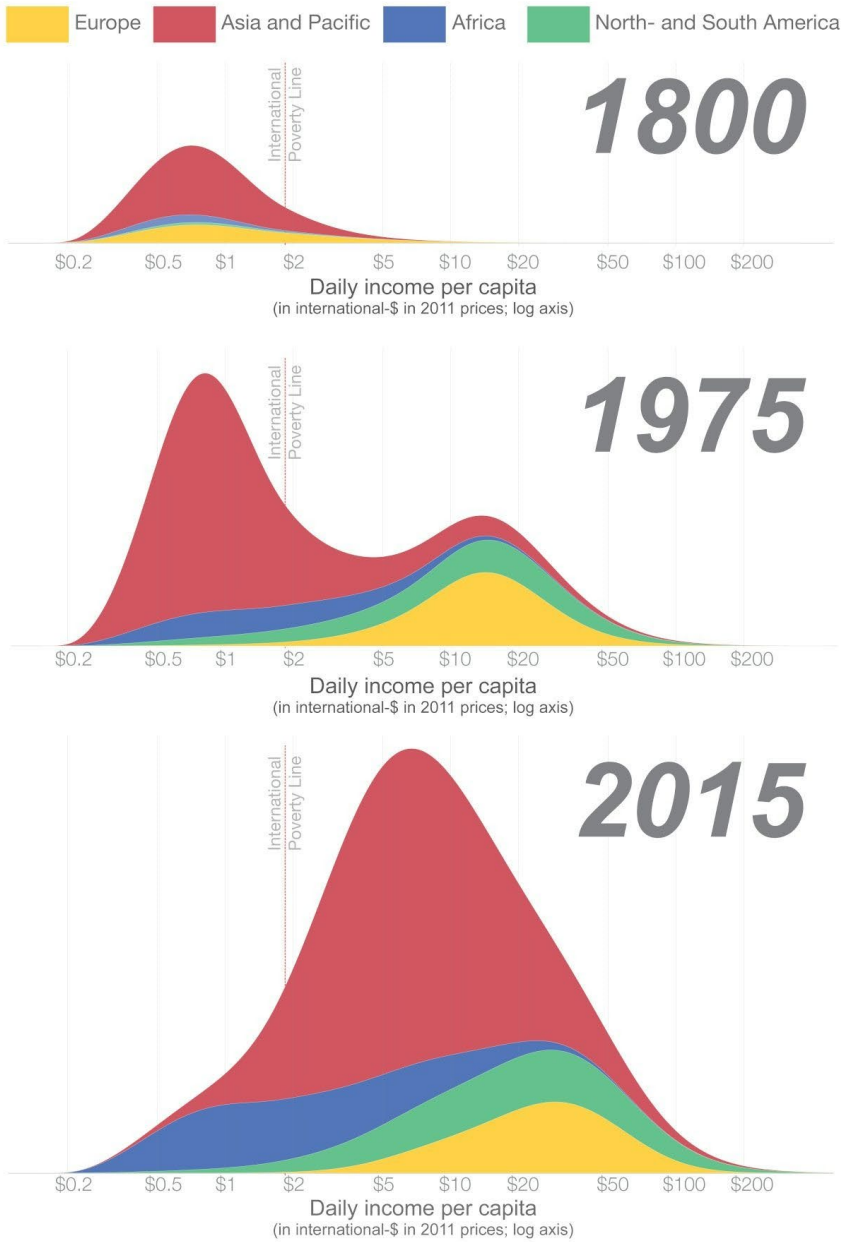
The first electric bus to be built in Singapore. Electric buses will lead to improvements in the health of the population, which will mean lower healthcare costs and fewer man-hours lost to sick leave in the future. PHOTO: ST FILE

https://ourworldindata.org/technology-long-run

Global income distribution in 1800, 1975, and 2015

Our World in Data

Income is measured by adjusting for price changes over time (inflation) and
for price differences between countries (purchasing power parity (PPP) adjustment).
These estimates are based on reconstructed National Accounts and within-country inequality measures.
Non-market income (e.g. through home production such as subsistence farming) is taken into account.
The *International Poverty Line* is set by the *United Nations* and is the the poverty line that defines extreme poverty.

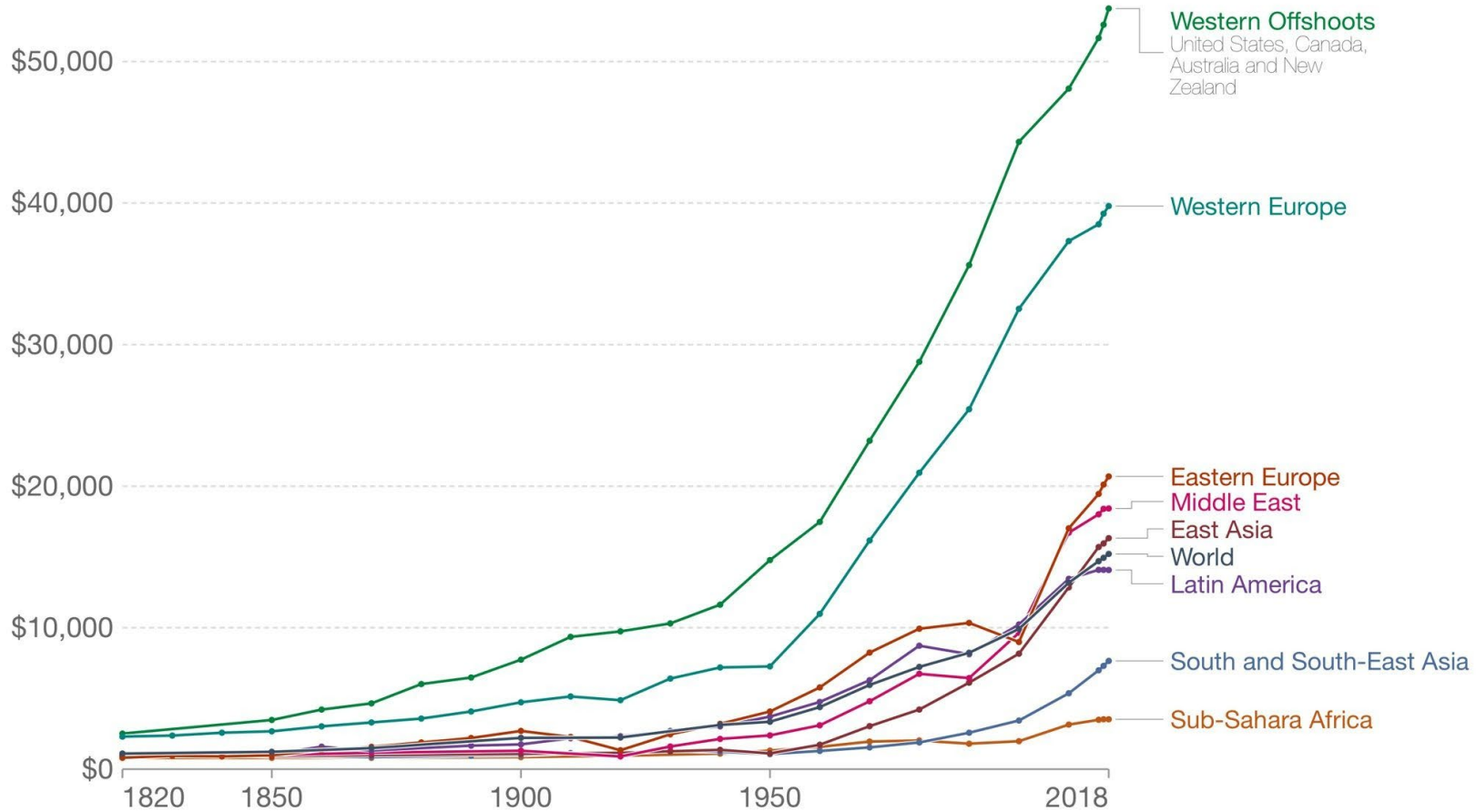


Data source: Calculations by Ola Rosling from Gapminder
OurWorldinData.org – Research and data to make progress against the world's largest problems.

GDP per capita, 1820 to 2018

Our World in Data

This data is adjusted for differences in the cost of living between countries, and for inflation. It is measured in constant 2011 international-$.

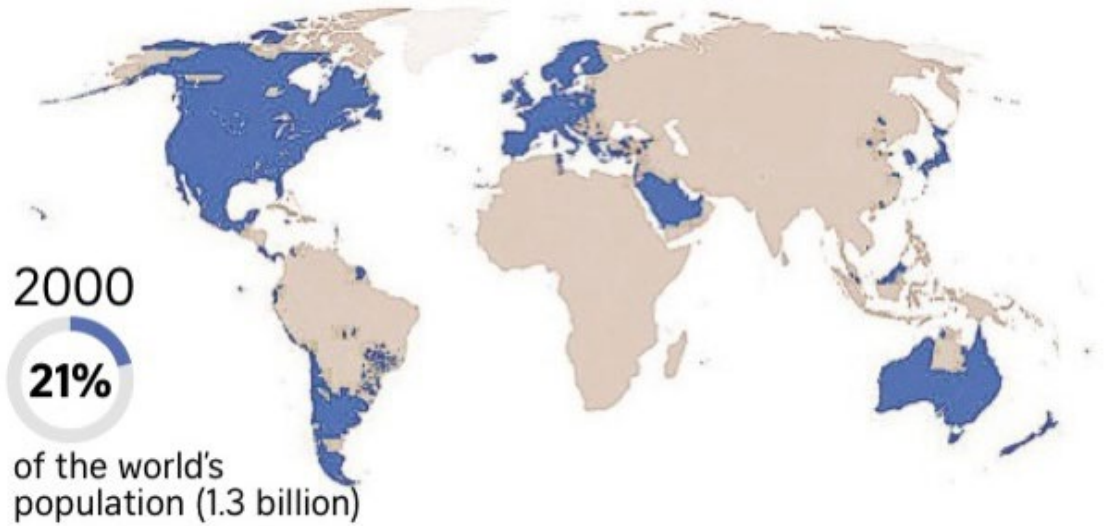


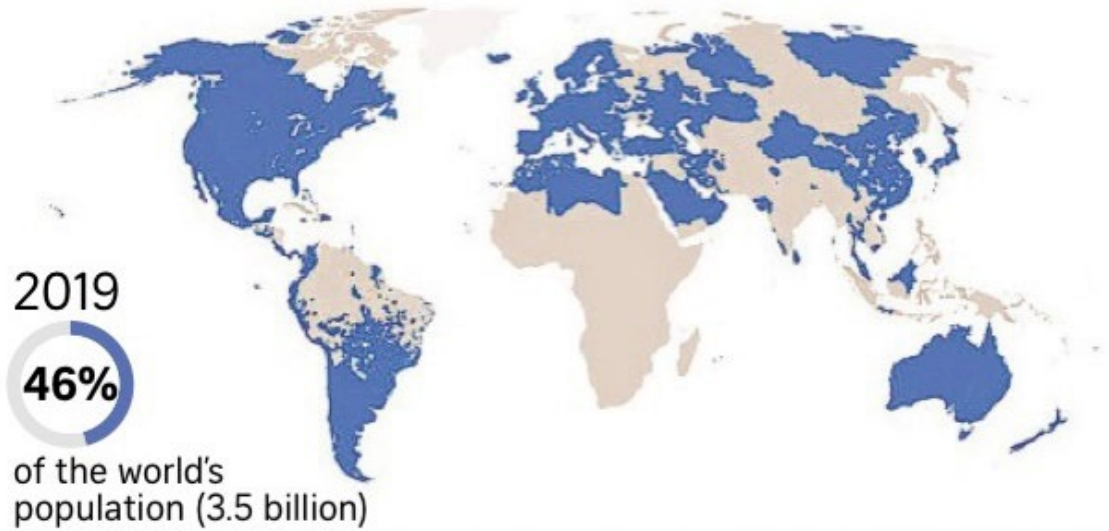
Source: Maddison Project Database 2020 (Bolt and van Zanden, 2020)

OurWorldInData.org/economic-growth • CC BY

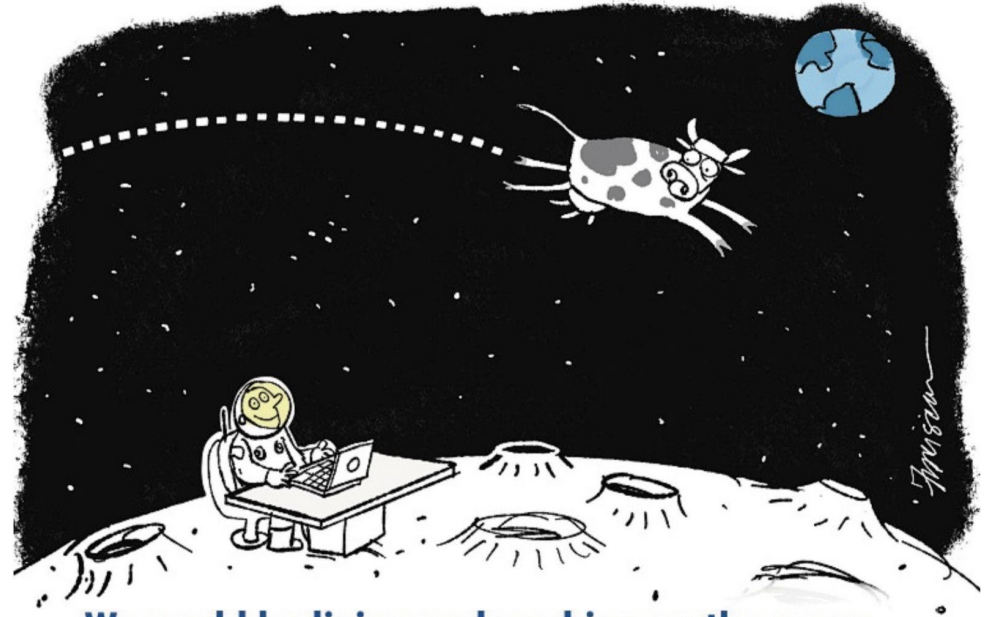
The rise of the moderately prosperous

Regions where people live longer than 72.5 years and have a GDP per capita exceeding US$8,300 (S$11,200).





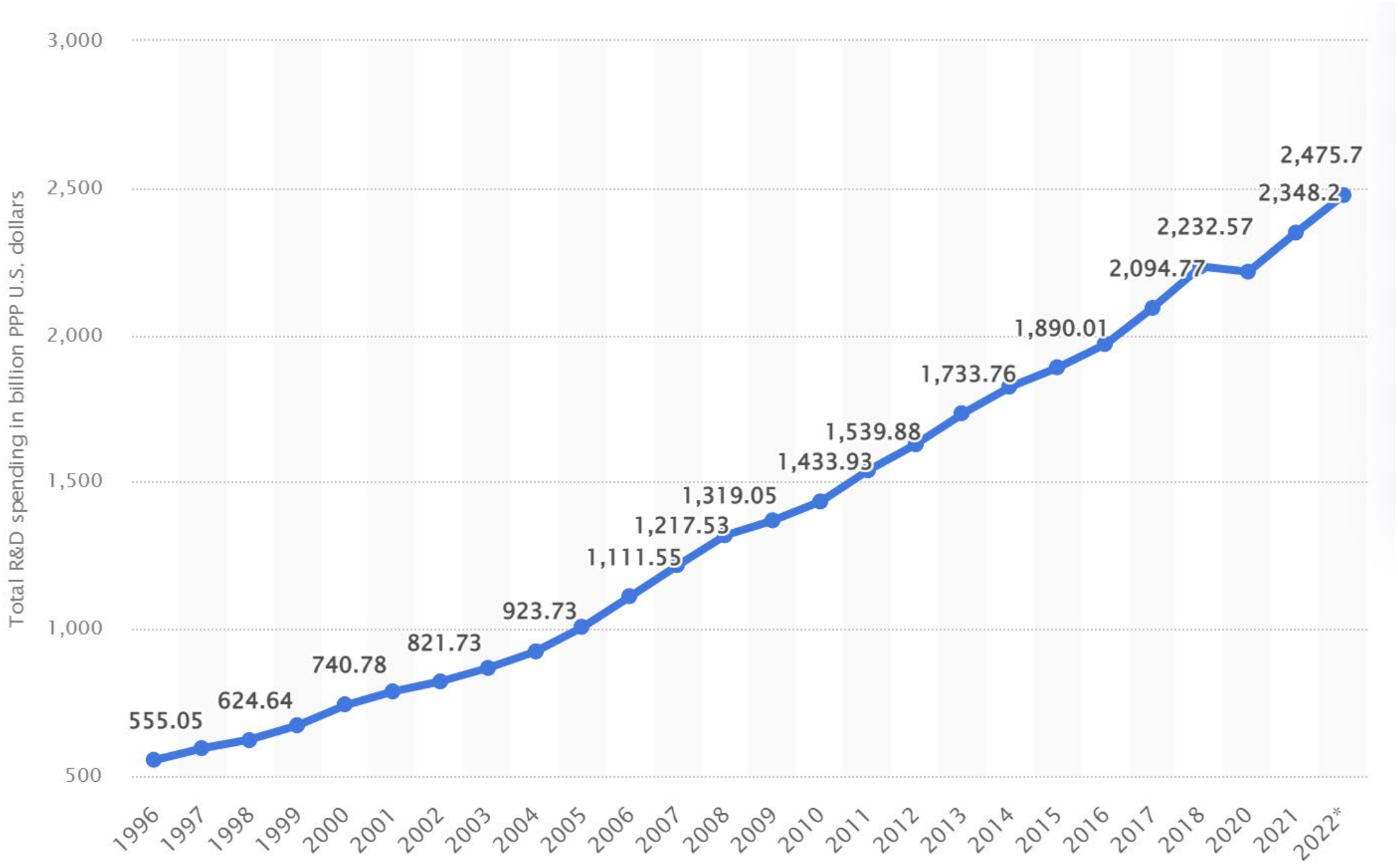
Source: McKinsey Global Institute STRAITS TIMES GRAPHICS



We could be living and working on the moon by 2030, says Nasa

The Mars simulation habitat at Nasa's research base in Houston, Texas. Volunteers will live inside a 160 sq m home, dubbed Mars Dune Alpha, which includes two bathrooms, a vertical farm to grow greens, a room dedicated to medical care, an area for relaxing and several workstations. PHOTO: REUTERS

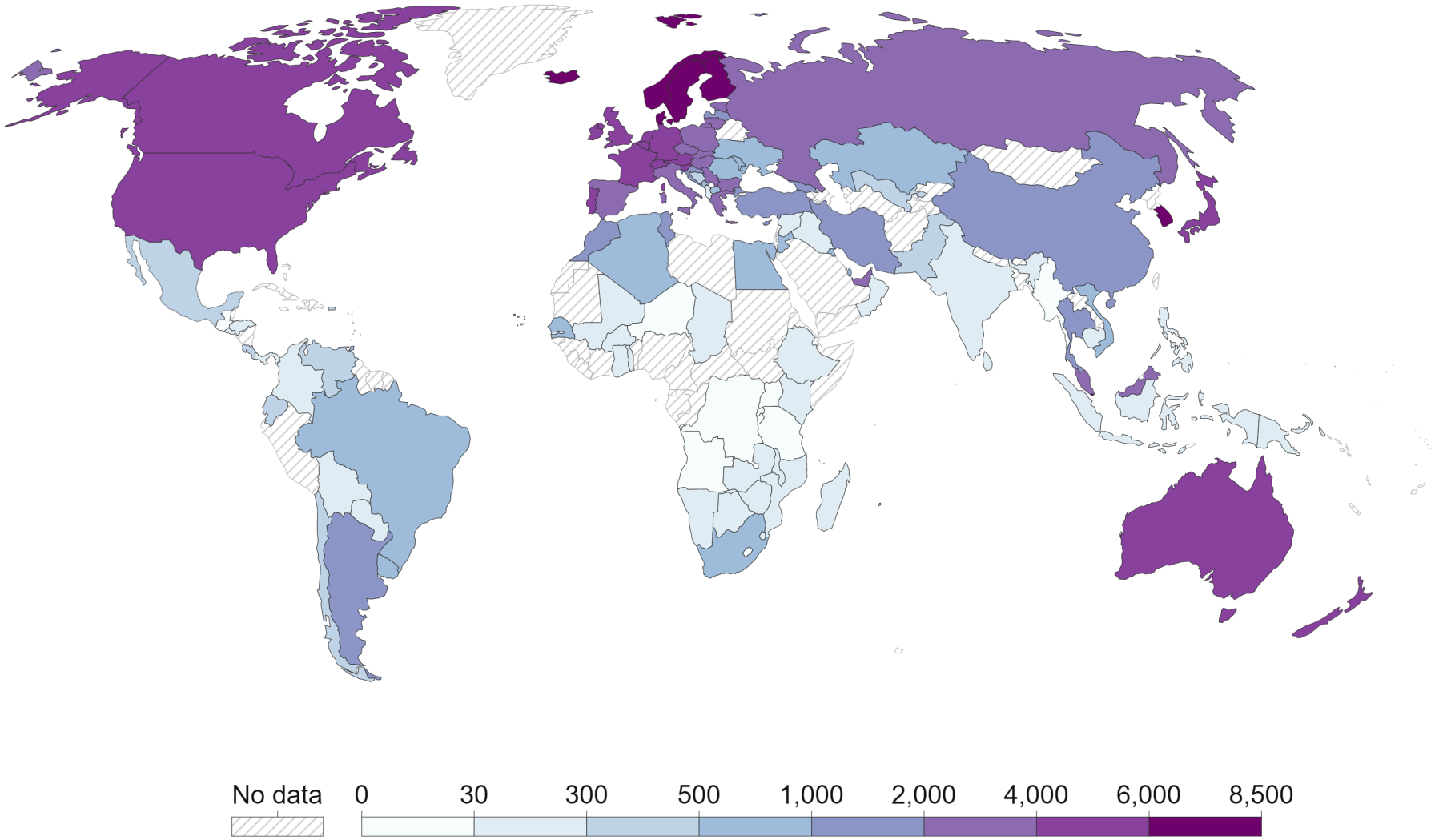
Total global spending on research and development (R&D) from 1996 to 2022 *(in billion PPP U.S. dollars) @ Statista*



Number of researchers per million people, 2018

Researchers in research & development (R&D) are professionals engaged in the conception or creation of new knowledge, products, processes, methods, or systems. Postgraduate students are included.

Our World in Data

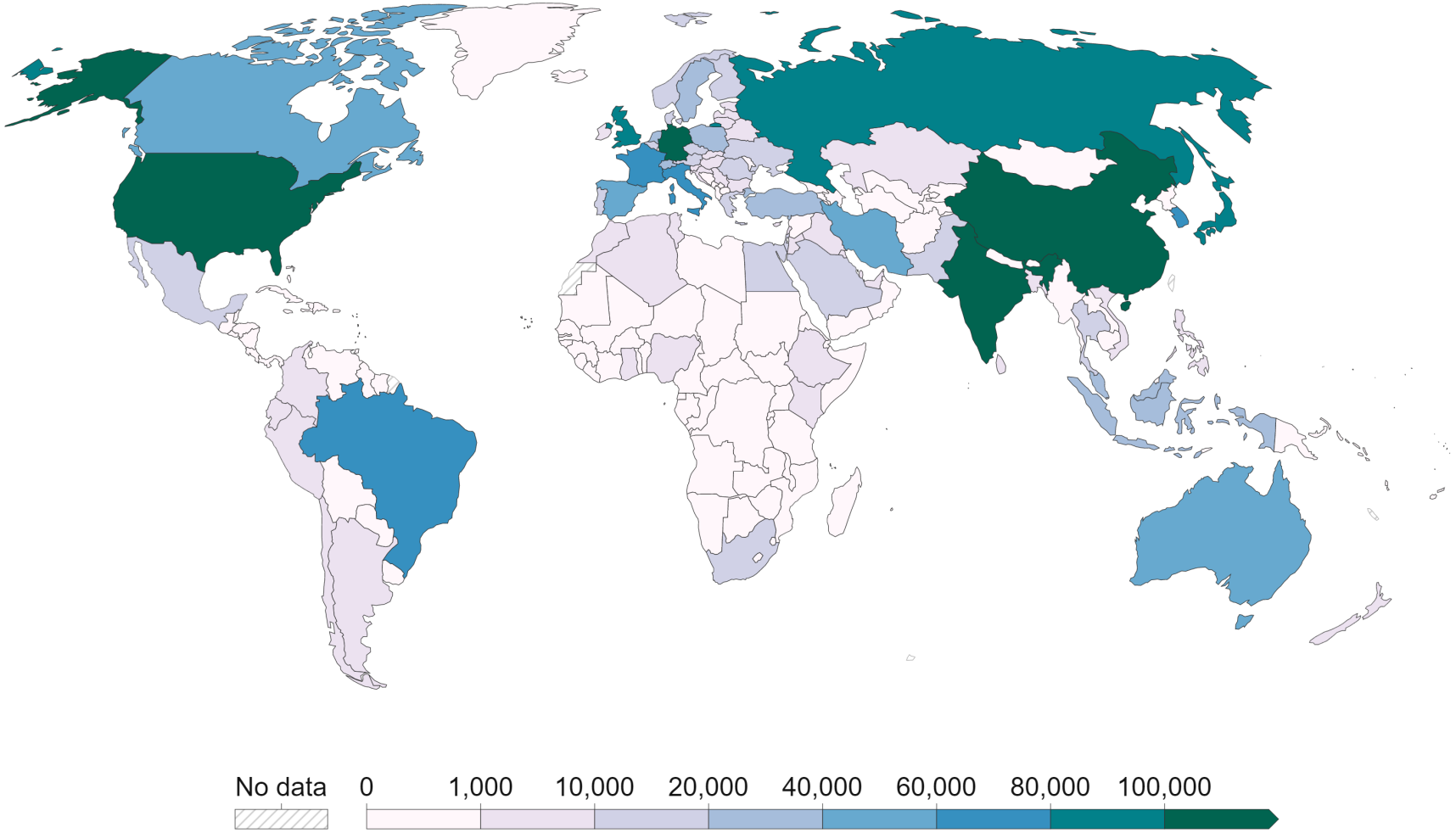


Source: UNESCO (via World Bank)

Scientific and technical journal articles, 2018

This is counted by the country of the author's institution. Includes scientific articles published in the following fields: physics, biology, chemistry, mathematics, clinical medicine, biomedical research, engineering and technology, and earth and space sciences.

Our World in Data



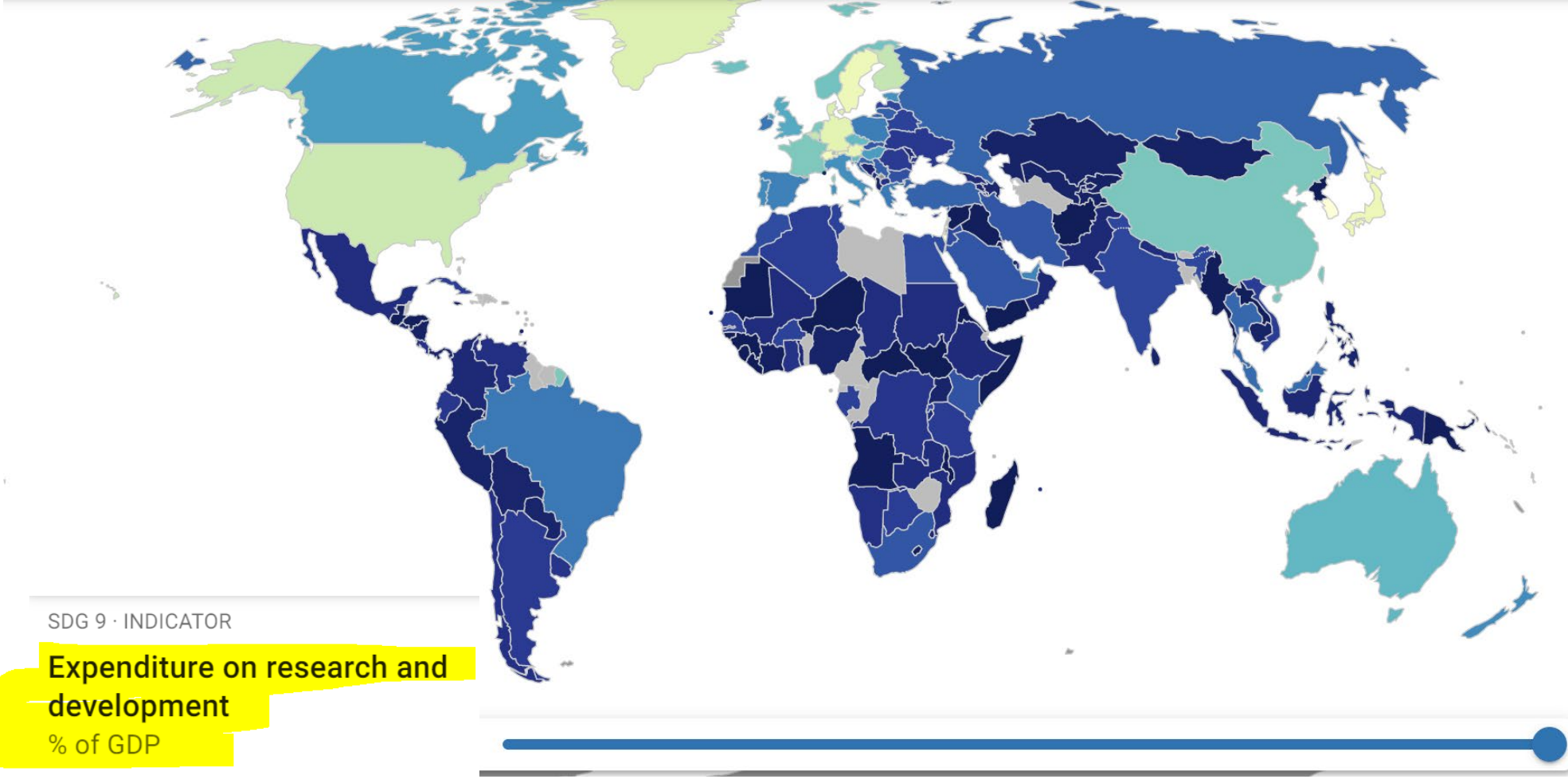
Country	Number of scientific publications (2020)	Scientific publications per capita (in ppm)
Vatican City	5	6061
Monaco	232	6050
Switzerland	47607	5461
Denmark	29982	5110
Falkland Islands	20	5000
Norway	25204	4654
Iceland	1738	4622
Singapore	23078	4232
Sweden	43270	4141
Australia	106614	4109
Cyprus	3629	4087
Finland	21789	3948
Macau	2549	3736
Luxembourg	2256	3554
Netherlands	62512	3534
Ireland	16581	3309
New Zealand	16886	3286
Hong Kong	24203	3273
Slovenia	6808	3228

Source: National Science Foundation (via World Bank)

OurWorldInData.org/research-and-development • CC BY

https://en.wikipedia.org/wiki/List_of_countries_by_number_of_scientific_and_technical_journal_articles

Data from Wipo reveals that seven out of 10 IP applications are now taking place in Asia, Africa and Latin America. Venture capital investment more than quadrupled in Africa and Latin America over the last 12 months to US$3 billion (S$4.1 billion) and US$16 billion (S$22.2 billion) respectively. Close to 50 countries, including Ecuador, Indonesia, Lithuania, Malaysia, Senegal and Thailand, now boast a start-up that has achieved unicorn status. A decade ago, the number stood at just five. And the countries that are making the strongest improvements in Wipo's Global Innovation Index include Turkey, Vietnam, India and the Philippines.



https://dashboards.sdgindex.org/map/indicators/expenditure-on-research-and-development/values

Top 100 Global Innovators™ 2023 from Clarivate

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
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

World Top 100 Scientists 2023

https://www.adscientificindex.com/top-100-scientist/?&sl5h=1&sl5h=1&cern=1

Country (population, million)	Number of Top 100 Scientists
USA (300)	56
China (1400)	12
UK (68)	6
Canada (40)	4
Netherlands (18)	4
Australia (26)	3
Singapore (5)	3
Denmark (6)	3
South Korea (51)	2
Saudi Arabia (36)	1
Sweden (10)	1
Switzerland (8)	1
France (65)	1
Poland (40)	1
Spain (47)	1
Germany (84)	1

HIGH COST OF DECOUPLING

If you take into account that there is also the impact on innovation, on technology, on creativity, there is much more than that, so the cost is very high... You may not end up at war, but it will be very regrettable, at the very least.

”

PRIME MINISTER LEE HSIEN LOONG, on the cost of trade fragmentation, which will impact more than just trade and investment.

THE STRAITS TIMES

Wednesday, January 18, 2023

Call for scientists to collaborate regardless of geopolitical tensions

Zhaki Abdullah

The scientific community can collaborate on the advancement of knowledge, regardless of the ups and downs of international relations, said Deputy Prime Minister Heng Swee Keat on Tuesday.

Speaking at the Global Young Scientists Summit, Mr Heng, who is chairman of the National Research Foundation (NRF), said collaboration has slowed or stalled in some areas as a result of intensified competition between major powers and fractured political rhetoric.

In such an environment, science can provide objectivity and rigour, he noted.

It can bring together the best minds to "study and develop solutions for challenges that affect the world, regardless of nationality and political beliefs", he added.

He gave the example of the 2022 Nobel Prize in Physics, which was won by physicists Alain Aspect, John Clauser and Anton Zeilinger for developing experimental tools that helped prove quantum entanglement – a phenomenon where states of particles depend on one another regardless of distance, described by scientist Albert Einstein as "spooky action at a distance".

"The three laureates I highlighted are of different nationalities – Aspect is French, Clauser is American and Zeilinger is Austrian," said Mr Heng. "This is the true beauty of science – its ability to bring together people from different cultures, nationalities and religions, in pursuit of the common mission of growing scientific knowledge."

Deputy Prime Minister Heng Swee Keat said science can provide objectivity and rigour in a time of intensified competition between major powers. ST PHOTO: FELINE LIM

Now in its 11th year, the Global Young Scientists Summit will run until Friday at the Singapore University of Technology and Design in Changi. There will be lectures and panel discussions with 21 scientists, including Nobel laureates and winners of the Millennium Technology Prize, awarded by independent foundation Technology Academy Finland.

After the event, which is organised by the NRF, was held virtually in the past two years due to the pandemic, this year's edition is adopting a hybrid format, with attendees from 29 countries.

About 350 participants are attending in person, while more than 1,400 are engaged virtually.

Among the topics being discussed are advances in graphene research, current trends in high-performance computing, and the impact of brain processes on health and diseases.

The pandemic has been a reminder of the role played by the scientific community in tackling global challenges, Mr Heng said.

"Without the prompt and significant developments in diagnostics, vaccines and therapeutics, we might still be holding this summit virtually," he added.

While the world has not yet overcome the coronavirus, it must now tackle other challenges such as climate change and ageing populations, Mr Heng said.

Breakthroughs such as making existing low-carbon technology more economically viable and exploring new possibilities like nuclear fusion will be needed to get the world to net-zero emissions, he noted.

"Science will be the driving force for tackling global challenges. In this sense, the global scientific community carries hope for humanity."

azhaki@sph.com.sg

NRF aims to advance S'pore's capabilities in strategic technology areas and drive growth

Lee Li Ying

Singapore's efforts in building a thriving research, innovation and enterprise (RIE) sector have borne fruit in many areas. Investments in biomedical sciences and medical technology have seen the sector grow to support more than 25,000 jobs, making up almost 4 per cent of Singapore's gross domestic product.

Singapore's start-up ecosystem is continuing to grow, with venture capital funding raised here increasing more than 20 times, from about $500 million in 2011 to about $11 billion in 2022.

These accomplishments were detailed in an addendum released by the National Research Foundation (NRF) under the Prime Minister's Office on Wednesday, following President Halimah Yacob's address at the opening of the new session of Parliament earlier in the week.

The NRF, which was set up in 2006, sets the national direction for research and development (R&D) by enacting policies, plans and strategies.

In addition to their economic importance, efforts in the RIE sector have been critical in addressing Singapore's challenges in areas such as public health and resource resilience, said Deputy Prime Minister Heng Swee Keat, who is chairman of the NRF.

He raised the example of Singapore's capabilities in biomedical science and infectious diseases that enabled the country to respond to Covid-19 quickly. Singapore was one of the first countries to culture the virus, developing several diagnostic test kits that were deployed for use both locally and overseas.

The NRF will support the next wave of Singapore's economic transformation by advancing its capabilities in strategic technology areas, unlocking new opportunities for growth and good jobs.

"For example, in the area of semiconductors, our public research institutes and universities are collaborating with industry through corporate laboratories and joint projects, to work on new materials, designs and manufacturing techniques that can drive the next generation of more efficient and powerful chips," said Mr Heng.

"These innovations will enable advances in wide-ranging applications such as wearables, communications equipment and vehicles, and expand the base of semiconductor manufacturing activities and jobs in Singapore."

The NRF will also continue to support the transformation efforts of businesses across industry sectors by creating new and improved solutions that leverage science and technology. It is scaling up platforms that bring together institutes of higher learning, public research institutes and industry, so that technological advancements in areas such as medical diagnostics and additive manufacturing are more quickly commercialised. Companies can also establish corporate laboratories with public research performers to address their industry challenges.

The foundation will also strengthen Singapore's position as an attractive node for businesses to conduct R&D, building on the growth in the country's business expenditure on R&D, which has risen from about $1.9 billion in 2000 to about $6.6 billion in 2020.

Investments in biomedical sciences and medical technology have seen the sector grow to support more than 25,000 jobs, making up almost 4 per cent of Singapore's gross domestic product. ST FILE PHOTO

A robust talent pool is also key, said Mr Heng, adding that the number of public and industry researchers in Singapore more than doubled from 20,000 in 2000 to 46,000 in 2020.

The NRF will continue to build a strong core of local research talent by nurturing young people's interest in the science, technology, engineering and mathematics fields, and providing diverse pathways for those who wish to take up research careers.

Mr Heng said the NRF will also continue to enhance the porosity of research talent across academia, public research institutes and industry, for instance, by seconding public researchers to local enterprises. It is also working with the industry to enhance research capacity, through initiatives such as the Industrial Postgraduate Programme, which provides opportunities for postgraduate students to undertake industrial R&D projects with companies.

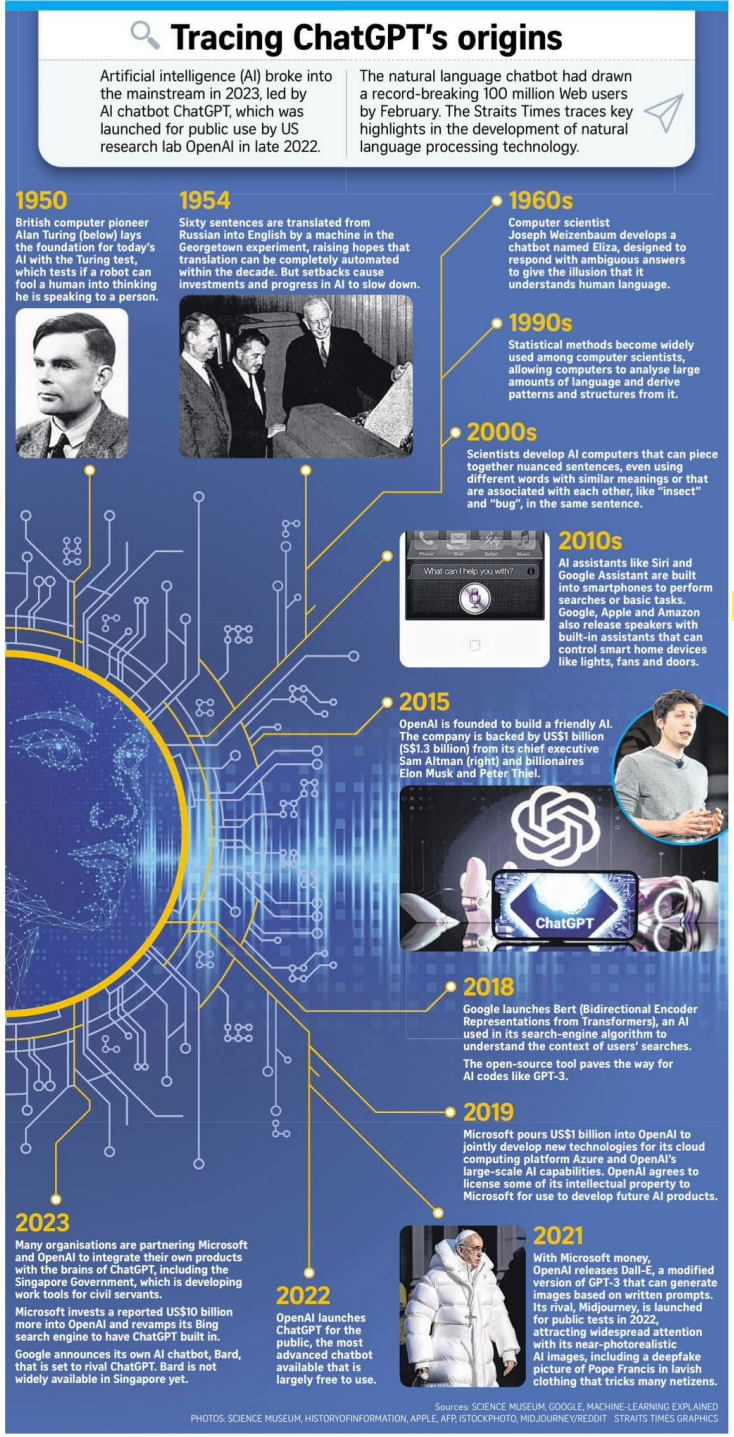
"Our RIE investments have created a strong foundation for Singapore to remain competitive amid rapid technological changes. We must continue to leverage and build Singapore's science and technology capabilities to meet imminent needs and challenges, capture new economic opportunities, and support our businesses and workforce," said Mr Heng.

liyinglee@sph.com.sg

Is science important?

Where is science heading?

The main challenges before today's scientists



Dear Prof Seeram,

Thanks so much for sharing the post.

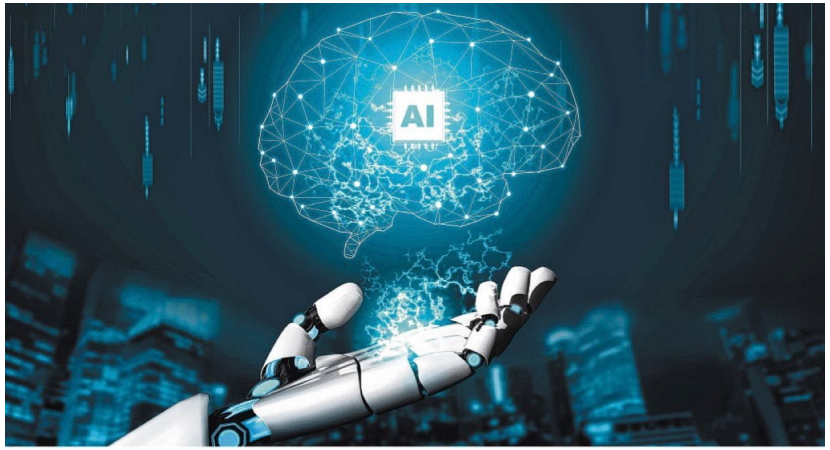
Full life cycle thinking, a growth mindset, and a regularly spring-cleaned mind are helpful. Deep and clear understandings soothe the mind.
Indeed.

For my field of work, the prospect of generative AI is simply crazy and scary.
There is no doubt the world doesn't need so many photographers, and they will be competing with a model that works 24/7 at an insane pace.
The same goes for many other professions.

My only solace is that we still live in a world dominated by humans, and humans still need that interaction. That touch.

Running on the hamster wheel. 🙂

Stefen Chow
Director/Photographer
+86 18611767475 (Beijing)
www.stefenchow.com
www.chowandlin.com



where science is heading?

Science is an ever-evolving field that constantly builds upon previous discoveries and pushes the boundaries of our understanding. Here are some of the areas where science is currently heading:

1. Artificial intelligence and machine learning: AI is becoming increasingly important in areas such as healthcare, finance, and transportation. Machine learning algorithms are being developed that can analyze vast amounts of data and make predictions and decisions based on that data.
2. Climate change and sustainability: The scientific community is working to better understand the impacts of climate change and develop sustainable technologies and practices to mitigate these impacts.
3. Genomics and personalized medicine: Advances in genomics are leading to the development of personalized medicine, where treatments are tailored to an individual's specific genetic makeup.
4. Quantum computing and quantum technologies: Quantum computing has the potential to revolutionize fields such as cryptography, materials science, and drug discovery.
5. Space exploration: NASA and other space agencies are working to explore Mars and other planets in our solar system, as well as develop new technologies to support space travel and exploration.

Overall, science is heading towards a future where technology is increasingly integrated into our lives, where we have a deeper understanding of the world around us, and where we work towards sustainable solutions for the challenges facing our planet.

Where is science heading?

	Ancient Science	Modern Science	21st Century Science
Motivation (researcher)	Inquisitive	Inquisitive | Interest	Inquisitive | Interest | Career
Motivation (funder)	Patron	Endowments | Corporates	Governments | Corporates | Endowments
Areas of research	A few	Several	Multitude
Number of researchers	Hundreds	Thousands	Several millions
Geographical distribution of researchers	Local	Local | Regional	Local | Regional | Global
Connectivity of researchers	Local	Local | Regional	Global
Dissemination of research	Slow	Gradual (via printed books)	Instant (via digital infrastructure)
Qualification of researchers	Apprentice	Higher education	Higher education| PhD
Knowledge | Skillset of researcher	Inclusive	Poly-disciplinary | Monodisciplinary	Monodisciplinary | Specialized in a narrow domain
Pace of research	At own pace	At own pace	Hustled
Research funds	Sporadic	Sustained	Professionally managed

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Engineering Degrees

Civil Engineering

Mechanical Engineering

Electrical Engineering
- Solar Engineering
- Wind Energy Engineering

Computer Science and Engineering

Information Security
- Software Development

Chemical Engineering

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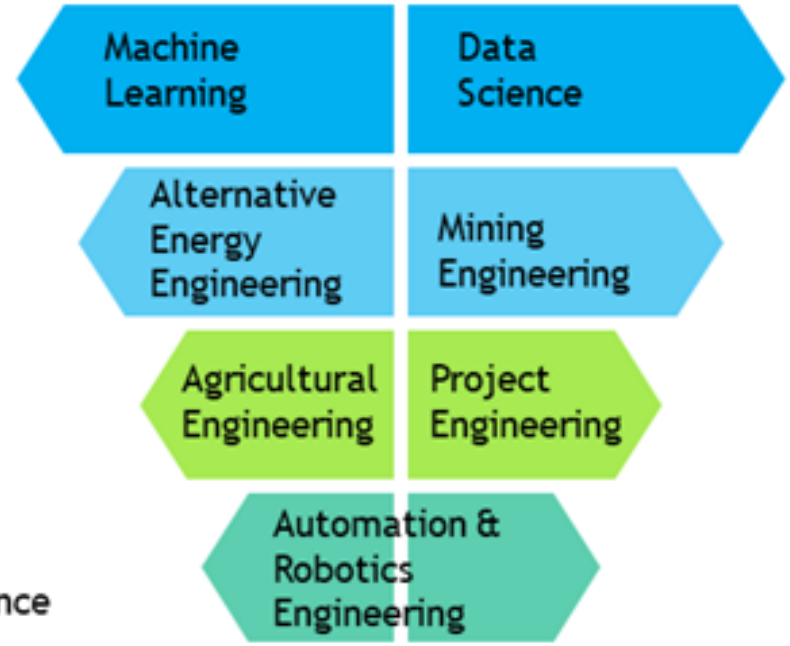
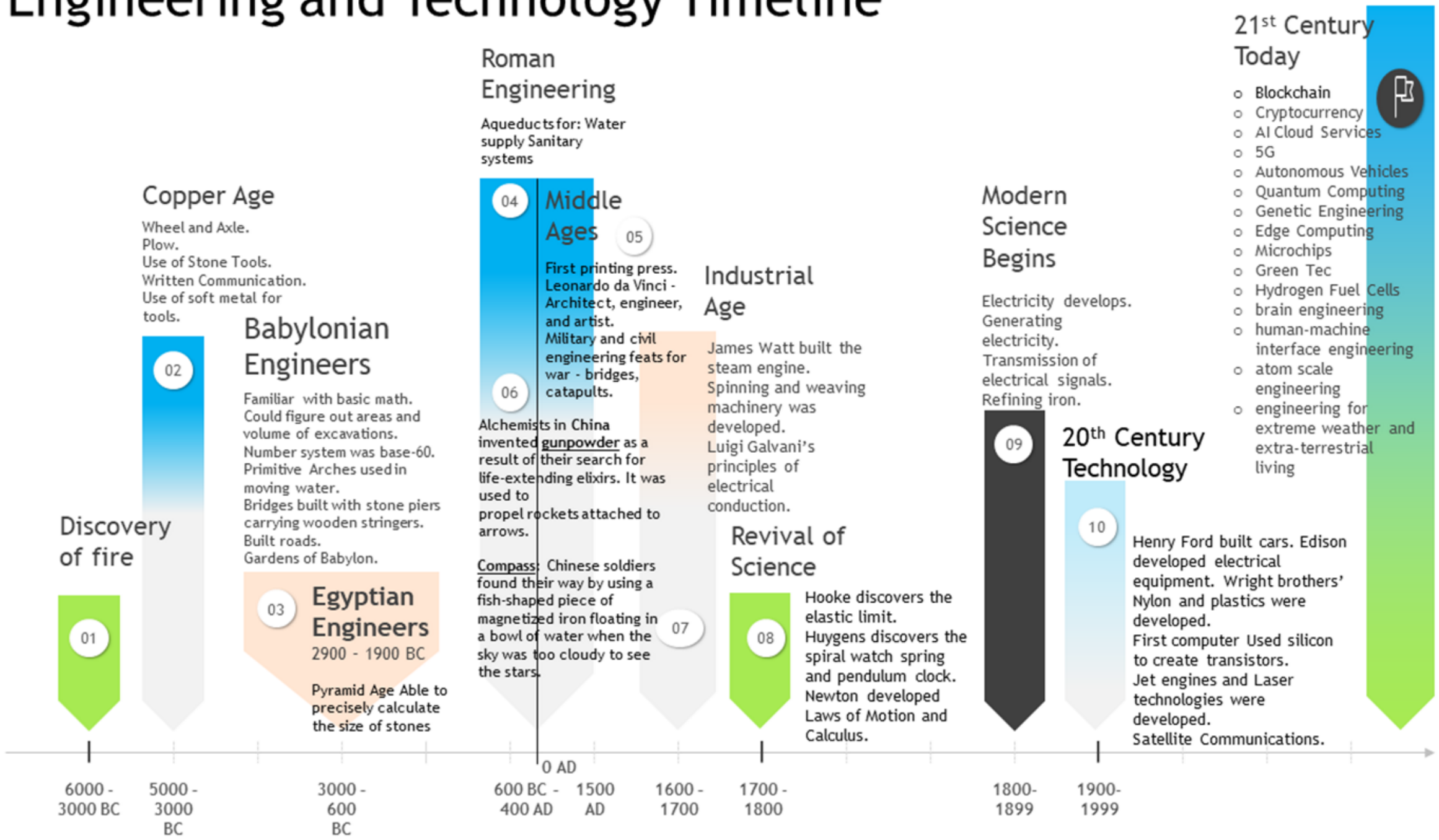
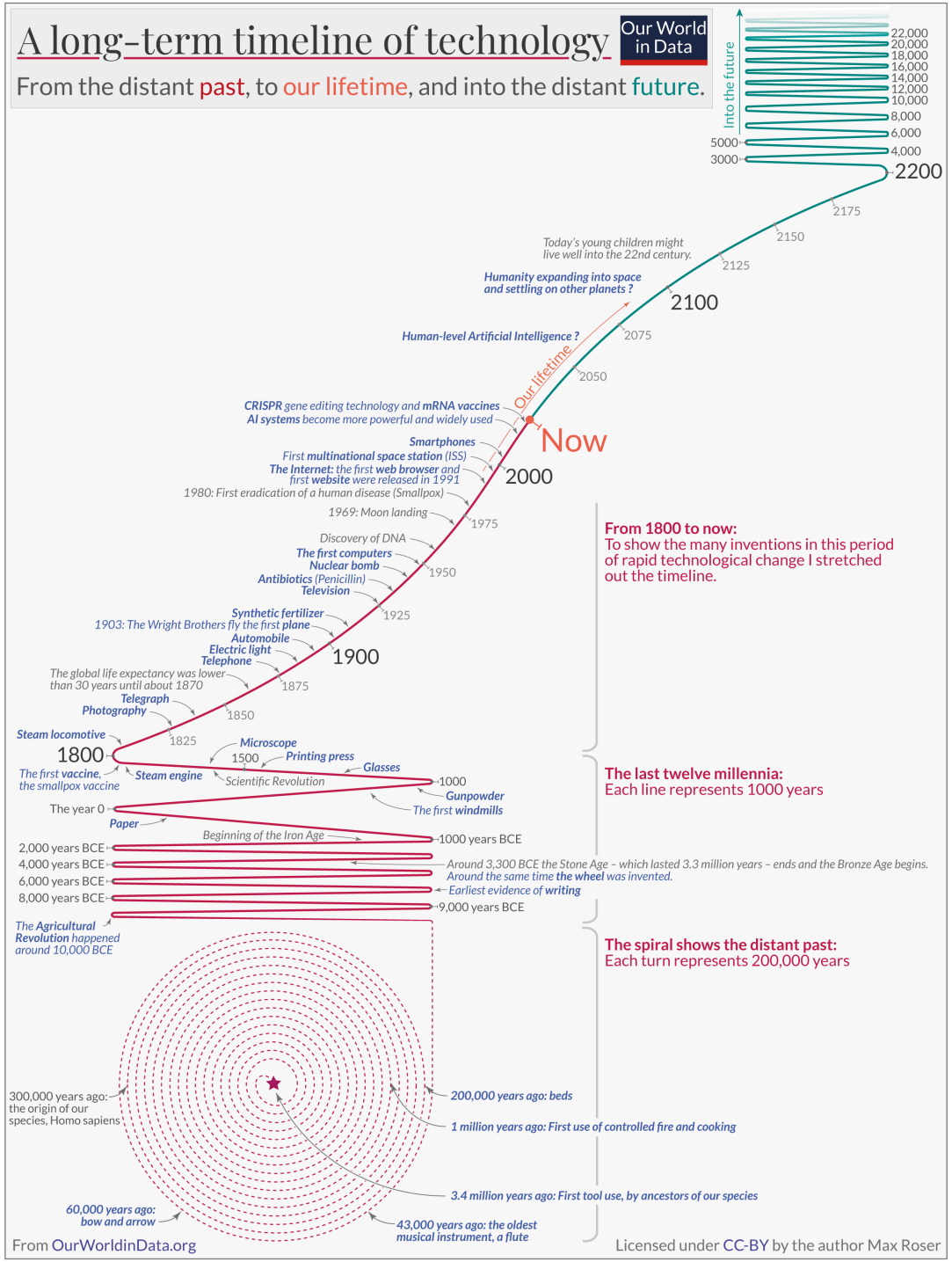


Engineering and Technology Timeline



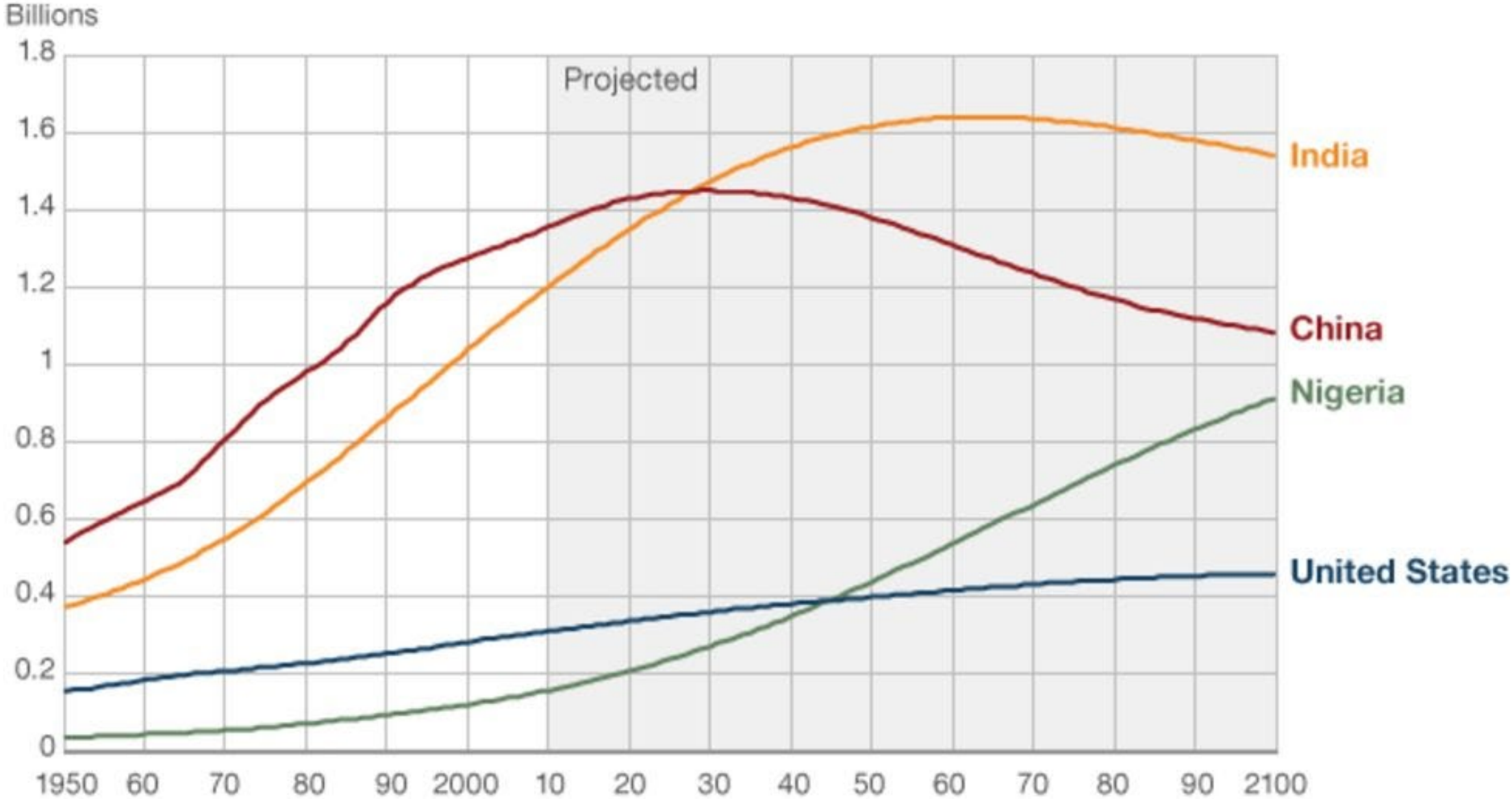


Jose, R., Ramakrishna, S. Humanity's Top Ten Existential Concerns. Mater Circ Econ ***4****, 26 (2022). https://doi.org/10.1007/s42824-022-00068-0*

https://ourworldindata.org/technology-long-run

Population growth in China, India, Nigeria and USA

1950-2100, actual and projected



Source: United Nations

Depollution: Zero carbon by 2050 pledges by the countries

Journal of Energy Chemistry 59 (2021) 688–705, https://doi.org/10.1016/j.jechem.2020.12.005

Saturday, March 18, 2023

THE STRAITS TIMES

EU announces plans to lead green industrial revolution

BRUSSELS – The European Commission has presented the centrepieces of a strategy to ensure its industry can compete with the United States and China in making clean tech products and accessing raw materials required for the green transition.

The European Union executive's Net-Zero Industry Act and Critical Raw Materials Act, part of its Green Deal Industrial Plan, are designed to ensure the bloc is not just a front runner in cutting carbon emissions, but also ahead on the technology required to do so.

Global investment in the green transition is set to triple by 2030 from US$1 trillion (S$1.3 trillion) in 2022, the Commission said.

"The bottom line is that we want to be leaders in the green industries of the future," EC vice-president Valdis Dombrovskis told a news conference on Thursday.

The EU executive set targets for the region to mine 10 per cent of the critical raw materials it consumes, such as lithium and for the first time copper and nickel, with recycling adding a further 15 per cent.

It also aims to increase processing to 40 per cent of its needs by 2030.

The supply of minerals vital for the green transition is a challenge, with China processing almost 90 per cent of rare earths and 60 per cent of lithium, a key element for batteries.

The Commission said no more than 65 per cent of any key raw material should come from a single third country.

"We are not a resource-rich continent," Mr Dombrovskis said, adding that Europe relied on a small number of partners for many materials.

"This is not a stable nor reliable way to build the industries of the future. So we urgently need to diversify."

Russia's invasion of Ukraine has reinforced a lesson learnt during the Covid-19 pandemic, namely that the EU cannot rely on a single supplier for essential materials.

The EU executive would recognise plans to mine or process raw materials as "strategic projects", which would allow them to benefit from streamlined permits and access to financing.

In trade, the EU would seek to expand its network of partnerships, such as with Australia, Canada and Chile.

Mr Jochen Eickholt, the chief executive of Siemens Gamesa, the world's largest maker of offshore turbines, said the Critical Raw Materials Act had the potential to foster responsible mining supply chains needed for European industry.

"Such regulatory frameworks are important – we now need to act fast and enforce them."

The EU also set a target of producing by 2030 at least 40 per cent of the products it needs for "net-zero" technologies, such as solar power or fuel cells, partly by streamlining the granting of permits for green projects.

The bloc also announced a goal for carbon capture of 50 million tonnes by 2030.

Carbon capture is one of a list of "net-zero" technologies the EU recognises.

Controversially, these also include advanced nuclear processes.

BusinessEurope described the proposal as of "limited scope" and said the EU should acknowledge that the decarbonisation of Europe is a priority for the whole economy.

Another industry group, WindEurope, said the proposals failed to explain what financial support the EU would offer to massively scale up turbine manufacturing or how governments would use the new flexible rules to support this.

Mr Colin Mackey, head of European operations at miner Rio Tinto, said he welcomed the Critical Raw Materials Act, but that there was a long way to go to meet anticipated demand.

Swedish mining and smelting group Boliden said Europe needed much work to improve from a poor starting point, and that major projects for copper and nickel were a priority.

REUTERS

Engineering Singapore's green future

By Seeram Ramakrishna and Dalson Chung

COUNTRIES have pledged zero emissions by 2050 but the means to get there are vague. Businesses need specific details on the decarbonisation of economies to align their own strategies, to raise and make investments, and to participate with impact.

There are three main routes to decarbonisation. Energy efficiency is estimated to reduce emissions by 15-20 per cent. Deploying decarbonised technologies across all sectors contributes to a 40-45 per cent cut in discharges. And up to a 40 per cent emissions reduction is envisaged by transitioning from the current linear economy to a more circular one.

Circular economy

Moreover, the circular industrial economy reduces dependence on virgin resources and generates resources from the solid waste generated by consumerism. A circular economy emulates the circularity of nature, wherein there is no waste, and dead matter becomes food for other animals or plants.

Singapore and others such as the European Union are pursuing green economic growth amid global uncertainties and to demonstrate their responsible behaviour to improve the global commons. Green growth includes greening existing industries and creating new green industries.

The ways and means depend on the country's economic structure, industrial strengths, geography, demography, access to resources and technologies, international relationships, investing ability, and politics. For example, the 32 sq km Jurong Island, which houses more than 100 leading chemical and energy companies, stands as a major pillar of Singapore's economy and sustainability drive.

The Institution of Engineers, Singapore (IES), the national society of engineers, formulated the IES Green Plan 2030 in line with Singapore's green growth interests. At its launch on Jan 17, Grace Fu, Minister for Sustainability and the Environment, said: "Tackling climate change is a complex engineering problem. It requires innovation in products, productions, and systems. Over the years, from our water and energy infrastructure, housing, and transport systems, engineers have established new frontiers for Singapore with your expertise and innovative solutions."

Take Singapore's approach towards water. The Republic employed smart and innovative engineering solutions to collect, treat, recycle, and supply water. Per capita household water consumption was reduced from 165 litres a day in 2000 to 141 litres in 2018. The target by 2030 is around 130 litres. Green, circular, and smart water solutions are growth opportunities as demand for them is growing around the world.

Singapore has also begun to decarbonise energy, which has been dominated by fossil fuels. Adoption of energy efficiency technologies and solar energy is growing steadily. A full transformation requires harnessing smart grid technologies, hydrogen energy, and nuclear energy. Decarbonised energy technologies are poised for mass production as the global market for them will grow to US$1 trillion a year in the next two decades.

Longer-life batteries, safer fuel cells, biofuel, and carbon capture and conversion technologies are necessary to decarbonise the energy systems of land, sea, and air transport.

Singapore and others such as the European Union are pursuing green economic growth amid global uncertainties and to demonstrate their responsible behaviour to improve the global commons.

The manufacturing industry is expected to embrace decarbonised materials, processes, and components with enhanced circularity performance. Notable examples include low-carbon footprint steel, aluminium, and concrete.

There will be zero-energy and energy-plus buildings that employ energy efficiency technologies, circular materials, and low-carbon digital technologies. A prime example is sustainable data centres, at the heart of the growing digitalisation drive.

Digital technologies are helpful to monitor carbon offsets and nature-based climate solutions so as to develop investors' and public confidence. These include engineering solutions using drones and data for real-time and predictive analytics, and for cost-effective management of large-scale physical assets.

Further innovative engineering solutions are needed to mitigate rising sea levels and erosion of land and coastal areas. Singapore engineers are expeditiously building polders at Pulau Tekong. Furthermore, cyber-informed engineering ensures the security of the critical infrastructure.

Scaling up urban farms and biological processes is necessary to satisfy the food nutrition and security needs of the growing world population. Producing valuable materials from food waste and farm waste is yet another green growth opportunity.

In recycling, the extended producers' responsibility (EPR) scheme for e-waste, and the forthcoming beverage containers return scheme (BCRS), require harnessing digital technologies such as labelling, reverse vending machines, and robots for automatic sorting and segregation. They spell opportunities in circular economy waste businesses and new jobs.

Pursuing green growth

Businesses need to invest in the skills and technologies to pursue green growth. The IES Green Plan 2030 aims to bridge the skills gap among engineers, with SkillsFuture Singapore collaborating with IES as the skills development partner.

Scaled-up engineering solutions, thoughtful delivery of green infrastructure, green investments, upskilled human resources, new business models, and green-conscious behaviour of consumers, will enable Singapore to realise green growth while avoiding falling behind international competitors aided by green trade wars. The green growth pursuit affects everyone in Singapore.

Seeram Ramakrishna is professor of mechanical engineering at the National University of Singapore and adviser to the IES Green Plan 2030. Dalson Chung is president of The Institution of Engineers Singapore (IES)

THE BUSINESS TIMES

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Wildebeest in the Serengeti National Park in Tanzania. The animals turn the Serengeti into a carbon sink by grazing, which reduces wildfire risk. Their waste, which contains carbon from the vegetation, is then buried in the soil by insects. ST FILE PHOTO

Tree-planting is not a solution without animals

Data in the paper published in Nature's climate change journal shows that protecting or restoring populations of just nine animal species and groups – fish, whales, sharks, grey wolves, wildebeest, sea otters, musk oxen, African forest elephants and American bison – could collectively remove an additional 6.41 billion tonnes of CO2 from the atmosphere annually. That's more than 95 per cent of the annual amount needed to eliminate 500 billion tonnes of CO2 from the atmosphere by 2100.

Table 1 | Estimated animal effects on net ecosystem carbon storage and the spatial extent of ecosystems in which the animals occur

Species	Ecosystem type	Spatial extent (km^2)	Additional ecosystem CO_2 uptake ($GtCO_2 yr^{-1}$)
Enhanced sinks and avoided emissions by protecting species			
Wildebeest	Savannah	2.5×10^4	0.0044±0.001
Sea otter	Coastal kelp forest	1.2×10^4	0.0052±0.0025
Grey wolf	Boreal forest	1.9×10^6	0.260±0.134
Tiger, black-tipped reef and lemon sharks	Coral reefs	2.1×10^3	0.00074±0.00037
Muskox	Arctic wet meadows	4.8×10^5	0.030±0.015
Fish	Marine pelagic and inshore	3.0×10^8	5.50±4.40
Subtotal			5.80
Enhanced sinks by restoring species			
African forest elephant	Tropical forest	5.4×10^5	0.013±0.007
Bison	Tall and shortgrass prairie	4×10^5	0.595±0.275
Baleen whales	Southern Ocean	7.9×10^6	0.00062±0.0001
Subtotal			0.608
Total			6.41

Schmitz, O.J., Sylvén, M., Atwood, T.B. et al. Trophic rewilding can expand natural climate solutions. Nat. Clim. Chang. 13, 324–333 (2023). https://doi.org/10.1038/s41558-023-01631-6

Plastics in our food

Growing plastic pollution increases the risk of microplastics entering the human body through the food chain.

B4&5

THE STRAITS TIMES

Monday, January 16, 2023

Is it possible to live a day without plastic?

It is not just about bags or straws, as the writer found in his 24-hour experiment

A.J. Jacobs

Saturday, March 11, 2023

THE STRAITS TIMES

EATING PLASTICS

From the US to Europe to Asia, microplastics are contaminating the soil, rivers and seas, entering the food chain and finding their way into the human body. What is being done to reduce plastic waste and the harm it can do to nature, including humans?

Hope in the time of microplastics

Unrelenting growth

PM Lee noted that countries all over the world are facing the problem of ageing populations.

Almost one in four Singaporeans is likely to be over the age of 65 by 2030, which is a massive change for society, PM Lee said.

Yet it is not so straightforward to address the challenges of an ageing population, he added, citing examples from elsewhere.

Countries in the European Union spend on average 13 per cent of their gross domestic product on old-age pensions, which will only continue to rise as the population ages, if reforms are not implemented.

For Japan, whose population is not only ageing but also shrinking, rural areas have become depopulated and villages are left empty and abandoned.

China, where more than 260 million people were over the age of 60 in 2020, is also looking very hard at this issue, as the number of seniors is expected to rise to 400 million by 2040, he said.

Are you a rapid ager?

Biological age is a better health indicator than the number of years you have lived, but it is tricky to measure

Aditi Gurkar

Do you ever wake up some days and think, "When I was younger, I could survive on just four hours of sleep, but now it seems like I need 10"? Or have you ever walked out of the gym and "felt" your knees?

Almost everyone experiences these kinds of signs of ageing. But there are some people who seem to defy their age.

US Supreme Court Justice Ruth Bader Ginsburg stayed on the Bench until her death at age 87.

The Great British Bake Off judge Mary Berry, now in her 80s, continues to inspire people all over the world to bake and enjoy life.

And actor Paul Rudd was named People magazine's Sexiest Man Alive in 2021 at age 52 while still looking like he is in his 30s. Is age just a number, then?

Researchers have focused a lot of attention on understanding the causes and risk factors of age-related diseases such as Alzheimer's, dementia, osteoporosis and cancer. But many ignore the major risk factor for all of these diseases: Ageing itself.

More than any individual risk factor such as smoking or lack of exercise, the number of years you have lived predicts onset of disease. Indeed, ageing increases the risk of multiple chronic diseases by up to a thousandfold.

However, no two people age the same. Although age is the principal risk factor for several chronic diseases, it is an unreliable indicator of how quickly your body will decline or how susceptible you are to age-related disease.

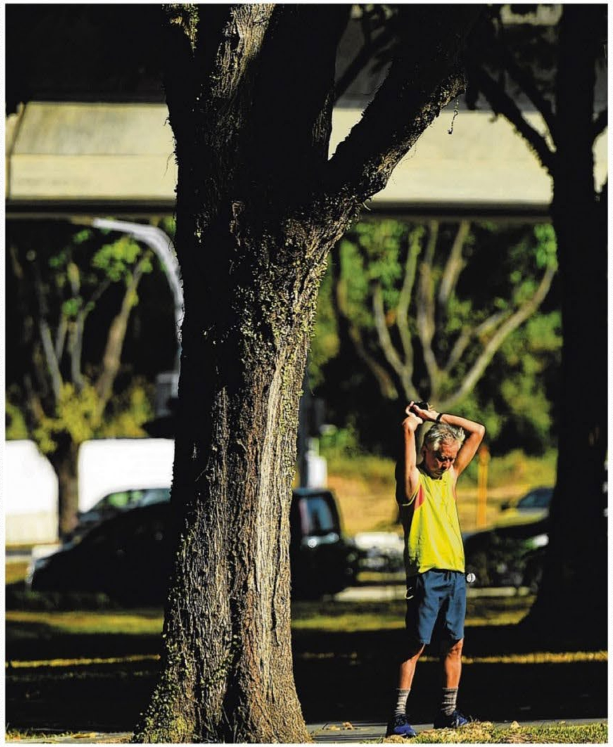
This is because there is a difference between your chronological age, or the number of years you have been alive, and your biological age – your physical and functional ability.

I am a scientist interested in redefining "age". Instead of benchmarking chronological age, my lab is invested in measuring biological age.

Biological age is a more accurate measure of health span, or years lived in good health, than chronological age, and does not directly correlate with wrinkles and grey hair.

Rapid agers experience a faster rate of functional deterioration relative to their chronological age.

My grandmother, who lived to be 83 but was bedridden and



Biological ageing is multifaceted, arising from a complex mix of genetic traits and is influenced by factors such as microbiome composition, environment, lifestyle, stress, diet and exercise, says the writer. ST PHOTO: LIM YAOHUI

was a rapid ager. My grandfather, on the other hand, also lived until he was 83, but he was active, functional and even did my homework with me until he passed away – he was a healthy ager.

With the unprecedented growth of the world's ageing population, I believe that figuring out ways to measure biological age and how to maintain or delay its advance is critical not only for individual health, but also for the social, political and economic health of our society.

Detecting rapid agers early on presents an opportunity to delay, change or even reverse the trajectory of biological ageing.

GENETICS AND BIOLOGICAL AGE

Biological ageing is multifaceted. It arises from a complex mix of genetic traits and is influenced by factors such as microbiome composition, environment, lifestyle, stress, diet and exercise.

Genetics was once thought to have no influence on ageing or longevity.

However, in the early 1990s, researchers reported the first studies identifying genes that were able to extend the lifespan of a small roundworm. Since then, multiple observations support the influence of genetics on ageing.

For example, children of long-lived parents and even those with long-lived siblings tend to live longer.

Researchers have also identified multiple genes that influence stress. These include genes that repair DNA, protect cells from free radicals and regulate fat levels.

However, it is clear from studies in identical twins – who share the same genes but not the same exact lifespans – that genes are not the only factor that influences ageing.

In fact, genes probably account for only 20 per cent to 30 per cent of biological age. This suggests that other parameters can strongly influence biological ageing.

Social connectedness is essential for well-being throughout life. But social connections can be challenging to maintain over time due to loss of family and friends, depression, chronic illness or other factors. Several studies have reported a strong link between social isolation and increased stress, morbidity and mortality. Similarly, diet and exercise are strong influencers of biological age. Blue zones, which are areas around the world where people live long lives, attribute their successful ageing to diet, exercise and social connectedness.

ENVIRONMENTAL AND LIFESTYLE EFFECTS

Researchers have found that environmental and lifestyle factors heavily influence biological age, including social connectedness, sleeping habits, water consumption, exercise and diet.

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Blue zones, which are areas around the world where people live long lives, attribute their successful ageing to diet, exercise and social connectedness.

Mostly plant-based meals and spurts of activity throughout the day are well-known "secrets" of health span and longevity.

Although newer studies on the effects of diet interventions such as intermittent fasting and time-restricted feeding on longevity have not been rigorously tested, they do show multiple health benefits,

While genetics is difficult to control, diet and exercise can be modified to delay biological ageing.

HOW TO MEASURE BIOLOGICAL AGE

Currently, there is no effective test to predict an individual's health trajectory early enough in life to intervene and improve quality of life with age.

Scientists are interested in identifying a molecule that is sensitive and specific enough to serve as a unique fingerprint for biological age.

Considering the health and resilience of the individual instead of focusing solely on disease state is important in discussions on biological age.

Resilience is the state of adapting and bouncing back from a health challenge and is often more predictive of functional health.

A molecular ageing fingerprint may provide a tool to help identify people who are less resilient and require more aggressive monitoring and early intervention to preserve their health and help reduce gender, racial and ethnic health disparities.

There are several promising molecular markers that may serve as biological age fingerprints.

One of these markers are epigenetic clocks. Epigenetics are chemical modifications of DNA that control gene function.

Several scientists have found that DNA can get "marked" by methyl groups in a pattern that changes with age and could potentially act as a readout for ageing.

It is important to note, however, that while epigenetic clocks have been valuable in predicting chronological age, they do not equate to biological age. In addition, it is unclear how these epigenetic marks work or how they contribute to ageing.

Another well-regarded marker of biological age is the build-up of dysfunctional cells, called senescent or zombie cells.

Cells become senescent when they experience multiple types of stress and become so damaged that they cannot divide any more, releasing molecules that cause chronic low-grade inflammation and disease.

Animal studies have shown that getting rid of these cells can improve health span. However, what clearly defines senescent cells in humans is still unknown, making them challenging to track as a measure of biological age.

Lastly, the body releases unique metabolites, or chemical fingerprints, as by-products of normal metabolism.

These metabolites play a dynamic and direct role in physiological regulation and can inform functional health.

My lab and others are figuring out the exact make-up of these chemicals to figure out which can best measure biological age.

A lot of work still remains on not only identifying these metabolites but also understanding how they affect biological age.

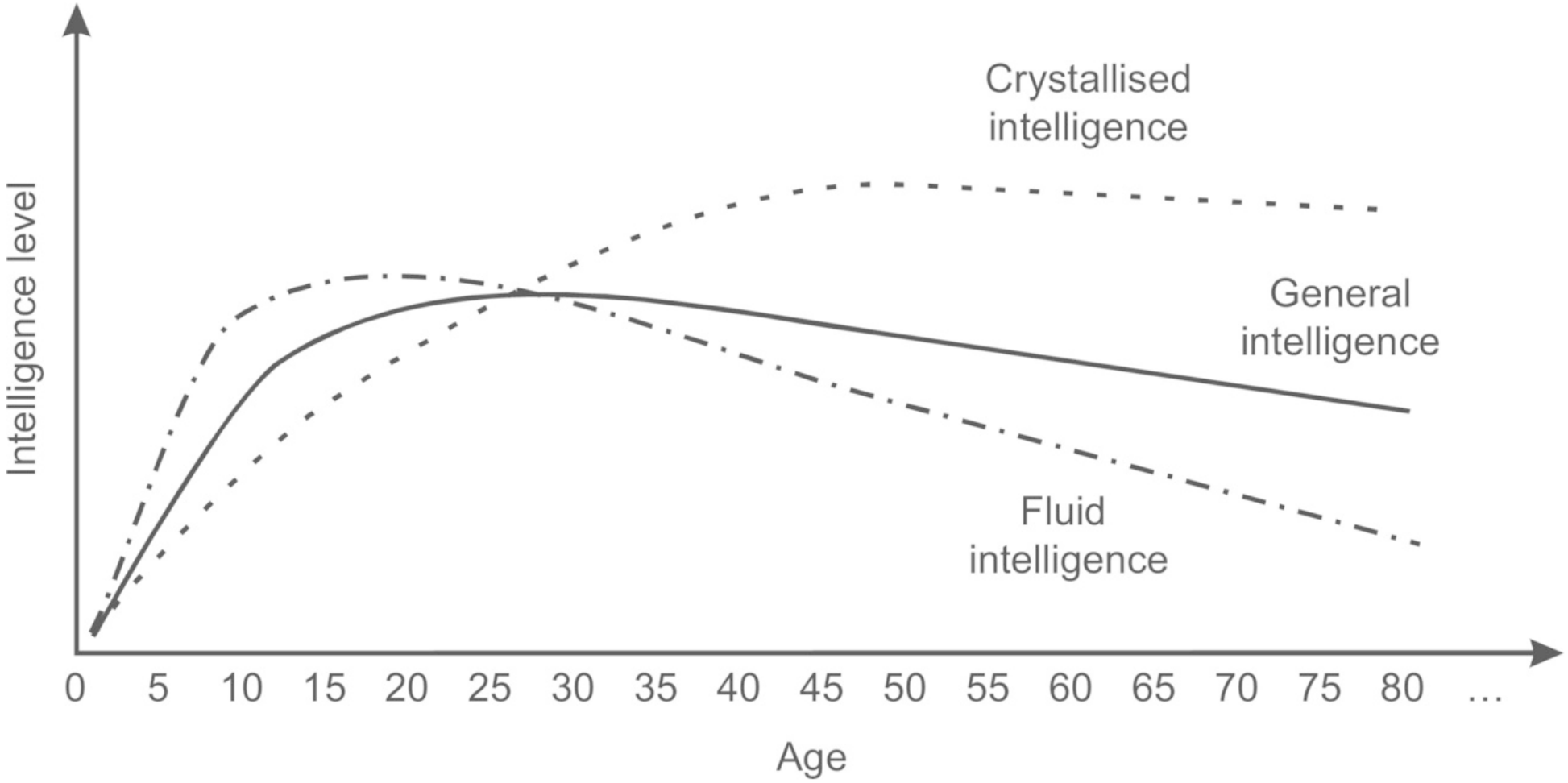
People have long sought a fountain of youth. Whether such an elixir exists is still unknown.

But research is starting to show that delaying biological age may be one way to live healthier, fuller lives.

• Aditi Gurkar is assistant professor of geriatric medicine at the University of Pittsburgh in the

Fluid intelligence is the ability to reason, analyze and solve novel problems in unique and novel situations. It is highest relatively early in adulthood and starts to decline in one's 40s.

Crystallized intelligence is the ability to use knowledge gained from past learning and experience. And because it relies on building on years of an accumulating body of expertise and knowledge, it tends to increase through one's 40s, and does not diminish until very late in life.



Rindermann, H. (2018). Human Capital, Cognitive Ability and Intelligence. In Cognitive Capitalism: Human Capital and the Wellbeing of Nations (pp. 40-84). Cambridge: Cambridge University Press. doi:10.1017/9781107279339.004
Gwenith G. Fisher et al Chapter 2 - Theories of Cognitive Aging and Work, Editor(s): Boris B. Baltes, Cort W. Rudolph, Hannes Zacher, Work Across the Lifespan, Academic Press, 2019, Pages 17-45, https://doi.org/10.1016/B978-0-12-812756-8.00002-5.

Chong Siow Ann

It's astonishing to think that two men who have announced they will campaign for the United States presidency in 2024 have a collective age of 156. The incumbent, President Joe Biden, is 80, and second-time seeker Donald Trump is 76.

They must think they have the vim and smarts to lead a superpower and manage the world's largest economy, even though they are well past most people's retirement age. How up to it would someone really be at that age?

This is especially so in the light of a New York Times opinion piece on ageing and the ability to do one's work. Although the piece was about doctors ("How would you feel about a 100-year-old doctor?" by Sandeep Jauhar), it cited a study in the medical journal Jama Neurology which found that one in five adults over 65 may be living with cognitive impairment out of proportion to the normal age-related changes.

Noting that there is no mandatory retirement age for doctors in the US, the writer (who is a medical doctor) suggested periodic competency examinations for physicians aged 65 onwards.

In Singapore, there is no compulsory retirement age for doctors in the private sector, although the Singapore Medical Council requires all practising physicians to chalk up sufficient hours of medical education activities to renew their certificate of practice every two years, and to police themselves with regard to their own physical and mental capacities to practise and to either self-report or report on a colleague to the licensing body.

But knowing when to call it a day before one's decline leads to a humiliating exit is not an easy matter. As Dwight D. Eisenhower, the former supreme commander of the Allied forces who subsequently served two full terms as the 34th president of the United States, once commented: "We all know that when advancing years and diminishing energy begin to take their toll, the last one that ever appreciates such a situation is the victim himself".

FLUID AND CRYSTALLISED INTELLIGENCE

We have this blind spot when it comes to our own capability: Research has shown that in most fields of work, many people are unaware that their decline starts earlier than they think.

The general trend is that success and productivity increase through the first 20 years after the start of a career, and thereafter, starts to slide. But the specific timing of peak and decline vary, depending on the profession.

The theory of fluid and crystallised intelligence might shed some light. Fluid intelligence is the ability to reason, analyse and solve novel problems in unique and novel situations. It is highest relatively early in adulthood and starts to decline in one's 40s.

Studies of major inventors and Nobel Prize winners found that most were in their late 30s when they produced their most significant work. The likelihood of a major discovery increases rapidly through their 20s and 30s, and then declines steadily in their 40s, 50s and 60s. (There are, of course, outliers: Thomas Edison continued to file patents well into his 80s.).

Things are even more stark in the tech sector. Silicon Valley has promulgated a culture which holds that bold ideas are the providence of the young. Mr Mark Zuckerberg (who was 19 when he created Facebook) once stated "Young people are just smarter", and venture capitalist Vinod Khosla has flatly declared that "people over 45 basically die in terms of new ideas".

Crystallised intelligence, in contrast, is the ability to use knowledge gained from past learning and experience. And because it relies on building on years of an accumulating body of expertise and knowledge, it tends to increase through one's 40s, and does not diminish until very late in life.

Careers that rely primarily on fluid intelligence tend to peak early, while those that use more crystallised intelligence peak later.

Scholarly academics like historians – who rely on a crystallised stockpile of knowledge – don't reach this milestone until about the age of 60. Doctors would probably fall into this second category where the cumulative years of practice, continuing medical education, hard-won experience and lessons learnt would (hopefully) lead to clinical wisdom.

But we can't deny or stop the depredation of progressive ageing, which brings mental decline, loss of sensory acuity, physical mobility and stamina. So, there is still that legitimate concern of declining performance after a certain age, though what that number should be is controversial.

Sadly and rather regretfully, some of us want to hang on, even after we have exceeded our shelf life. Part of it might be ego and the desire for money, recognition and status – though with passing time, such external rewards are usually not as numerous or so readily attained as they were when we were younger and more driven.

I think by far the greatest fear is of becoming irrelevant and insignificant, and fading into invisibility.

This is particularly likely in a world that places decreasing value on authority based on years of knowledge and experience. Times have changed: Older workers (with higher salaries) are commonly replaced with young people who may have less experience but cost less to hire.

At the same time, rapid technological innovation often renders an older person's skill set obsolete. The Internet, with its increasingly powerful search engines, has seen to that. Why ask an old person a question when you can find the answer with a few taps of the keyboard?

Is there no place for the old among the digital natives of the tech world? Mr Chip Conley, an American hotelier and entrepreneur, thinks otherwise. He gave an upbeat personal account in the Harvard Business Review of how he became a "modern elder" at the age of 52 when he became the in-house mentor for the chief executive of Airbnb who was 21 years his junior. "Many young people can read the face of their iPhone better than the face of the person sitting next to them," he wrote. As an "emo-savvy" older person, he could offer emotional intelligence in return for the digital intelligence of the "tech-savvy" young.

LIFE CYCLES AND FINDING MEANING

Mr Conley was putting into practice theories of Dr Erik Erikson, a development psychologist who said there are specific psychological conflicts that take place through eight sequential stages of a person's life cycle, including from birth to infancy, childhood into adulthood, and middle age into, finally, old age.

Each stage presents a struggle between two opposing states which, if resolved, sees us become better prepared for challenges in the next stage. Failure, on the other hand, leads to difficulty navigating our future and perturbs our sense of self and leaves us feeling inadequate.

In the seventh stage, between 40 and 65 years of age, Dr Erikson believed this midlife station presents two possibilities which he called "generativity versus stagnation".

Generativity is "primarily the concern for establishing and guiding the next generation", and we should work towards passing on knowledge and skills while obtaining a measure of satisfaction in the assurance of being useful in life, of having accomplished something and contributing to society. Failure of generativity can lead to profound personal stagnation and discontent.

And in the final eighth stage, we have the chance to review a lifetime of beliefs, to come to terms with choices made and opportunities lost, and arrive at a comprehensive sense of wisdom. It is the stage of life that helps us grasp who we are and what our life has meant.

Whether we accept our own diminishing role and inevitable exit with grace and equanimity probably depends on what we were like before we become old.

Narcissistic, self-centred, self-serving people are likely to find time's fading drumbeat less tolerable than those who seek meaning in life by helping others or devoting themselves to causes for reasons beyond themselves. And they might be fortunate to be blessed with the old age described by neurologist and writer Oliver Sacks: "A time of leisure and freedom, freed from the factitious urgencies of earlier days, free to explore whatever I wish, and to bind the thoughts and feelings of a lifetime together."

• Professor Chong Siow Ann is a senior consultant psychiatrist at the Institute of Mental Health.

The writer says that the difference between fluid and crystallised intelligence might shed some light on the timing of peaks in careers. Fluid intelligence is the ability to reason, analyse and solve novel problems in unique and novel situations. It is highest relatively early in adulthood and starts to decline in one's 40s. Inventors and those in the tech industry tend to use this intelligence. Crystallised intelligence, in contrast, is the ability to use knowledge gained from past learning and experience. It tends to increase through one's 40s, and does not diminish until very late in life. Scholarly academics and doctors tend to use this intelligence.
ST PHOTO: KUA CHEE SIONG

https://www.straitstimes.com/opinion/how-old-is-too-old-and-when-do-you-call-it-quits-from-work

Preliminary findings from a five-year study here have found that vascular pre-dementia – which can manifest in ways such as slowness of thought and difficulty with planning – resulting from silent strokes is likely to be the most common cognitive disorder here.

Of the 631 participants recruited so far by the Biomarker and Cognitive Impairment Study (Biocis), 344 had mild cognitive impairment, or pre-dementia.

Among these 344, 93 per cent had suffered from some form of silent strokes – or strokes without any noticeable symptoms – which are associated with chronic conditions such as hypertension and diabetes.

Magnetic resonance imaging (MRI) scans, which the participants had to go through, can detect previous silent strokes through the presence of white spots on the brain, indicating damage.

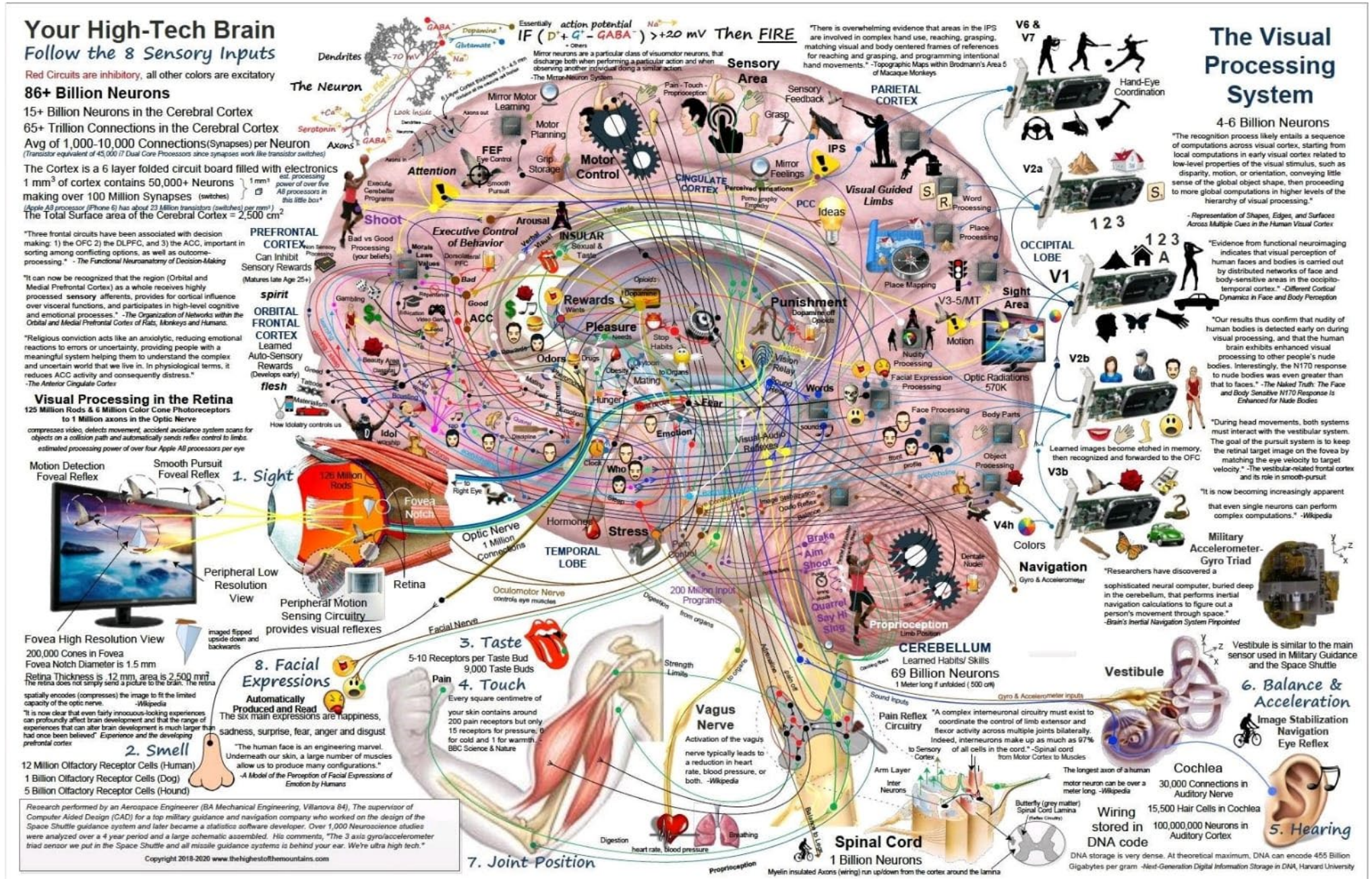
This is likely to be reflective of the broader Singapore population, researchers note.

This points to the need to better manage such conditions so as to address dementia, said Associate Professor Nagaendran Kandiah, director of the Dementia Research Centre (Singapore), or DRCS, which is conducting the ongoing study.

"We want to find the right treatment that can reduce the silent strokes and hence prevent dementia, and then go to the policymakers to say that this treatment should be part of our general guidelines when it comes to dementia," he added.

Dementia is an umbrella term for neurological conditions that lead to a decline in cognitive function, which include Alzheimer's disease.

About one in 10 people aged 60 and above in Singapore has dementia, according to a 2015 study by the Institute of Mental Health, with the increasing life expectancy and rapidly ageing population expected to lead to a higher number of those with the condition.



Human Brains Vs Computers

Human brains are slower than machines at processing simple information, such as arithmetic, but they far surpass machines in processing complex information as brains deal better with few and/or uncertain data. Brains can perform both sequential and parallel processing (whereas computers can do only the former), and they outperform computers in decision-making on large, highly heterogeneous, and incomplete datasets and other challenging forms of processing.

	Frontier supercomputer (June 2020)	Human brain
Speed	1.102 exaFLOPS	~1 exaFLOPS (estimate)
Power requirements	21 MW	10-20 W
Dimensions	680 m^2 (7,300 sq ft)	1.3–1.4 kg (2.9–3.1 lb)
Cost	$600 million	Not applicable
Cabling	145 km (90 miles)	850,000 km (528,000 miles) of axons and dendrites
Memory	75 TB/s read; 35 TB/s write; 15 billion IOPS flash storage system, along with the 700 PB Orion site-wide Lustre file system	2.5 PB (petabyte)
Storage	58 billion transistors	125 trillion synapses, which can store 4.7 bits of information each

The Hewlett Packard Enterprise Frontier, or OLCF-5, is the world's first exascale supercomputer, hosted at the Oak Ridge Leadership Computing Facility (OLCF) in Tennessee. It is compared here with the human brain. For sources see (6–11).

Smirnova Lena, et al, Organoid intelligence (OI): the new frontier in biocomputing and intelligence-in-a-dish, Frontiers in Science, 1, 2023, DOI=10.3389/fsci.2023.1017235

https://en.m.wikipedia.org/wiki/Patrick_Aebischer

Artificial brains | neurons grown on chips

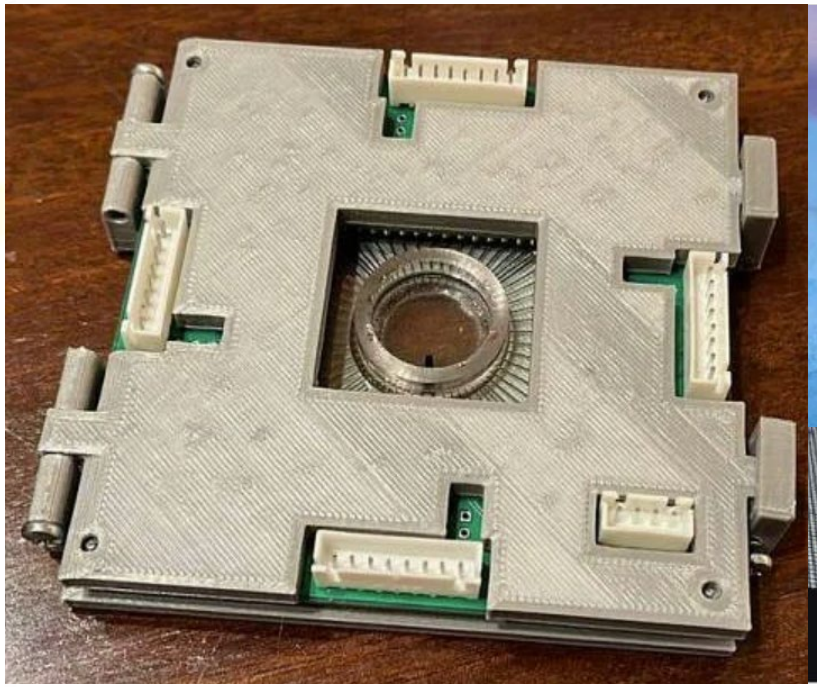
Osmond Chia

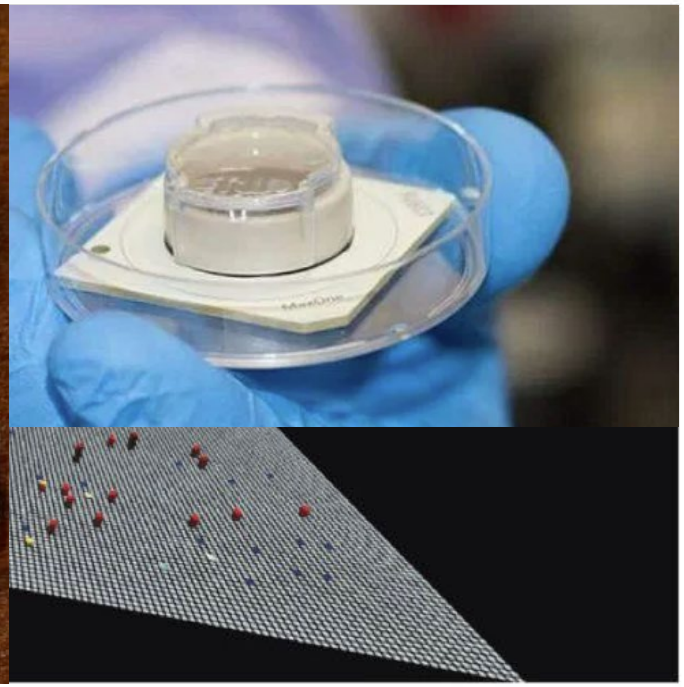
Computer chips based on lab-grown brain cells could one day power artificial intelligence (AI) tools to discover new drugs without generating as much heat as normal computers.

That is the future imagined by Singapore-headquartered start-up Cortical Labs, which received a US$10 million (S$13.4 million) investment from venture capitalists to commercialise its patented biological intelligence operating system and release a run of prototypes by 2024.

The funding round was led by billionaire Li Ka-Shing's Horizons Ventures. The Hong Kong venture capital firm has put its money in AI projects including DeepMind, which famously beat a human at the game Go. Other investors include Australia's leading venture capital fund Blackbird Ventures, the venture capital arm of the United States Central Intelligence Agency's In-Q-Tel, and US-based LifeX Ventures.

The funding will help four-year-old Cortical Labs commercialise a new computer system to help discover drugs and other AI applications, founder and chief executive Hon Weng Chong, 35, told The Straits Times.





A visualisation of cells learning to play the video game Pong by receiving cues from computer chips read through pulses. As the mini-brain understood the rules of the game and learnt from its mistakes, each rally became longer. PHOTO: CORTICAL LABS

Called DishBrain, the lab's cell-powered chip comprises neurons cultivated from stem cells and grown on a series of microelectrodes in a petri dish. The system stimulates the cells with electrical signals, and records electric charges from the neurons themselves.

Neurons are cells that transmit information within the brain, and between the central nervous system and the rest of the body via electrical or chemical signals.

In a study published in scientific journal Neuron last December, Cortical Labs detailed how the neurons could be manipulated by electric charges to generate computing power in real time – when it learnt to play the retro video game Pong in five minutes.

In a simulation of the table tennis-like game, a prototype of the DishBrain was plugged into a computer that sent electric signals to the neurons to indicate where the ball was relative to the paddle. An electric pulse indicated a successful return of the ball. An erratic series of pulses signalled a miss.

The cells learnt the rules of the game by recognising patterns in the pulses, said the researchers.

Or, as Dr Hon put it: "The neurons in the dish were able to organise themselves to play the game."

And as the mini-brain understood the rules of the game and learnt from its mistakes, each rally became longer.

This marks the earliest known breakthrough in terms of a mini-brain plugged into a computer to perform tasks in a program, and it could eventually perform tasks beyond gaming.

The computer also paves the way for a new way to discover drugs. Testing computerised cells in a dish can produce more realistic results compared with traditional algorithms, allowing researchers to gather more data on how cells react to new drugs, said the researchers.

The company plans to eventually open data centres with cell-powered chips. As the neurons power the computer processing, the chips will not generate heat, unlike normal data centres which need to be cooled, said Dr Hon.

The company is also working with bioethicists to ensure that it does not create a conscious brain by mistake, or one that can feel pain.

osmondc@sph.com.sg

https://www.straitstimes.com/tech/brain-in-a-dish-learns-to-play-pong-and-offers-a-new-way-to-discover-drugs

Smirnova, Lena & Morales Pantoja, Itzy Erin & Hartung, Thomas. (2023). Organoid intelligence (OI) - The ultimate functionality of a brain microphysiological system. ALTEX. 40. 191-203. 10.14573/altex.2303261.

"Mini Antlers" Grown On Mice Heads After Scientists Implant Deer Cells

Maybe they could give us all wings next?

"Mini Antlers" Grown On Mice Heads After Scientists Implant Deer Cells

NEWS | 30 March 2023

Stressed plants 'cry' – and some animals can probably hear them

Microphones capture ultrasonic crackles from plants that are water-deprived or injured.

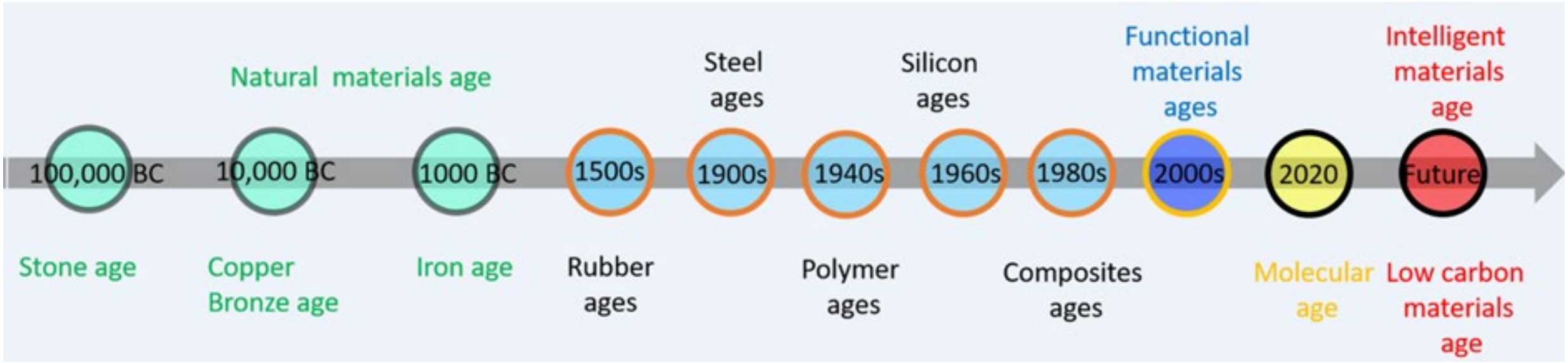
Emma Marris

Research showing water-stressed or injured plants emitting high-pitched sounds could have implications for horticultural monitoring. credit: Lilach Hadany

https://www.nature.com/articles/d41586-023-00890-9

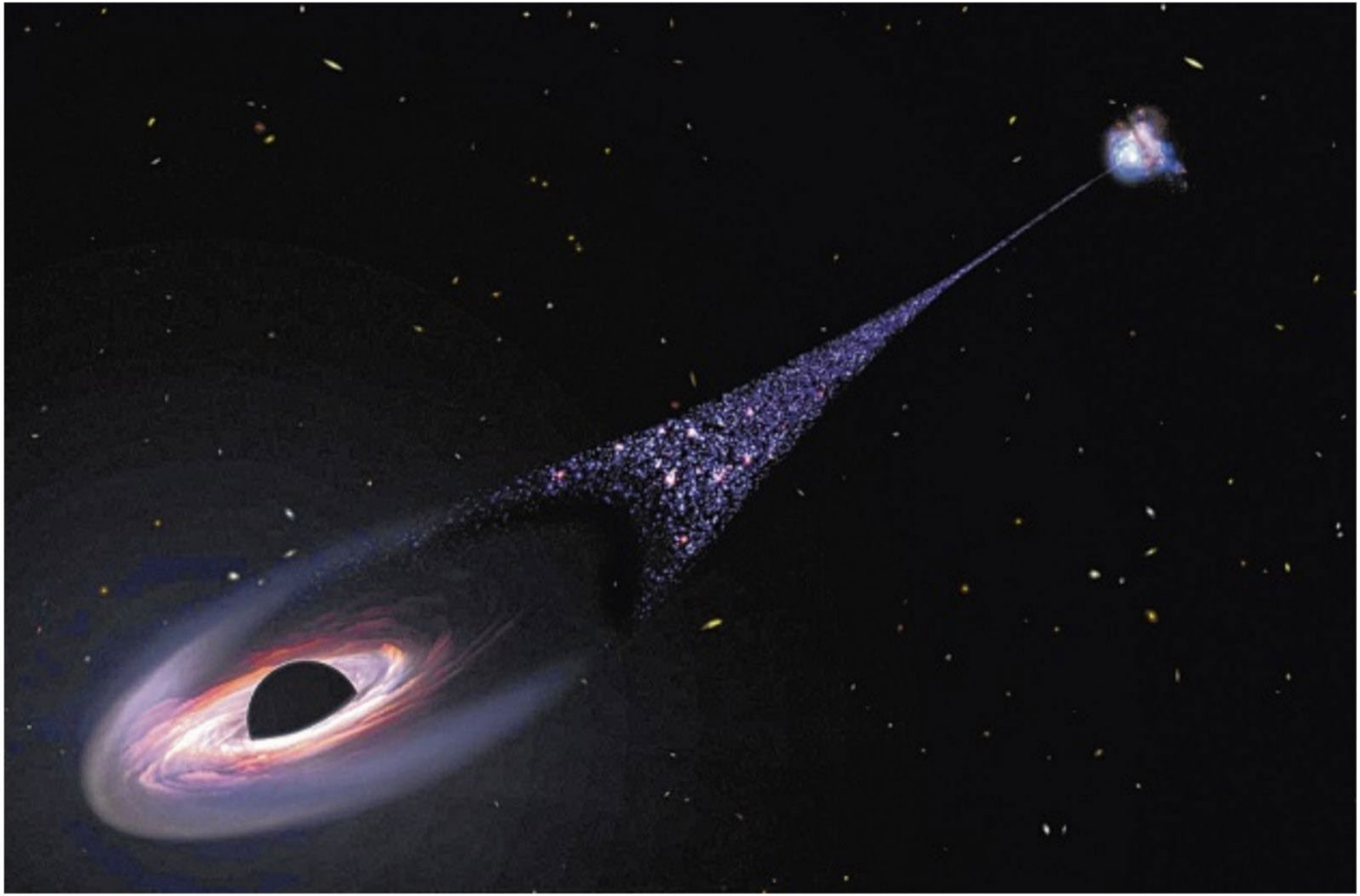
History of Human Civilization denoted by Materials Age

For millennia, thousands of materials have been sourced | synthesized | developed and employed in the service of humans. They are grouped to denote their historical significance, and to appreciate enabling science and technological advances. Current circumstances of the world and advances in science and technology set the stage for imagining future directions of materials, i.e. Intelligent Materials and Sustainable | Low-carbon Materials.



https://buildingcircularity.org; https://wedocs.unep.org/20.500.11822/34184

Tamil Selvan and Seeram Ramakrishna, Sustainability for Beginners, World Scientific Publishers; https://www.uschamberfoundation.org/circular-economy-toolbox/about-circularity/circularity-vs-sustainability



An artist's impression of the black hole rampaging through space. Scientists say it is ploughing into gas clouds in its path, and the incredible forces at play mean this gas is being forged into a contrail of new stars. PHOTO: AFP

Dark matter works like an attractive force — a kind of cosmic cement that holds our universe together. This is because dark matter does interact with gravity, but it doesn't reflect, absorb, or emit light. Meanwhile, dark energy is a repulsive force — a sort of anti-gravity — that drives the universe's ever-accelerating expansion.

Dark energy is the far more dominant force of the two, accounting for roughly 68 percent of the universe's total mass and energy. Dark matter makes up 27 percent. And the rest — a measly 5 percent — is all the regular matter we see and interact with every day.

Friday, February 24, 2023

THE STRAITS TIMES

Webb telescope spots surprisingly massive galaxies in early universe

Discovery of such galaxies goes against current understanding of the universe

PARIS – The James Webb Space Telescope has spotted six massive galaxies that emerged not long after the Big Bang, a study said on Wednesday, surprising scientists by forming at a speed that contradicts our current understanding of the universe.

Since becoming operational last July, the largest, most powerful observatory ever launched to space has been peering farther than ever before into the universe's distant reaches – which also means it is looking back in time.

For its latest discovery, the telescope spied galaxies from between 500 million and 700 million years after the Big Bang 13.8 billion years ago, meaning the universe was under 5 per cent of its current age.

Webb's NIRCam instrument, which operates in the near infrared wavelength invisible to the naked eye, observed the six galaxies in a little-known region of the sky, according to a study published in the journal Nature.

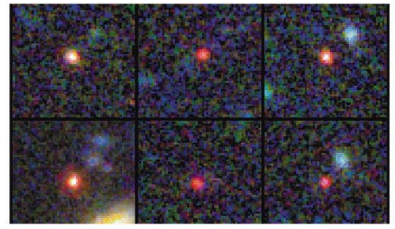
Two of the galaxies had previously been spotted by the Hubble Space Telescope but were so faint in those images that they went unnoticed.

These six new "candidate galaxies", so-called because their discovery still needs to be confirmed by other measurements, contain many more stars than scientists expected.

One galaxy is even believed to have around 100 billion stars.

That would make it around the size of the Milky Way, which is "crazy", the study's first author Ivo Labbe told Agence France-Presse.

It took our home galaxy the entire life of the universe for all its stars to assemble.



Images of six candidate massive galaxies, seen 540 million to 770 million years after the Big Bang, in a handout picture based on observations by Nasa's James Webb Space Telescope. PHOTO: REUTERS

For this young galaxy to achieve the same growth in just 700 million years, it would have had to grow around 20 times faster than the Milky Way, said Dr Labbe, a researcher at Australia's Swinburne University of Technology.

For there to be such massive galaxies so soon after the Big Bang goes against the current cosmological model which represents science's best understanding of how the universe works.

"According to theory, galaxies grow slowly from very small beginnings at early times," Dr Labbe said, adding that such galaxies were expected to be between 10 and 100 times smaller.

But the size of these galaxies "really go off a cliff", he said.

What could be going on? One suspect is the mysterious dark matter, which makes up a sizeable amount of the universe.

While much about dark matter remains unknown, scientists believe it plays a key role in the formation of galaxies.

When dark matter "clumps" together into a halo, it attracts gas from the surrounding universe which in turn forms a galaxy and its stars, Dr Labbe said.

But this process is supposed to take a long time, and "in the early universe, there's just not that many clumps of dark matter", he said.

The newly discovered galaxies could indicate that things sped up far faster in the early universe than previously thought, allowing stars to form "much more efficiently", said Dr David Elbaz, an astrophysicist at the French Atomic Energy Commission not involved in the research.

This could be linked to recent signs that the universe itself is expanding faster than we once believed, he added.

This subject sparks fierce debate among cosmologists, making this latest discovery "all the more exciting, because it is one more indication that the model is cracking", Dr Elbaz said.

Dr Elbaz is one of many scientists working on the European Space Agency's Euclid space telescope, which is scheduled to launch in July to join Webb in space.

Euclid's mission is to uncover the secrets of dark matter and dark energy – and it could also help solve this latest mystery, Dr Elbaz said.

Dr Labbe referred to the "black swan theory", under which just one unexpected event can overturn our previous understanding – such as when Europeans saw the first black swans in Australia.

Calling the galaxies "six black swans", Dr Labbe said that "if even one of them turns out to be true, then it means we have to change our theories". AFP

Roberta Ramponi

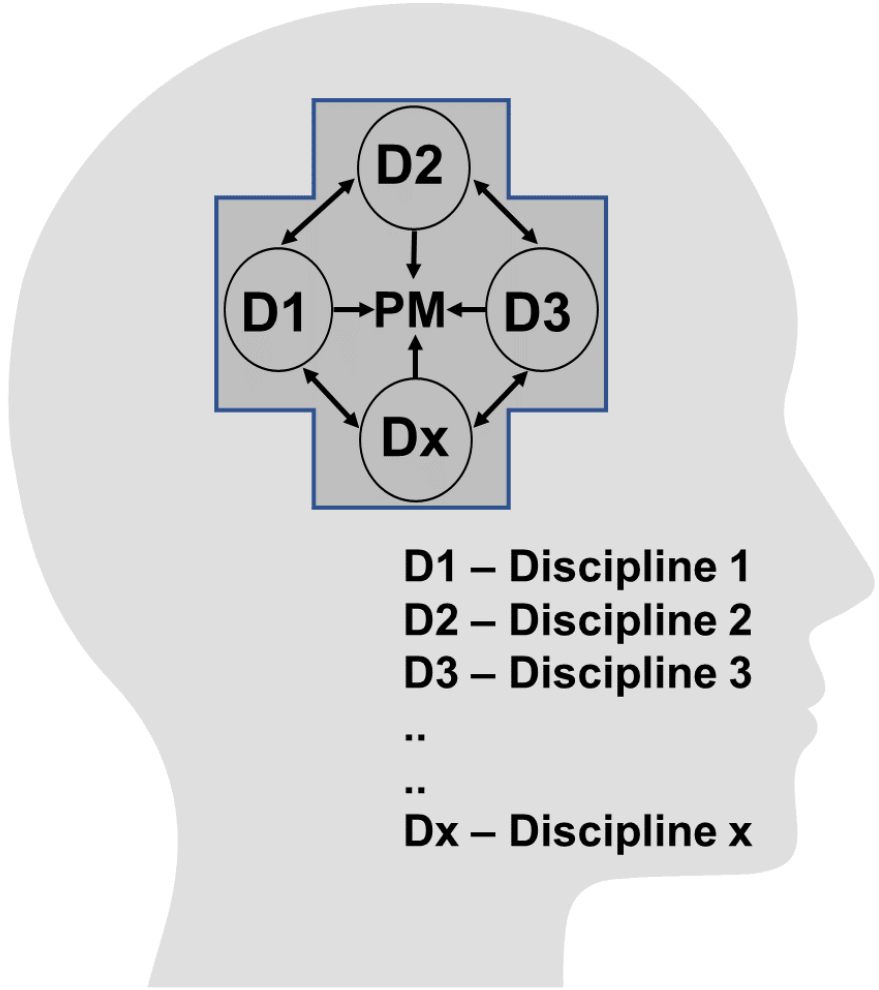
Prof Mechanical Eng & Applied Phys

Politecnico de Milano. Her research has covered a wide range of activities in the fields of Quantum Electronics, Optoelectronics, Quantum Optics and Photonics. In particular she has developed innovative techniques for the fabrication of waveguides in nonlinear crystals, passive and active glas characterization of such waveguides; design and realization of all-optical de and optical communications. More re the design and realization of integrate means of direct writing with femt fabrication of optical waveguides, and by chemical etching for microchannels

- Many challenges and needs of human beings, which include climate change, extreme weather, biodiversity loss, food supply, nutrition, health care, security, urbanization, sanitation, clean water, clean energy, resources, shelter, transportation, and circular economy demand poly-disciplinary efforts.

- Hence, poly-disciplinary minds and pursuits to be encouraged.

An illustration of a poly-disciplinary mind (PM) leveraging multiple disciplines i.e. discipline 1 (D1), discipline 2 (D2), discipline 3 (D3), and discipline X (Dx)

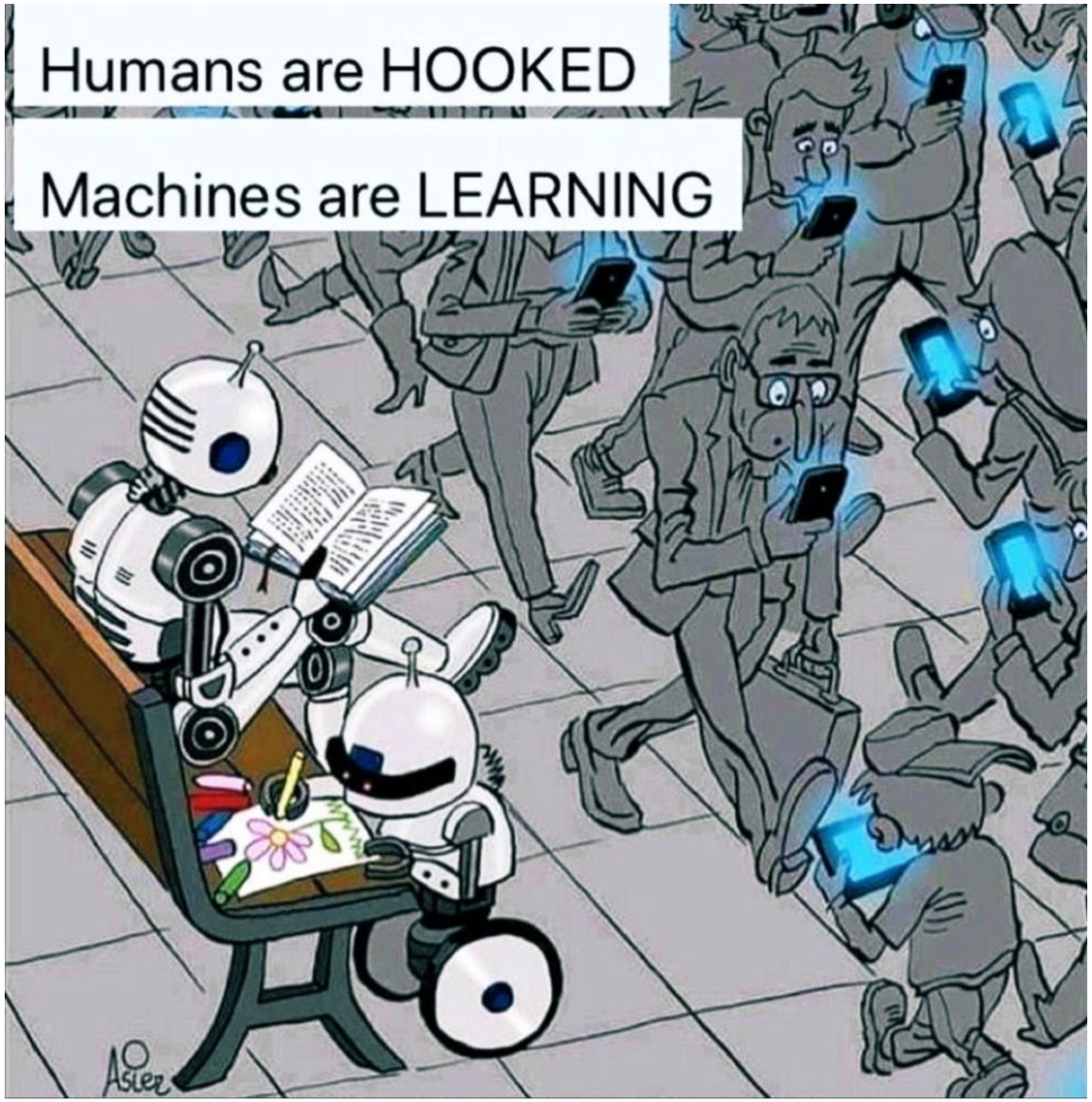


Seeram Ramakrishna (2022) Celebrate poly-disciplinary minds, Drying Technology, DOI: 10.1080/07373937.2023.2158266

Is science important?

Where is science heading?

The main challenges before today's scientists



Main challenges before today's researchers?

Today's researchers face a wide range of challenges, including:

1. Funding: Securing funding for research can be a significant challenge, particularly for early-career researchers or those working in less well-funded areas.
2. Ethics: Researchers must navigate complex ethical issues when conducting research involving human or animal subjects, as well as issues related to data privacy and security.
3. Reproducibility: Ensuring that research findings are reproducible is crucial for building trust in the scientific process. However, achieving reproducibility can be challenging due to factors such as variability in sample sizes and experimental conditions.
4. Interdisciplinary collaboration: Many of today's research questions require expertise from multiple fields. Collaborating with researchers from different disciplines can be challenging due to differences in terminology, methods, and perspectives.
5. Communication: Communicating research findings to different audiences, including the general public and policymakers, can be challenging. Researchers must be able to communicate complex concepts in a clear and accessible way.
6. Technological advancements: While technological advancements provide opportunities for new research, keeping up with rapidly evolving technologies can be a challenge for researchers.
7. Publication pressure: Pressure to publish in high-impact journals can create a publish-or-perish culture that prioritizes quantity over quality. This can lead to a lack of replication studies and a bias towards positive results.

These challenges are just a few examples of the obstacles researchers face today. Overcoming these challenges requires a combination of individual and collective efforts, including training and education, policy changes, and collaboration across disciplines and sectors.

Regenerate response

Table 2 The main challenges before today's scientists

	High Income Countries	Middle Income Countries	Low Income Countries
Government Support	Research is a priority of the governments, hence tend to change research priorities	Research investment levels are below the global benchmarks	Governments do not invest in research
Industry | Corporate Support	Co-creation of innovations. Researchers pressured with short-term agendas	Wide gap between academia-industry. Researchers mostly perform consultants role	Non-existent
Quantitative assessment of research	Over emphasis of bibliometrics (number of journal papers; impact factor (IF); citations; H-index; patents: etc.) in research performance assessment is a source of stress for the researchers		
Research funds	Akin to pressure cooker. Low success rates of winning a grant causing researchers to spend enormous time in grantsmanship instead of doing research	Mindless bureaucracy in accessing and using research funds	Procedures are not well established
Research funds	Securing sustained research funding over long research career i.e. 30 to 50 years is a very challenging task		
Flow of research funds	Skewed towards established groups and research themes	Skewed towards national labs, and applied | mission programs	Case by case and intermittent

DOI 10.1080/07373937.2023.2205799

(TBC)

Table 2 The main challenges before today's scientists

	High Income Countries	Middle Income Countries	Low Income Countries
Research infrastructure	Capitalist nature of access to research infrastructure	Only available in certain places, and access is time consuming	No | minimal research infrastructure
Research human capital	Over supply, and hence downward pressure on the opportunities of researchers	Varied quality of research human capital thus affecting the global competitiveness of research	Inadequately trained | skilled human capital to rely on by the lead researcher
Interdisciplinary research	Fewer opportunities and encouragement for conducting interdisciplinary | multidisciplinary research		
Translation of research	Researchers are expected to demonstrate impact via translation of their research into real world solutions. However, their ecosystems lack resources | opportunities to do so		
Collaboration	Competition trumps cooperation	Competition trumps cooperation	Minimal opportunities
Mentorship	Researchers lack access to good mentors who can guide them to navigate complex research ecosystem. Research enterprise is dynamic with multitude of players | stakeholders		
Career path	Post-PhD career path is ill defined; fewer tenured | permanent positions; and lack structured opportunities for reskilling along the way.		
Family aspects	The choice of pursuing a strong career in research vs prioritizing a family; Deciding on the best moment for establishing a family.		
Meritocracy	Meritocracy among researchers is often plagued with pedigree, race and gender		

DOI:10.1080/07373937.2023.2205799

Table 2 The main challenges before today's scientists

	High Income Countries	Middle Income Countries	Low Income Countries
Pace of research	Fast paced underpinned by technology disruptions, high density of researchers	Laggard	
Publishing in high quality journals	Pressured to publish in high IF journals independent of their research areas	Often unable to pay high publication charges	Journal peer review process is stacked against the researchers
Publishers	Unscrupulous practices of peer review and publishing due to intense competition among the publishers. This is exacerbated by the profit only minded publishers		
Research ethics and integrity	Cut throat competition | monetary rewards | allure of fame affecting the ethics and integrity of researchers (black sheep!)		
Mental stress	Competitive research is demanding. Work-life balance is a challenge. Salary packages are not competitive. Mental stress and burnout among the researchers need due attention		
Over regulations	Research is often subjected to over regulations. Religiosity is a factor in certain areas		
Geopolitics | International funding	Lack of international research funding, and geopolitics | language barriers impeding the cross-border research cooperation and mobility of researchers.		
Commercialization of research enterprise	Commercial interests impeding sharing of knowledge, which is necessary for further advancement of scientific knowledge		

DOI 10.1080/07373937.2023.2205799

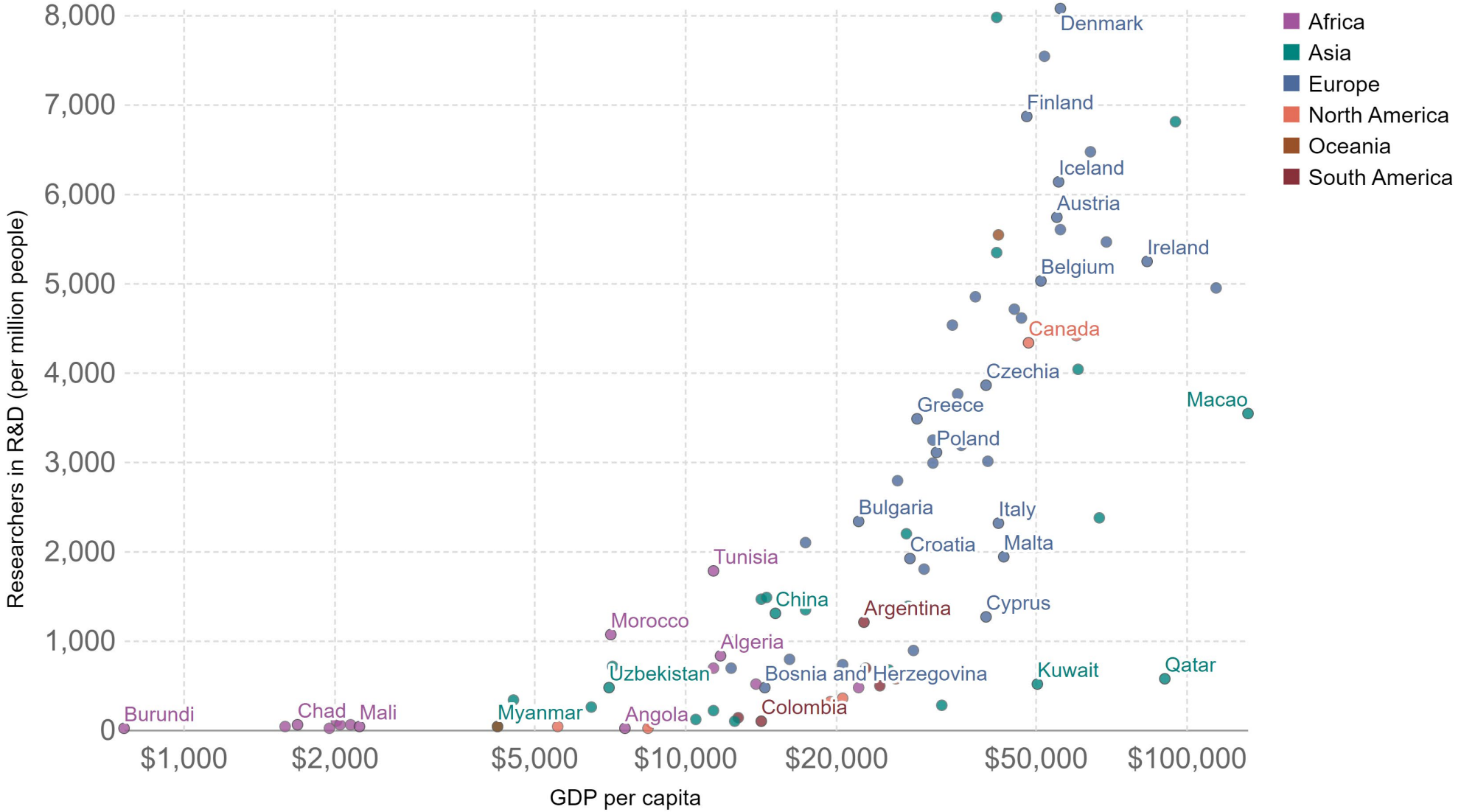
Peter Higgs: I wouldn't be productive enough for today's academic system

Physicist doubts work like Higgs boson identification achievable now as academics are expected to 'keep churning out papers'

Peter Higgs: 'Today I wouldn't get an academic job. It's as simple as that'. Photograph: David Levene for the Guardian

Number of researchers per million vs GDP per capita, 2018

Researchers in research and development (R&D) are professionals engaged in the conception or creation of new knowledge, products, processes, methods, or systems. Postgraduate students are included.

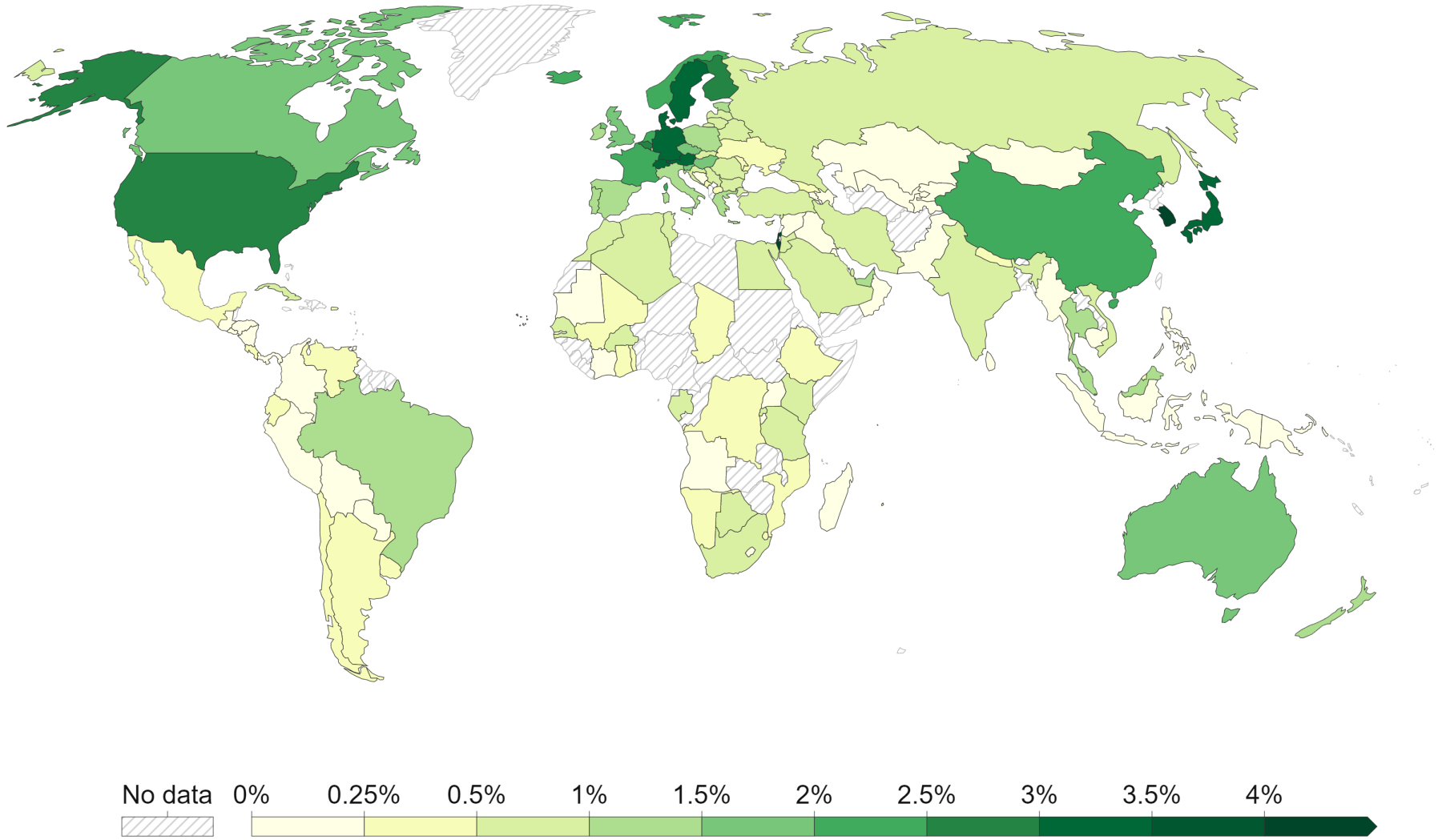


Source: UNESCO (via World Bank); Data compiled from multiple sources by World Bank OurWorldInData.org/research-and-development • CC BY

Research spending as a share of GDP, 2019

Research and Development (R&D) covers basic research, applied research, and experimental development. Spending includes current and capital expenditures (and public and private) on research.

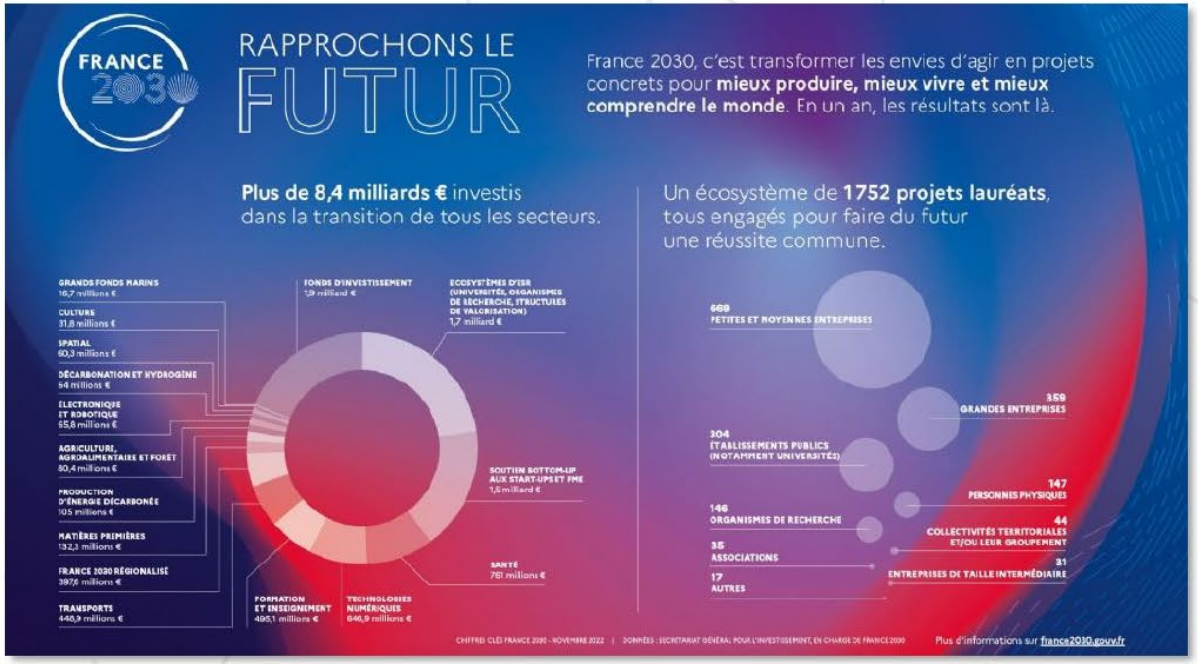
Our World in Data



Source: UNESCO (via World Bank)

OurWorldInData.org/research-and-development • CC BY

Deeptech entrepreneurship key to the France 2030 target: 500 Deeptech start-ups originating from research each year



"We must accelerate start-ups originating from research, as this is where our industrial and technological future lies."

Elisabeth Borne, Prime Minister, France 2030 Committee on November 18, 2022

https://www.ip-paris.fr/en/about/governance/members-international-scientific-advisory-board-isab

For young immigrant women, the pressures of early-career research are particularly severe. It doesn't have to be that way.

I left Slovakia to study in the United Kingdom at the age of 18, with a small suitcase and big hopes. I wanted to take advantage of opportunities that my parents had only been able to dream of growing up under a communist regime. But never in my wildest dreams did I think I would become a professor before the age of 35.

I got here by elbow grease — and long hours. I worked feverishly to get funded PhD and postdoctoral positions. The stiff competition for grants and positions at high-ranking universities helped me to crystallize my research ideas in my field of early education and child development. But to stand out from my peers, I doubled my working hours. It wasn't uncommon for me to work 12 hours a day, 7 days a week, for months at a time.

More hours meant more results. Seeing my studies on digital reading translated into apps for children or family websites motivated me to do more. I put my work on a pedestal, often at the cost of my health and social life.

I thought I was the exception. But when I read an article containing interviews with five successful female psychology researchers (P. Alexander *et al. Educ. Psychol. Rev.* **33**, 763–795; 2021), I realized that this is the norm for top-performing academics. I greatly admire the interviewees and share their passion for their work. But I now realize that, by hiding behind passion, I was excusing my contribution to a toxic burnout culture in research. And for me and many others like me — female, immigrant, non-native English speakers — the pressures are even greater. It's time to speak out.

I made the greatest sacrifices during my years on temporary postdoc and lectureship contracts, when not publishing an extra paper could have cost me the grant I needed to secure next year's salary. A mentor told me that the passport to academia is publications, so I filled every spare moment with writing. A doctor told me ice would ease my permanent carpal tunnel syndrome, so I typed wearing iced wrist splints.

Not being a native English speaker, I had to put in extra hours for each paper. The fear of being misunderstood by using the wrong word added to the stress of conference presentations and translated into regular pounding headaches and fatigue, which I still experience.

The pressure to perform sucked me into a negative spiral. When I felt stressed, I doubted myself, feared saying 'no', overcompensated by saying 'yes' to extra tasks, and became more stressed. I cut back on spending time with friends and on sleep. My then-boyfriend told me I was married to my computer and cut our holiday short when he saw me typing a paper on the beach. The ticket inspector on the late-night commuter train knew me by name because I regularly overslept my stop. When I had a bout of autoimmune illness, my family was not surprised.

> "I now realize that, by hiding behind passion, I was excusing my contribution to a toxic burnout culture in research."

I see now that my choice to work hard was fuelled not only by my love for the work but also by systemic factors. Studies show that the risk of burnout is higher among young researchers (A. Boone *et al. Front. Psychol.* **13**, 839728; 2022), as well as among female academics from marginalized groups, because there is greater pressure to perform. Although that includes me, I can't speak to the even greater pressures that affect many young women, among them those from minority racial groups, those juggling motherhood with early-career research, those from the LGBTQ community, and scientists from countries where there is extreme gender discrimination or violent conflict.

Through a combination of hard work and luck, I got a permanent position early in my career. But the workload has only grown heavier as I have climbed the career ladder, with increasing requests for mentoring, article and grant reviews, departmental duties, committee memberships, and voluntary contributions of time and expertise to professional societies. The costs of making a mistake are also higher: if my lower performance delays a large grant, that can jeopardize several people's salaries.

But my survival anxiety has lessened. Starting a family and moving to Norway, a country known for a better work–life balance than the United Kingdom, helped. Beginning to take my childhood hobby of writing poetry seriously was the best thing I ever did for my mental health. And I have learnt to manage my calendar better, blocking out time to write and not feeling guilty for setting out-of-office replies.

The extreme workload of my early career was unhealthy for me, and it's unhealthy for others. I want to undo my contribution to this toxic culture of overwork, especially for groups that are disproportionately affected.

I see it as my responsibility to promote definitions of academic success that are not tied to extreme working hours. In the book *Inspirational Women in Academia: Supporting Careers and Improving Minority Representation* (2023), my colleague Loleta Fahad, who is head of career development at University College London, and I interview female academics and administrators. We openly share where we failed, what we wish we had known when we started working at a university and what those in power could do to address systemic discrimination.

The pursuit of science lends itself to fervour: there is no ceiling to knowledge, and the discovery process can be all-consuming. But being passionate about our work should not be equated with working extreme hours. And it should not put extra pressure on women from marginalized backgrounds.

Natalia Ingebretsen Kucirkova is a professor of child development at the University of Stavanger, Norway, and at the Open University, UK.
e-mail: natalia.kucirkova@uis.no

ELISABETH TØNNESSEN

1. Find the next big funding...if the funding topic has changed, find how to connect one's topic with that

2. Find how to increase H-index and be relevant within the community.

3. Find the next good student who is committed to his/her work

Vaccine pioneer who made the world safer

Edward Jenner's vaccine helped eradicate smallpox, leading to a breakthrough for managing pandemics and treating diseases

Ronan O'Connell

As I looked into the eyes of the man sitting before me, I thought: "If not for you, I wouldn't be here."

I was not in the presence of my father, but rather, a statue of Edward Jenner, the visionary British scientist credited with inventing vaccinations. The only reason I could be there in London – risking a 20-hour flight from Australia during the coronavirus pandemic – was because I felt protected by my multiple jabs against Covid-19.

Scientists like Jenner were all but invisible to the masses before the emergence of Covid-19. Few people might have heard of an epidemiologist back then. They might also have struggled to explain the basic role of a virologist or a biochemist.

Suddenly, in 2020, the work of these scientists was constantly on people's minds. That year, too, the world celebrated as news broke that a vaccine had been developed for Covid-19.

That success can be traced to 1796 and the scientist whose statue is in London's Kensington Gardens. As the pandemic wanes, the world can thank Jenner who made a vaccine breakthrough.

Each day, many tourists visit this park. It is not only one of the city's most attractive green spaces, but it also hosts many sites linked to Princess Diana, including her former home Kensington Palace, which can be explored on guided tours.

About 800m east of that mansion, I found a series of man-made ponds called the Italian Gardens. Jenner never stops gazing at them as his statue is situated at their eastern fringe, a prestigious perch that befits a man of lasting influence.

Called the Edward Jenner Memorial, this bronze sculpture was unveiled by Prince Albert in 1858. Its base is adorned by splendid stonework and the statue is flanked on either side by benches.

I sat on a bench there and read further about the life of Jenner. In 1749, he was born about 160km west of this spot, in the village of Berkeley in Gloucestershire county.

Few travellers would ever pass through that tiny community, which is not on the road to anywhere of significance. But those who do can visit the house where he was raised, which is now a museum.

Jenner, whose father was the local vicar, stood out among his eight brothers and sisters due to his intelligence. At just 14 years old, he became an apprentice to a Gloucestershire surgeon.

After seven years, he moved to London for two years of formal medical training. He caught the eye of renowned surgeon John Hunter. In 1772, 23-year-old Jenner returned to his village, where he spent many years as a surgeon and general practitioner.

It was in Berkeley that he heard that anyone who contracted cowpox from livestock would be immune to smallpox. By the late 1700s, smallpox was Britain's deadliest scourge, particularly among children.

By comparison, cowpox was largely harmless to humans. If they caught it from cattle, they typically acquired a few pockmarks on their skin and were mildly ill for a short period. In 1796, Jenner decided to test out the local cowpox myth.

He took pus from a human cowpox boil and rubbed it into cuts on the arm of an eight-year-old boy, James Phipps. When Phipps exhibited cowpox symptoms, that proved that disease could be transmitted from human to human.

A few weeks later, Jenner deliberately infected the same boy with smallpox, but he did not develop any symptoms that time or when the process was repeated later. He appeared to have gained immunity to smallpox.

Thrilled by this outcome, Jenner submitted the results to Britain's Royal Society, the world's oldest independent scientific academy.

Instead of hailing him as a genius, the society said his smallpox treatment remained unproven. So he repeated it on more young patients and resubmitted his research, which was published.

Yet, for years thereafter, Jenner's vaccines were rubbished and branded sacrilegious by the church. The positive impact of the vaccinations became impossible to ignore and the treatment spread across Britain and, eventually, the world.

After I spent time alongside Jenner's statue in Kensington Gardens, I walked across to London's Science Museum, where I found an exhibit on him.

It displayed a range of Jenner's medical tools. They included instruments for cupping and bleeding, and a medicine chest where he kept an opium-alcohol blend for dulling pain, among others.

His legacy was summed up by an information board explaining that smallpox killed more than 500 million people worldwide – until 1980, when the World Health Organisation declared that the disease had been eradicated.

All thanks to Jenner, whose inquisitive mind and medical expertise prompted him to conduct experiments that invented vaccinations, something that humans have come to rely upon.

stlife@sph.com.sg

• Ronan O'Connell is an Australian journalist and photographer who loves bringing historical tales back to life by visiting the places where they unfolded.

A series of man-made ponds called the Italian Gardens (above) in Kensington Gardens, about 800m east of Kensington Palace. Edward Jenner's statue is situated at the eastern fringe overlooking the ponds. PHOTOS: RONAN O'CONNELL

The Edward Jenner Memorial (left), a bronze sculpture in Kensington Gardens, honours the visionary British scientist credited with inventing vaccinations.

A range of Jenner's tools – including instruments for cupping and bleeding, and a chest where he kept an opium-alcohol blend for dulling pain – is on display at London's Science Museum.

From basic research to innovation

As amply evidenced, we all know how infinitely less secure and comfortable our lives would be without things that society takes for granted and which originated from basic research. For example, although Albert Einstein's esoteric theory of general relativity is seemingly irrelevant to any practical application, there would be no GPS devices without it. It was the apparently random 'trials' that led to Röntgen's discovery of X-rays, and a curiosity-driven exercise par excellence that allowed Watson and Crick to elucidate the structure of the DNA double helix — a finding that has revolutionized the life sciences as a whole. Remarkably, the first lasers were described as a 'solution in search of a problem'. In a similar vein, Paul Dirac's 1927 prediction of antimatter (such as the positron) was regarded at the time as an entirely useless oddity with little, if any, practical significance. Now, decades later, almost every major hospital uses positron emission tomography for the early diagnosis of cancer. Consider Michael Faraday's ground-breaking work on the riddle of electricity and magnetism. Without his scientific interest in electromagnetism, which was seen as an amusing but largely useless diversion in the first half of the 19th century, we would all still be in the dark! When asked by William Gladstone, the British Prime Minister of the day, whether his publicly funded research on electricity would ever be of any use, Faraday coolly replied, "One day, Sir, you may tax it". Although Gladstone himself did not live to see the rise of the electrical industry or benefit from the tax revenue it generated, the salient point is that returns on research investment are long-term and can be massive: up to 60% per year according to recent estimates[5]. In another example, approximately 20% of the global economy is related in some way or another to chemical catalysis: that is, to the initially purely academic question of how bonds in molecules are made and broken. Also, does Schrödinger's famous equation from 1926 (equation 1), which was formulated to describe the wave nature of electrons and represents basic theoretical physics research in its purest form, serve any use? According to estimates that about 20% of gross domestic product is based on applications of quantum mechanics, the answer would be a resounding 'yes' (REF. 5).

Schwarz, H. On the usefulness of useless knowledge. Nat Rev Chem **1**, 0001 (2017). https://doi.org/10.1038/s41570-016-0001

THE STRAITS TIMES

SpaceX Starship's test was a successful failure

The primary goal of the mission was accomplished because the most powerful rocket ever developed left the launch pad.

Wendy Whitman Cobb

On April 20, a new SpaceX rocket called Starship exploded over the Gulf of Mexico three minutes into its first flight. SpaceX is calling the test launch a success, despite the fiery end result. As a space policy expert, I agree that the "rapid unscheduled disassembly" – the term SpaceX uses when its rockets explode – was a very successful failure.

This launch was the first fully integrated test of SpaceX's new Starship. Starship is the most powerful rocket ever developed and is designed to be fully reusable. It is made of two different stages, or sections. The first stage, called Super Heavy, is a collection of 33 individual engines and provides more than twice the thrust of a Saturn V, the rocket that sent astronauts to the Moon in the 1960s and 1970s.

The first stage is designed to get the rocket to about 65km above Earth. Once Super Heavy's job is done, it is supposed to separate from the rest of the craft and land safely back on the surface to be used again. At that point the second stage, called the Starship spacecraft, is supposed to ignite its own engines to carry the payload – whether people, satellites or anything else – into orbit.

EXPLOSIVE FIRST FLIGHT

While parts of Starship have been tested previously, the launch on Thursday was the first fully integrated test with the Starship spacecraft stacked on top of the Super Heavy rocket. If it had been successful, once the first stage was spent, it would have separated from the upper stage and crashed into the Gulf of Mexico. Starship would then have continued on, eventually crashing 250km off Hawaii.

During the SpaceX live stream, the team stated that the primary goal of this mission was to get the rocket off the launch pad. It accomplished that goal and more. Starship flew for more than three minutes, passing through what engineers call "max Q" – the moment at which a rocket experiences the most physical stress from acceleration and air resistance.

According to SpaceX, a few things went wrong with the launch. First, multiple engines went out some time before the point at which the Starship spacecraft and the Super Heavy rocket were supposed to separate from each other. The two stages were also unable to separate at the predetermined moment, and with the two stages stuck together, the rocket began to tumble end over end. It is still unclear what specifically caused this failure.

Starship is almost 120m tall and weighs 4.9 million kg. An out-of-control rocket full of highly flammable fuel is a very dangerous object, so to prevent any harm, SpaceX engineers triggered the self-destruct mechanism and blew up the rocket over the Gulf of Mexico.

All modern rockets have mechanisms built into them that allow engineers to safely destroy the rocket in flight if need be. SpaceX itself has blown up many of its own rockets during testing.

SUCCESS OR FAILURE?

Getting to space is hard, and it is not at all unusual for new rockets to experience problems. In the past two years, South Korea and Japan have attempted to launch new rockets that also failed to reach orbit. Commercial companies such as Virgin Orbit and Relativity Space have also lost rockets recently. None of these was a crewed mission, and in most of these failed launches, flight engineers purposefully destroyed the rockets after problems arose.

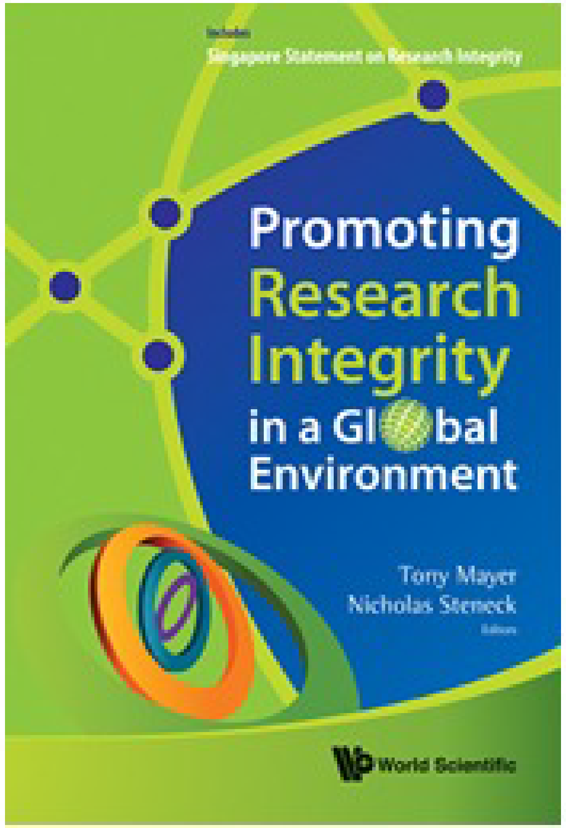
SpaceX's approach to testing is different from that of other groups. Its company philosophy is to fail fast, find problems and fix them with the next rocket. This is different from the more traditional approach taken by organisations such as Nasa (the United States' National Aeronautics and Space Administration) that spend far more time identifying and planning for possible problems before attempting a launch.

The traditional approach tends to be slow. The development of Nasa's Space Launch System – the rocket that will take astronauts to the Moon as part of the Artemis programme – took over 10 years before its launch last November.

SpaceX's method has allowed the company to move much faster, but can be costlier because of the time and resources it takes to build new rockets.

SpaceX engineers will look to identify the specific cause of the problem so that they can fix it for the next test launch. With this approach, launches like this first Starship test are successful failures that will help SpaceX reach its eventual goal of sending astronauts to Mars.

• Wendy Whitman Cobb is Professor of Strategy and Security Studies, Air University in Alabama in the United States. This article was first published in The Conversation.



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Aspiring lawyer who plagiarised paper told to take more time to reflect

Selina Lum
Senior Law Correspondent

Drags

- Plagiarism
- Fraud (over claims | cooked-up research | outsourcing)
- Unfairness to others (ethical | moral)

THE STRAITS TIMES
Thursday, January 26, 2023

European politicians face deep embarrassment over plagiarism

Jonathan Eyal

Auto-grouping encoded in the DNA of living beings?!

Studies show that for many of us, our social circles have shrunk, yet support networks are crucial

Research published in the Journal of Social and Personal Relationships suggests it takes 90 hours spent together to go from "casual" friend to "friend" and more than 200 hours to become "close" friends which probably explains why most friendships are formed at a younger age when responsibilities are fewer and there is far more time to spare. PHOTO: ISTOCKPHOTO

It's getting harder to make friends but here's how

Studies show that for many of us, our social circles have shrunk, yet support networks are crucial

Research published in the Journal of Social and Personal Relationships suggests it takes 90 hours spent together to go from "casual" friend to "friend" and more than 200 hours to become "close" friends which probably explains why most friendships are formed at a younger age when responsibilities are fewer and there is far more time to spare. PHOTO: ISTOCKPHOTO

Lee Su Shyan

Associate Editor & Senior Columnist

It was to be a good meal for the six of us, our first get-together since 2020 when Covid-19 cast a shadow over our lives. The restaurant had all my favourite Peranakan dishes. And yet I felt a sense of trepidation, almost overriding my anticipation of a decadently rich beef rendang.

Like many people, young and old, I had got out of the habit of personal interaction after two years of Zoom meetings and WhatsApp chats. Since 2020, when we last met in person, there had been stresses at work, illness and family bereavements. I wasn't sure if I could carry a conversation for an hour or more, let alone find the words to articulate how I felt about what we had gone through.

As we sat down after many hugs, I needn't have been worried about having nothing to say, as we were too busy reconnecting to even look at our phones. As we parted ways after dinner, we promised to meet again soon. I was stuffed to the gills but I was also re-energised and focused on looking ahead.

SHRINKING SOCIAL CIRCLE

It made me realise how important it was to have that supportive circle of friends – and how hard it is to make new ones. Asking around, most admitted it wasn't easy after their 20s.

It's a worldwide phenomenon. Despite the touted benefits of friendship, everyone just has fewer friends nowadays. The Survey Centre on American Life said in 2020 that nearly one in five Americans reported having no close social connections, double that in 2003.

In 2021, with ongoing pandemic restrictions, 44 per cent of those surveyed in a Straits Times poll said their social circles had shrunk outside of their immediate family.

It may even be getting more challenging for younger people to forge friendships. In another 2021 survey on marriage and parenthood, of the 2,848 respondents who were single, half were not currently dating, with the top reason being a limited social circle.

Another study, also from the Survey Centre on American Life noted that in 1990, 45 per cent of young men reported that when facing a personal problem they would reach out first to their friends. In 2021, that proportion had slumped to 22 per cent.

Yet, there is a yearning for more social connections. A recent LinkedIn survey of Australia employees showed the No. 1 reason for returning to the workplace as social interactions. The survey also covered professionals in India, with an overwhelming 72 per cent saying they missed their chai-break bonding sessions.

CHALLENGES OF MAKING FRIENDS

The usual reason – post- and pre-pandemic – for being unable to enter into more friendships is the lack of time after taking into account work or study, children, aged parents and other family commitments.

Research published in the Journal of Social and Personal Relationships suggests it takes 90 hours spent together to go from "casual" friend to "friend" and more than 200 hours to become "close" friends which probably explains why most friendships are formed at a younger age when responsibilities are fewer and there is far more time to spare.

And that's how my younger colleague consoled me about my apparent inability to clock up more friends. "It's not because you are anti-social," she said. "You already have formed what you need and there is no need to include more people deep into your life."

Still, that raises the interesting question of numbers. We encounter numerous people each day in the course of our lives but how many end up as friends? There is the well known Dunbar's number of 150, which is the average capacity of meaningful relationships per person. Meaningful relationships are defined as being able to greet these people without feeling awkward if you ran into them in an airport lounge.

The man who came up with the number, Dr Robin Dunbar, a professor of evolutionary psychology at Oxford University, says that friendships peak in the late teens and early 20s. By the 30s, the number is about 150 connections. This number shrinks by the late 60s and early 70s. And within these 150 connections, there are only five or so very close ones.

I may not be seeking a best friend but supportive connections are important. In 2021, Duke-NUS Medical School released a study led by experts in Singapore and Japan which showed that lonely older adults not only lived at least three years less than their peers, but also spent less of their remaining life in good health or being active.

Singapore is a vibrant city but urban loneliness is not unheard of. A World Economic Forum paper which surveyed nearly 800 people in Britain, Europe, Australia and the United States found that being in overcrowded environments increased loneliness by up to 38 per cent. Social inclusivity – the feeling of being with people who share our values and make us feel welcome – came with a 21 per cent decrease in loneliness.

There is an element of irony here – that urbanisation which should theoretically offer an individual vast opportunities to make social connections with many more people than previously possible is contributing to a sense of isolation. But look closer and the reasons for it become clearer.

Nowadays, jobs are no longer for life and often, neither is marriage. It is not uncommon to move house several times during one's lifetime, and in fact move countries as well. Bonds are increasingly more fragile and fragmentary.

Singapore is a vibrant city but urban loneliness is not unheard of. A World Economic Forum paper which surveyed nearly 800 people in Britain, Europe, Australia and the United States found that being in overcrowded environments increased loneliness by up to 38 per cent.

Family units are smaller, and with a longer life expectancy – nearly 86 years for women in Singapore – many will end up living solitary lives.

For younger people, secondary school students have the opportunity to spend four years together. These early years are prime time for forging friendships. But then paths diverge, with some headed for polytechnics, junior colleges and then universities at home and overseas. Some stay on abroad after they graduate. The challenge is to find enough common ground subsequently.

Perhaps national service is the one place where long-lasting friendships are formed as the recruits bond after spending months together.

Young adulthood is another critical juncture for friendship-forming, when financial cares are few and there is ample time to party and dine out. In a workplace setting, there is nothing like an urgent project and a tough boss to bring people together. Such relationships often form core friendships that can carry on well till old age.

But they need to be maintained. Rare is the employee nowadays who remains with the same company from start to finish. Even if one stays put, there are internal workplace movements and overseas postings. Fresh experiences at the workplace can rejuvenate one's career but are less conducive to maintaining or developing close friendships.

Once you enter your 40s and 50s, there may be even fewer opportunities to make friends. This may hit men especially, as their social interaction is often limited to the workplace.

FRIENDSHIP TIPS: COMMON INTERESTS

But how to get out of a friendship funk? Technology helps. You may already have Facebook friends – who scroll through your posts and photos and send messages – or Zoom friends, but often these are superficial social connections and/or lack quality interaction.

Go a step further by connecting in person, with like-minded people through social networking platforms such as Meetup. A check shows interest groups as diverse as investing, business networking or for those entering their 50s and wishing to age gracefully.

You may well find a few kindred spirits to add to your existing social network.

FAMILY CAN BE FRIENDS, TOO

There is a saying that you can't pick your family but you can pick your friends. But consider choosing some family members who can also serve as friends. Singapore's nuclear family size may be small but there is still a wider family network of distant uncles, aunts and cousins whom you bump into only during festive seasons.

Seize this opportunity to reach out to them. Yes, unlike strangers, your second cousin is likely aware of embarrassing incidents from your childhood or the backstory of why your parents do not get along. That cousin could be your newest bestie, as there is enough commonality to foster a friendship.

MENTORS AND FRIENDS

As ageing takes hold, friends may have moved overseas or drifted away. Others are in poor health. Acting as a mentor can be another form of having a fulfilling connection. At a very basic level, it means lending a helping hand where possible. Just the other day at the hawker centre, I spotted an elderly man being educated on the ins and outs of the Grab app by a middle-aged friend.

Join a network to share your experience and mentor younger people. You may find the younger person's energy and enthusiasm infectious. Certainly it should bring a smile to your face. For younger folk, hearing from your mentors could bring a more balanced perspective to your life and perhaps even a fillip to your career.

While mentor and mentee may not end up bosom buddies in the usual sense of the word, these experiences can count for a quality social connection.

REACH OUT TODAY

Much as we fear rejection, experts suggest making it a point to reach out to a friend or someone within your social circle on a regular basis. It could do you, as much as your friend, a world of good.

sushyan@sph.com.sg

Good | capable mentors to navigate the research enterprise over long career span

Wed 19/4/2023 7:37 pm

Seeram Ramakrishna

RE: Academic career

To Diego Pacheco

Dear Diego,

Thanks for your questions. I hope the following answers are helpful to you in some way.

What soft skills have most contributed to the progress of your academic career?

1, Understanding others deeply. 2, quashing my own biases. 3, increase mindshare to get things done

What are the main strategies or golden rules you adopt or used to adopt in your daily routine for ensuring or improving your academic productivity?

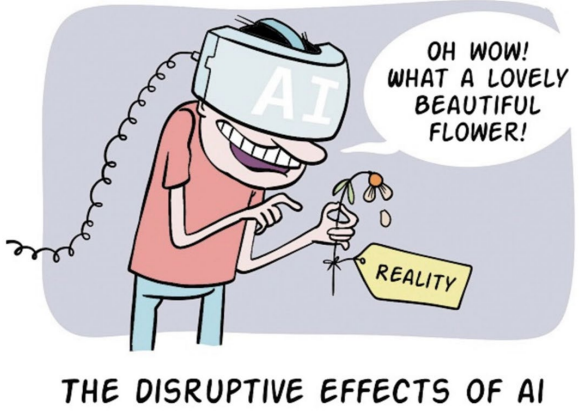
1, Don't keep others wait on you. 2, Whatever can or needs to be done today should be done and not to leave for another unspecified day in the future.

Where do your best ideas usually come from?

During reflection, and from unrelated but massive and diverse knowledge absorbed every day.

What were the best advice you have heard during your academic career that contributed most to boosting your career and results?

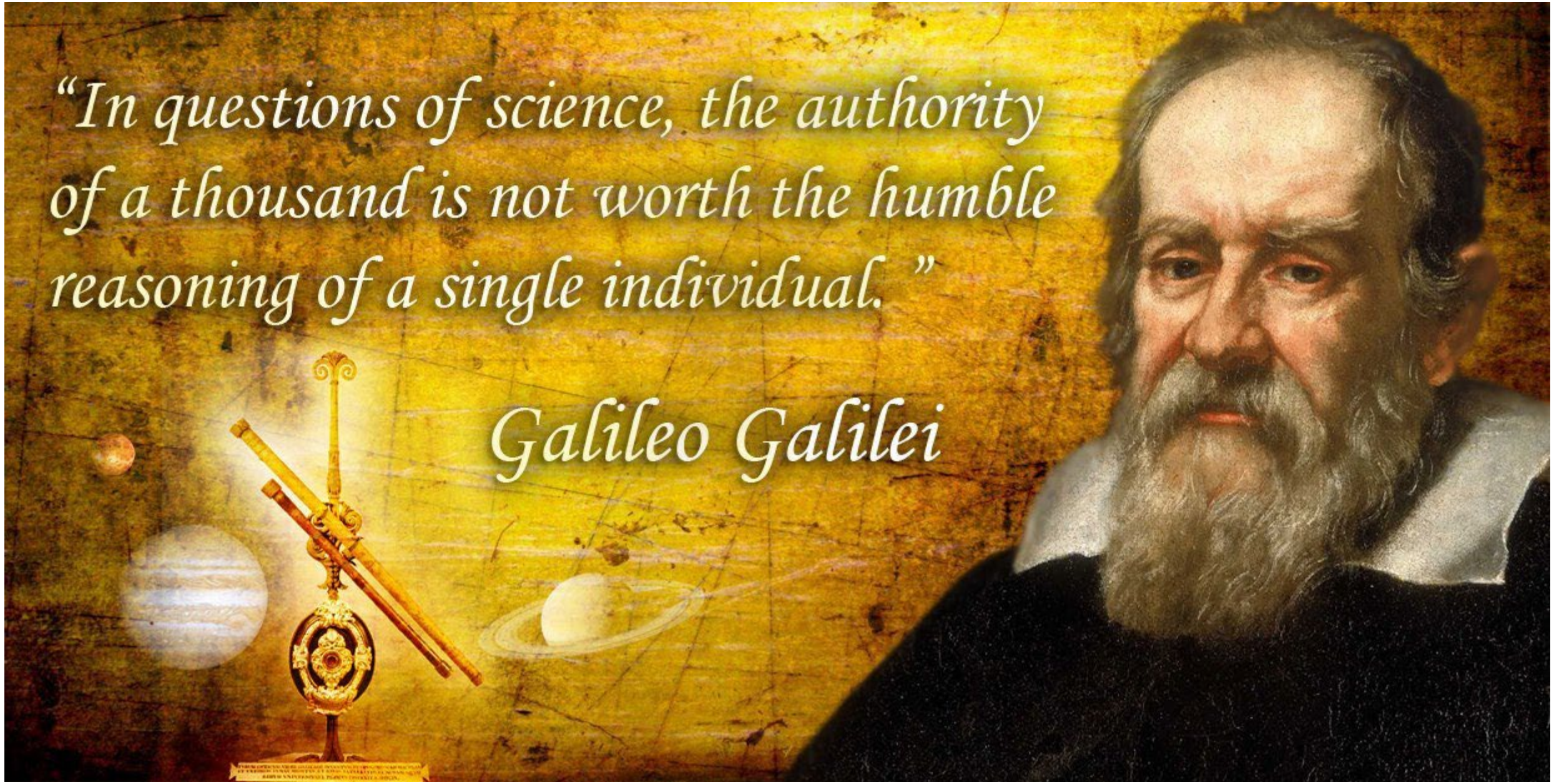
1, Employ your abilities one hundred percent no matter what. 2, Learn from own and others experiences. 3, Take a long-term view.



THE DISRUPTIVE EFFECTS OF AI

Standing on the shoulders of giants

https://en.wikipedia.org/wiki/Standing_on_the_shoulders_of_giants


"In questions of science, the authority of a thousand is not worth the humble reasoning of a single individual."
Galileo Galilei

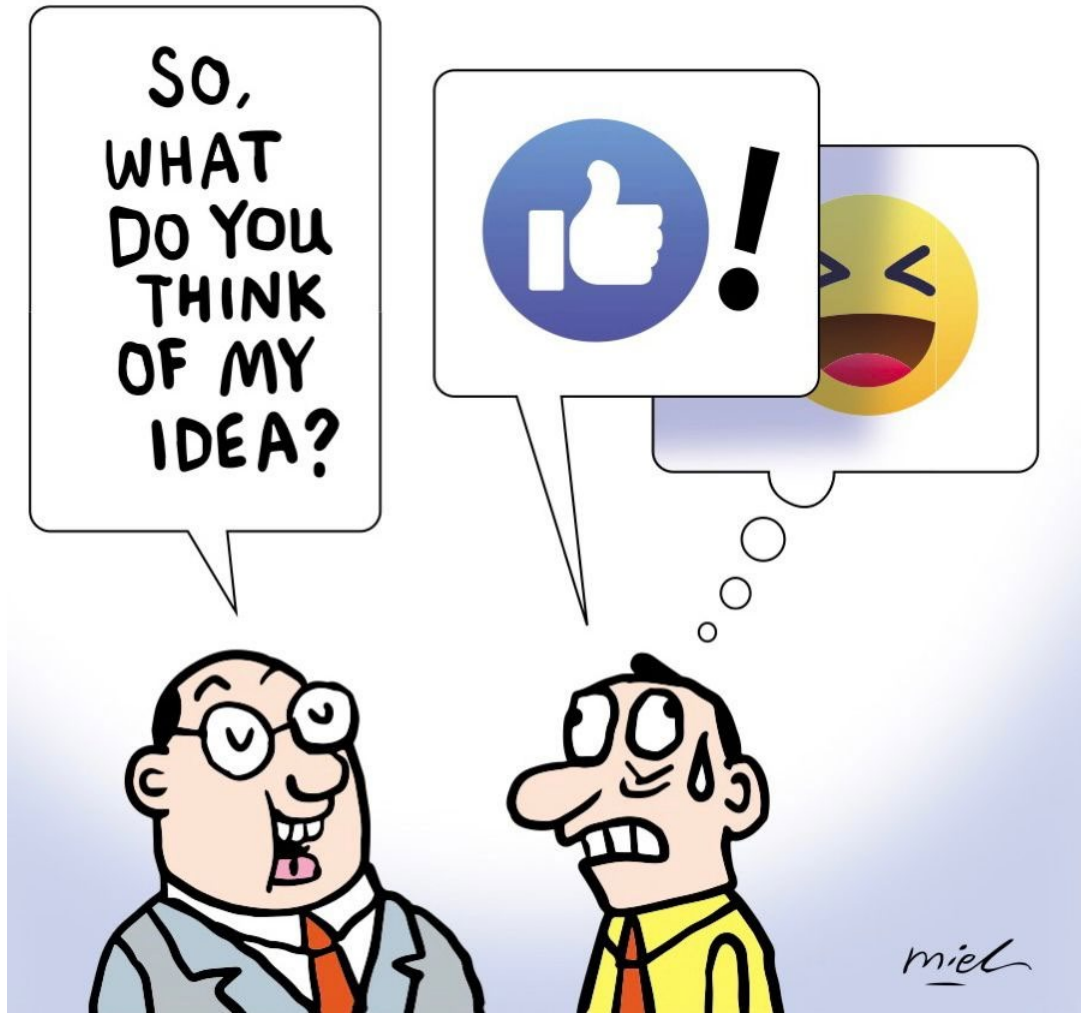
Summary

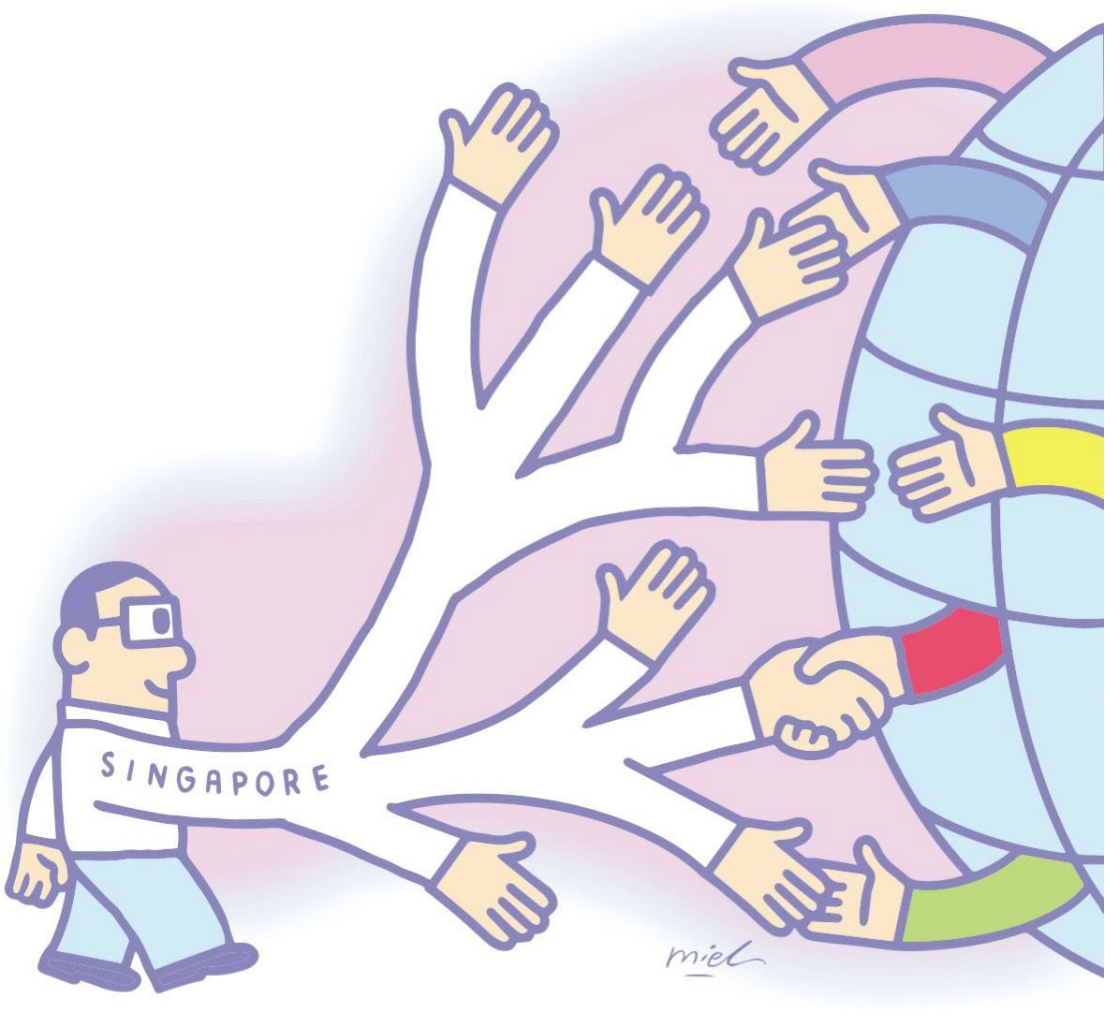
- Current time is dubbed as the most comfortable period in the history of humankind. The median life spans of human beings are inching up around the world. Global population passed the eight billion mark recently. Modernisation, education, and urbanisation are ubiquitous around the world.
- We are witnessing increasing competition among the nations for influence, technologies, and resources. Higher education institutions and their products in terms of graduates, thought leadership, creative innovations, and diverse research outputs are increasingly the focus of global competition.
- Social media | ubiquitous digital technologies shaping the current generation different from the earlier generations.
- Humans are an integral part of nature. Our well-being is tied to the health of its species and the natural functioning of its ecosystems.
- Addressing grand challenges such as climate change, extreme weathers, resources depletion and lack of their equitable access, pollution, biodiversity loss, rising sea levels, food shortages, water shortages, mental stress, human health effects, and growing income, education and technology inequalities require sustained and creative cooperation. Aforementioned developments compelled us to conceive the seventeen United Nations sustainable development goals (SDGs), which are aimed at the well-being of every person in every nation. Thoughtful and well-balanced competition as well as cooperation augur well for the humankind as well as all other living beings on the one and only planet Earth.

DOI 10.1080/07373937.2023.2205799

Summary

*Jose, R., Ramakrishna, S. Humanity's Top Ten Existential Concerns. Mater Circ Econ **4**, 26 (2022). https://doi.org/10.1007/s42824-022-00068-0*


SO, WHAT DO YOU THINK OF MY IDEA?
!
miel


SINGAPORE
miel

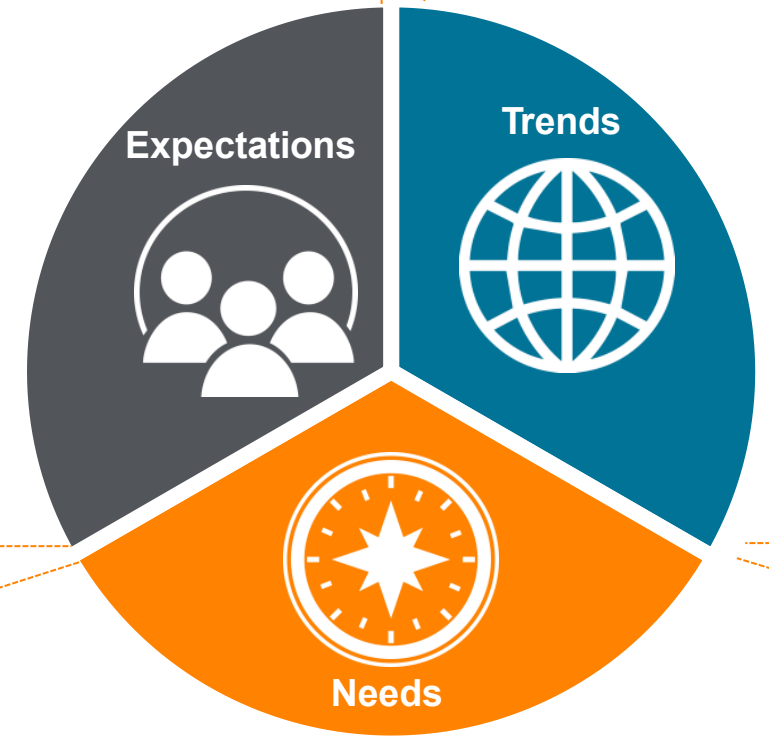
- Major challenges require new approaches, or inter- and transdisciplinarity across academic silos. Complex issues like the drivers and effects of climate change require insights from across various disciplines and all branches of sciences, and horizontal structures across scientific disciplines must be established.
- Universities need to open up to diverse ways of knowing. It is imperative that HEIs promote knowledge that comprises a diverse range of traditions, institutions and epistemologies to promote a truly global knowledge base for the SDGs, yet clearly not one that opposes rational thinking and scientific insights.
- Need for a more proactive presence of HEIs in society through partnerships. HEIs should aim not only to transform their own activities for addressing the SDGs, but also in relation to different sectors of society: the government, private sector and civil society as well as social organizations and communities. The role of universities and HEIs in this context will be even more important as lifelong learning becomes more prevalent.

Education 2030

https://unesdoc.unesco.org/ark:/48223/pf0000380519

The world of research is becoming more competitive

- Economic development
- Faster pay-offs
- Accountability & transparency

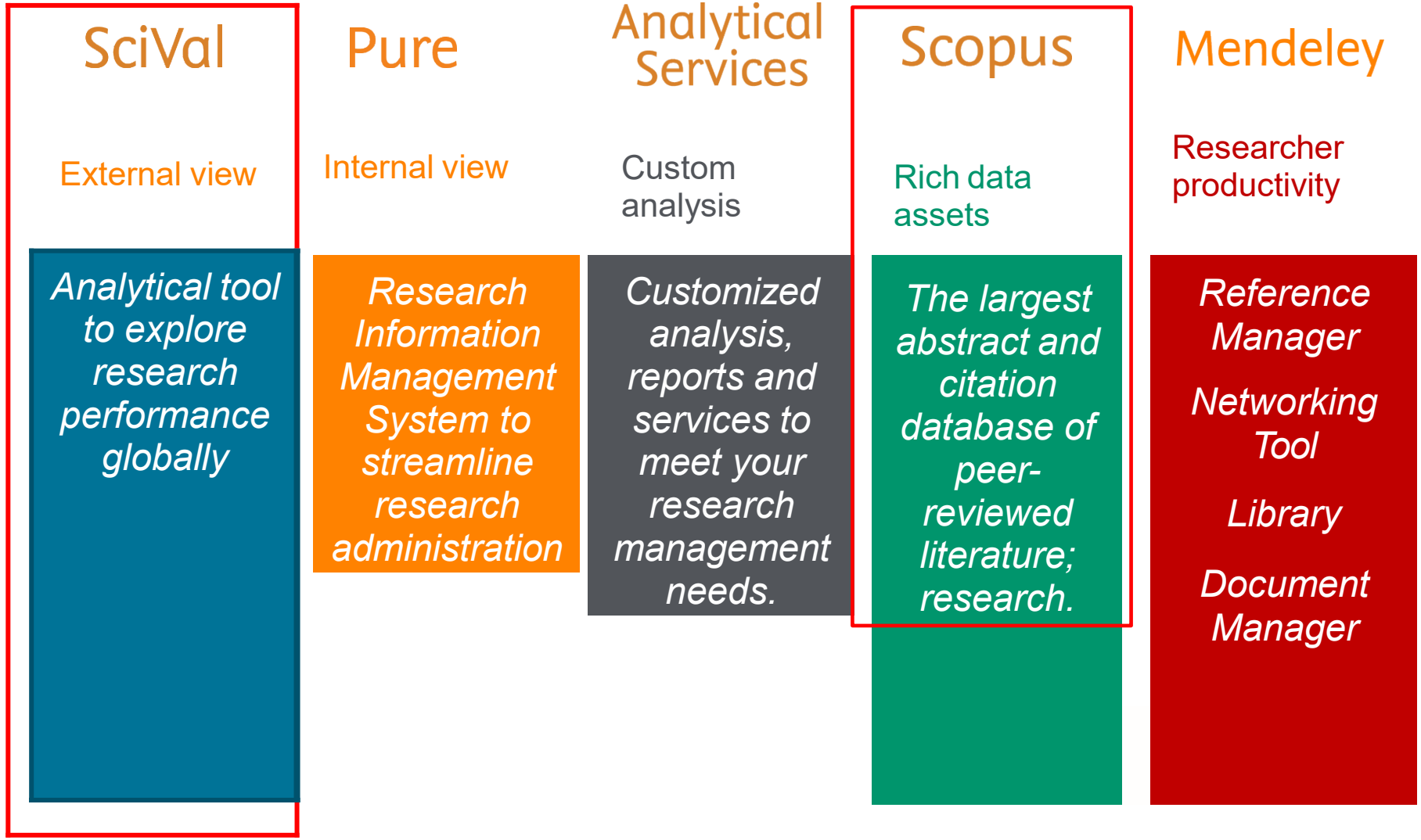


- R&D budgets
- More researchers +output growth
- Emerging research nations (China, India, Brazil)

● Identify strengths and shortcomings to inform research decisions ● Accelerate collaboration ● Secure more funding ● Retain and hire best-in-class researchers

Reference: International Comparative Performance of the UK Research Base 2013

Elsevier Research Intelligence portfolio



Aimed to improve your ability to Establish, Execute and Evaluate research strategy.

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SciVal supports the needs of a broad range of institutional users by providing ready-made, at-a-glance snapshots for flexible, institution-specific insight

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- Create management-level reports
- Accelerate collaboration
- Data to support and win large grants

Department Heads

- Evaluate researchers
- Model-test scenarios

Researchers

- Highlight achievements
- Expand networks
- Locate collaborators and mentors

Find more use cases on our website: https://www.elsevier.com/research-intelligence/case-studies

Basket of Metrics

Filter by: document type, subject limited, normalized, self-citation, absolute numbers vs percentages

Productivity metrics
- Scholarly Output
- Outputs in Top Percentiles
- Publications in Top Journal Percentiles

Citation Impact metrics
- Citation Count
- Citations per Publication
- Cited Publications
- Number of Citing Countries
- *h*-indices (*h*, *g*, *m*)
- Field-Weighted Citation Impact

Collaboration metrics
- Collaboration (geographical)
- Collaboration Impact (geographical)
- Academic-Corp Collaboration
- Academic-Corp Collaboration Impact

Disciplinary metrics
- Journal count
- Journal category count

Snowball Metric: www.snowballmetrics.com/met rics

Predefined and customised entities

SciVal pre-defines 6,300 institutions and 250 nations, and allow users to group those institutions and entities on-demand.

Ready-to-use & Create your own

- Institutions (+ groups)
- Countries (+ groups)
- Research Areas
  - Search terms
  - Entities
  - Competencies
- Researchers (+ groups)
- Publication sets (+ groups)

- Access to pre-defined 6300+ institutions, 250 countries and groups (i.e. EU28, US states, German Bundesländer, Russell group and more)
- Ability to create any desired grouping of entities, researcher groups or documents

Is Impact Factor a Good Measure of Quality? Citation Manipulation

May 7, 2022 | Impact Factor, Predatory Publishing

Although initially created to help libraries determine which journals to include in their catalog, ***Journal Impact Factors*** (JIF) have become one of the most utilized measures of journal ranking and they are increasingly used for performance evaluations, tenure, promotion, and research grant decisions. It is also a measure that some editors manipulate.

JIF is a mark of prestige, and editors are feeling pressure to raise their scores to ensure their journals stay relevant. This scenario can motivate scholars and editors to violate research norms, using several known methods of impact factor score manipulation. One is the use of editorials, comments, and letters in the journal. By a quirk of the JIF formula, these nonrefereed entries are not included in the denominator, but citations to them are added to the numerator. A second strategy is to publish review articles or retrospectives on topics that have been recently covered in their journal.

About the Journal Citation Indicator (JCI)

The Journal Citation Indicator will bring citation impact metrics to the full range of journals indexed in the Web of Science Core Collection, increasing the utility of the JCR as it expands its coverage to more than 21,000 scholarly publications. Providing this information for around 7,000 journals in the ESCI will increase exposure to journals from all disciplines, ranging from international and broad scope publications to those that provide deeper regional or specialty area coverage. This will enable users to understand how they compare to more established sources of scholarly content. By incorporating field normalization into the calculation, the JCI will also allow users to compare citation impact between disciplines more easily and fairly. It is designed to complement the Journal Impact Factor (JIF) and other metrics currently used in the research community, and when used responsibly will support more nuanced research assessment.

https://predatoryreports.org/news/f/is-impact-factor-a-good-measure-of-quality-citation-manipulation?blogcategory=Impact+Factor

Beall's List

Web of Science Group | A Clarivate Analytics company

Clarivate announced the exclusion of 82 journals from the Web of Science core collection. **This also means that these de-listed journals lost their Impact Factor.**

The announcement was made in the midst of a series of complaints that have been made against major scientific publishers suspected of not carrying out the due process of peer review, publishing articles without scientific rigor in exchange for high publication fees, mostly paid with public money.

Publisher	De-listed	Core Collection	%
Hindawi LTD	15	163	9,2%
Routledge Journals, Taylor & Francis LTD	4	1187	0,3%
Wiley-Hindawi	4	26	15,4%
AME Publishing Company	2	18	11,1%
BMJ Publishing Group	2	59	3,4%
MDPI	2	207	1,0%
Sage Publications LTD	2	428	0,5%
Springer	2	1060	0,2%
Springer Heidelberg	2	301	0,7%
Wiley	2	1356	0,1%

https://predatoryreports.org/news/f/web-of-science-de-listed-82-journal-including-15-from-hindawi

QS World University Rankings: Sustainability

- In 2022, the QS World University Ranking introduced its first sustainability rankings.
- The QS World University Rankings: Sustainability provides students with a unique lens on which institutions are demonstrating a commitment to a more sustainable existence.
- The Ranking has two categories: **Environmental Impact and Social Impact**. Each of these categories is worth 50%, which is then combined.

Environmental Impact

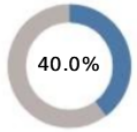
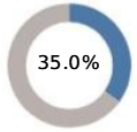
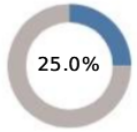
- **Sustainable institutions**
  - whether a university holds membership in officially recognized climate action or sustainability groups,
  - has a publicly available sustainability strategy, procurement / investment policies, and energy emissions report,
  - alumni impact in promoting sustainability in corporate sector
  - has student societies focused on environmental sustainability, and
  - a published commitment to becoming NetZero.
- **Sustainable education**
  - academic reputation within earth, marine and environmental sciences courses,
  - alumni impact in sustainability in non-corporate sectors – NGOs, think-tanks etc.,
  - availability of courses that embed climate science and/or sustainability within the curriculum.
  - if a university has a research centre dedicated to environmental sustainability
- **Sustainable research**
  - assesses the university's research activity around the United Nation's Sustainable Development Goals and
    - Quantity of research and citations, and quality of journals published
    - SDG7 (affordable energy), 9 (sustainable infrastructure), 11 (safe human settlements), 12 (responsible consumption), 13 (climate action), 14 (life below water), 15 (life on land)
  - whether the government is funding research and development in this area.

Social Impact

- **Equality**
  - the proportion of female students, and female faculty, women in leadership
  - the availability of public equality, diversity and inclusion policy, and disability support available.
  - Quantity and quality of research in SDG5 (gender equality) and 10 (reduced inequalities)
- **Knowledge exchange**
  - commitment to knowledge transfer in collaboration with less-economically-supported institutions,
  - inclination to partner with other institutions and organizations.
  - partnership with industry
- **Impact of education**
  - research into SDG 4 (quality education),
  - alumni impact in education and academic reputation in relevant social subjects, and
  - how free students and academics are in pursuing their research without censorship.
- **Employability and opportunities**
  - gives each university an employer reputation score and an employment outcomes score, based on how prepared students are for successful careers.
  - research into SDG8 (decent work and economic growth), and SDG16 (peace, justice and strong institutions),
  - rate of unemployment within the country they're based in.
- **Quality of life**
  - commitment to wellbeing within and outside of the university
  - research activity into SDG1, 2, 3, 6 - quality of life, health options on campus and air quality in the region, for example.

QS World University Rankings: Sustainability

Environmental Impact

Sustainable Education	This lens assesses how institutions are educating students to both understand and make a difference to the environment. It combines: academic reputation in Earth and Marine Sciences & Environmental Science; alumni outcomes data on those who go on to drive policy and third-sector work in the environment; presence of environmental research centres and available curriculum on climate related subjects. The data is aggregated to form a final score.	
Sustainable Institutions	This lens assesses the institution's strategy and operations towards an environmentally sustainable future. It asks whether or not an Institution has a) committed to environmental impact alleviation and b) demonstrated that commitment. Data from alumni, operations and policies, staff perceptions and reporting & governance are aggregated to form the final score.	
Sustainable Research	This lens assesses the impact of the research being done in areas aligned to specific UN SDG's, giving an indication of the relative research environment and attention being given to these crucial topics. It combines research data on the following SDGs: 7, 11, 12,13,14, & 15. It also brings in national-level data on research spend as a proportion of GDP. The data is aggregated to form a final score.	

Social Impact

Employment & Opportunities	This lens assesses the ability of the institution to propel graduates into strong careers, as well as the strength of connections the institution has with employers. We also survey alumni to ask how their institution prepared them for their careers, measure the impact of research into SDG 8, 9 and 16, and then add national-level statistics on employment. These are aggregated to produce a score.	
Equality	This lens assesses the climate of equality at the institution. It aggregates the following data to produce a score: research being done by institutions in SDGs 5 and 10; the operational activities of the institution; student and staff gender ratios; and national-level statistics on equality.	
Life Quality	This lens assesses the institution's impact on research into areas that affect our health and wellbeing as well as those of other living creatures. It looks at the research impact of SDGs: 1, 2, 3 and 6 and then overlays national-level statistics. We aggregate these to produce a final score.	
Impact of Education	This lens assesses the education provision and quality of certain subjects at the institution which most closely align with 'society': Education, Politics, Social Policy, Law, Art & Design. It also looks at research into education, and alumni impact in the education sector. National-level statistics on education are also included. These are all aggregated to produce a score.	
Knowledge Exchange	This lens assesses how institutions partner in research and with industry to share knowledge and spur educational growth. It has two research collaboration metrics and one research partnership with industry metric. These three metrics are aggregated to produce the score.	

Times Higher Education (THE) Impact Rankings

- The Times Higher Education Impact Rankings assess universities against the United Nations' Sustainable Development Goals (SDGs).
- It provides comparison across four broad areas: **research, stewardship, outreach and teaching**.
- The 2022 Impact Rankings is the fourth edition and the overall ranking includes 1,406 universities from 106 countries/regions

Definitions of areas

Research: the most obvious and traditional way that a university might help to deliver the SDGs is by creating research in relevant topics.

Stewardship: universities are custodians of significant resources; not just physical resources, but also their employees, faculty and students. How they act as stewards is one of the key factors in delivering the SDGs.

Outreach: place is critical in higher education, and the work that universities do with their local, regional, national and international communities is another key way that they can have an impact on sustainability.

Teaching: teaching plays a critical role, both in ensuring that there are enough skilled practitioners to deliver on the SDGs, and in making sure that all alumni take forward the key lessons of sustainability into their future careers.

SDGs included in ranking

The ranking takes into account all 17 SDGs.

Universities can submit data on as many of these SDGs as they are able. Each SDG has a series of metrics that are used to evaluate the performance of the university on that SDG.

Any university that provides data on SDG 17 and at least three other SDGs is included in the overall ranking.

Times Higher Education (THE) Impact Rankings

- **How is the ranking created?**
  - A university's final score in the overall table is calculated by combining its score in SDG 17 with its top three scores out of the remaining 16 SDGs.
  - SDG 17 accounts for 22 per cent of the overall score, while the other SDGs each carry a weight of 26 per cent.
  - This means that different universities are scored based on a different set of SDGs, depending on their focus.
  - The score from each SDG is scaled so that the highest score in each SDG in the overall calculation is 100 and the lowest score is 0.

- **Scoring within an SDG**
  - There are three categories of metrics within each SDG:
  - Research metrics are derived from data supplied by Elsevier.
  - Continuous metrics measure contributions to impact that vary continually across a range – for example, the number of graduates with a health-related degree.
  - Time frame