SWISSQUOTE MAGAZINE

FINANCE AND TECHNOLOGY UNPACKED

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DOSSIER

Swiss research under threat

→ Researchers concerned over budget cuts

→ Exclusive interviews with Joël Mesot, president of ETHZ, and Martin Vetterli, president of EPFL

BITCOIN
Our report from El Salvador

ENERGY
The Lithium Rush

SKI
A major shakeup to Swiss ski resorts

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HUBLOT

THE ART OF FUSION

BIG BANG UNICO

Titanium and blue ceramic case.
In-house UNICO chronograph movement.

HUBLOT

EDITORIAL

Looking to the future

Nothing remains unchangeable. A flower we forget to water will die, an untended love fades away. It's the same for Swiss excellence. We see the result of dozens of years of investment in education, research and innovation. This excellence is not a given, but rather requires work every day and regular care. Alas, as we've shown in this issue, this effort is slowly slipping away. At the national level, the Confederation is cutting even more budgets for education, research and innovation, whereas globally, Switzerland continues to be excluded from the European research programmes Horizon Europe and Erasmus+.

Given this situation, scientists are sounding the alarm via articles in this issue: they're starting to see the first signs of wear and tear on our excellence. Of course, in all the international rankings, Switzerland remains one of the best in class. But the first signs of a downgrade are already present: at ETHZ, top researchers are leaving to join the Max-Planck Institute in Germany. In Geneva, the start-up ID Quantique opened a branch in Vienna (Austria) rather than expanding in Switzerland. In Lausanne, EPFL is forced to limit the number of students to save money and maintain a quality education. These warning signs all show that now is the time to act.

As an alumnus of EPLF and member of the ETH Board since 2017, I will vehemently defend these institutions. But I also believe that the history of Swissquote itself is a testament to the excellence of Swiss education. If I hadn't studied at EPFL, I would never have met my good mate Paolo Buzzi. And if we didn't receive the high quality education that we did, we would never have thought to start Swissquote and certainly wouldn't have had the expertise needed to turn it into a company that employs more than 1,000 people in Switzerland 25 years later.

Swissquote is the story of my life. But it is only one story among many. In 2023 alone, nearly 80 startups were created from EPFL and ETHZ. Some of them will be the Swissquote of the future. With university budget cuts and exclusion from European research programmes, we're risking this incredible potential. In the exclusive interviews with Luciana Vaccaro, president of swissuniversities, Joël Mesot, president of ETHZ, Martin Vetterli, president of EPFL and Michael Hengartner, president of the ETH Board, they all agree: we cannot let the flowers die, the love fade away – we cannot let Swiss excellence decline.

We hope you enjoy reading!

BY MARC BÜRKI,
CEO OF SWISSQUOTE

c o n t e n t s

i m p r e s s u m

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ABB robots at a Volvo car manufacturing plant.

ROBOTICS

Volvo brings in ABB's modular robots

Volvo is set to deploy 1,300 of the latest generation of industrial robots supplied by Swiss company ABB at its electric car plants in Torslanda, Sweden, and Daqing, China. What makes these machines special is that they are fully modular, meaning that their parts are interchangeable to suit the task at hand. As such, they can handle payloads of between 150 kg and 310 kg and have a reach of 2.5 metres to 3.2 metres. ABB's robots will be used for tasks such as spot welding, riveting and ultrasonic weld inspection. Another advantage is that they use 20% less energy than the previous generation of robots. → ABBN

RANKING

Top five motor vehicle producing countries
(absolute figures in 2022)

1. CHINA **27,020,615**
2. UNITED STATES **10,060,339**
3. JAPAN **7,835,519**
4. INDIA **5,456,857**
5. SOUTH KOREA **3,757,049**

Source: OICA

The top five most valuable luxury brands
(based on brand value)

1. LOUIS VUITTON **$47.2 BN**
2. GUCCI **$22.6 BN**
3. HERMÈS **$21.6 BN**
4. CHANEL **$12.8 BN**
5. CARTIER **$12.2 BN**

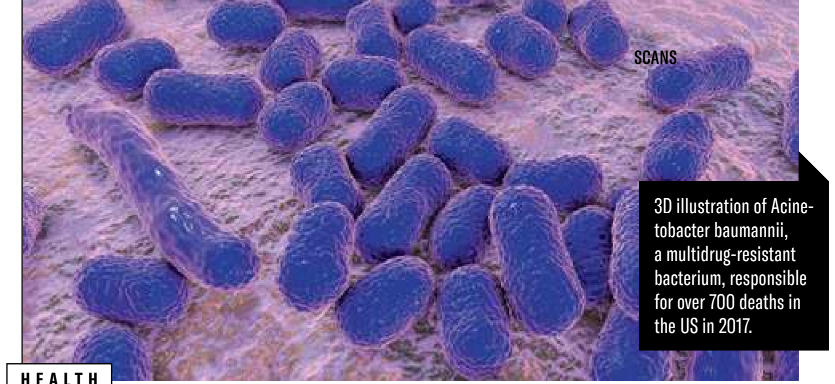
Source: Forbes

"We're building ChatGPT into every course as your personalized tutor"

Jeff Maggioncalda, CEO of online course provider Coursera.

8%

Percentage of electric vehicles sold in the United States in the third quarter of 2023. The share is rising but remains low by international standards. In the first nine months of the year, fewer than 1 million electric vehicles were sold in America, which cherishes its love affair with the automobile. That is almost half as many as in Europe and four times fewer than in China.



3D illustration of Acinetobacter baumannii, a multidrug-resistant bacterium, responsible for over 700 deaths in the US in 2017.

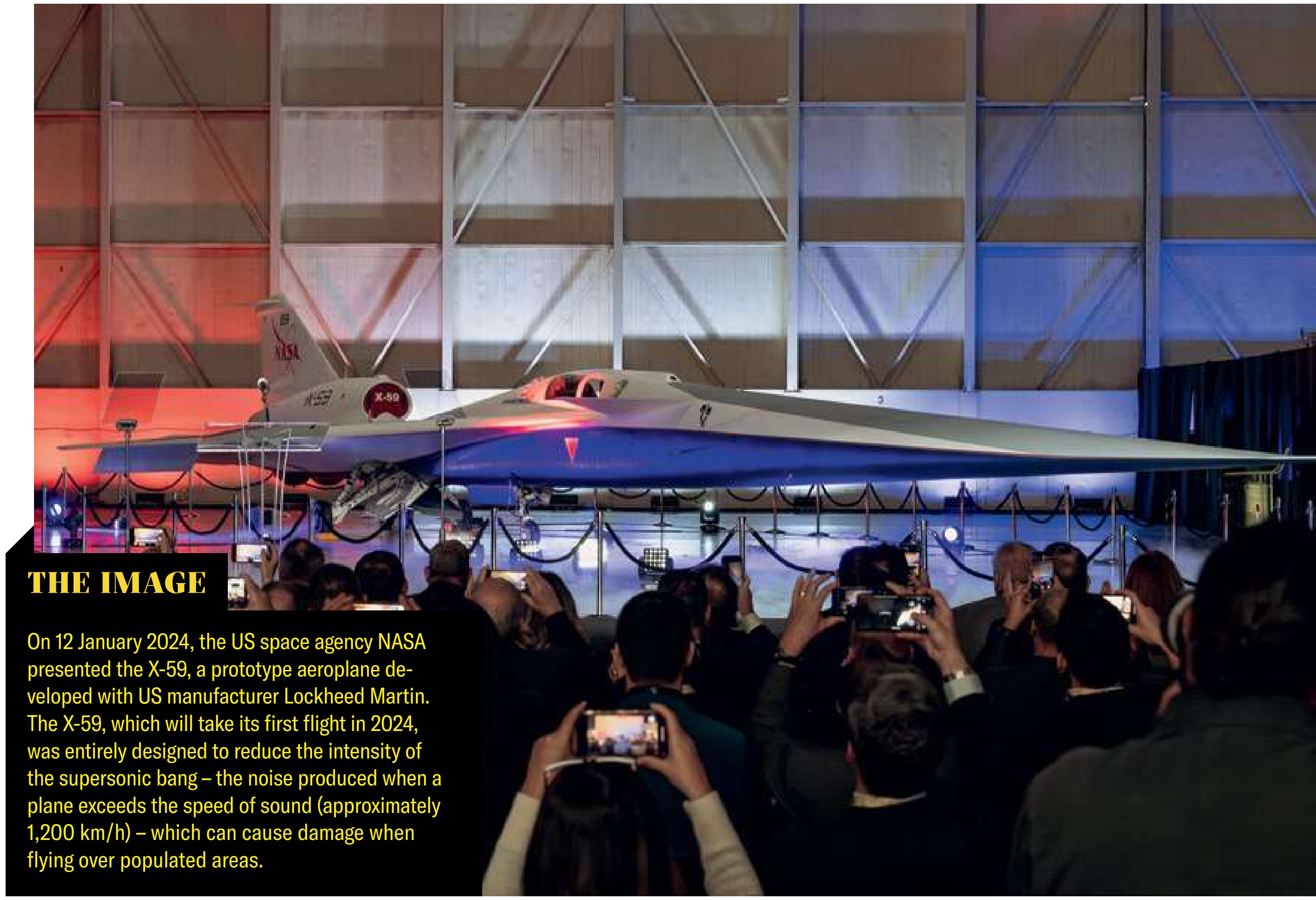
HEALTH

Roche announces a new antibiotic

The pharmaceutical group Roche and researchers at Harvard University have developed a new antibiotic. The drug is used to fight a bacterium that is resistant to antibiotics, is typically found in hospitals, can cause pneumonia, and kills 60% of the patients it infects. Acinetobacter baumannii caused 700 deaths in 2017 in the United States alone. The new drug, Zosurabalpin, works by interrupting the construction of the bacterium's outer membrane. It has been tested on mice and 64 patients as part of phase I clinical trials. If successful, it would be the first completely new antibiotic to hit the market since the 1980s. Pharmaceutical groups are reluctant to invest in research and development for this unprofitable class of drugs. → ROG

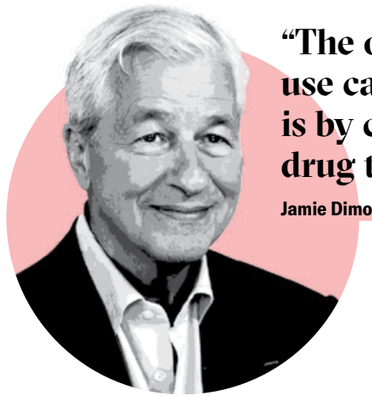
$400 BN

Annual global sales of luxury goods. This figure has tripled in two decades, reflecting growing purchasing power in emerging countries, especially in Asia. However, Europe is the main winner here, as brands from the Old Continent account for two-thirds of luxury sales, Deloitte reports.



THE IMAGE

On 12 January 2024, the US space agency NASA presented the X-59, a prototype aeroplane developed with US manufacturer Lockheed Martin. The X-59, which will take its first flight in 2024, was entirely designed to reduce the intensity of the supersonic bang – the noise produced when a plane exceeds the speed of sound (approximately 1,200 km/h) – which can cause damage when flying over populated areas.



“The only true use case for crypto is by criminals and drug traffickers”

Jamie Dimon, CEO of JP Morgan Chase.

150,000

Number of replacement parts that Alstom has produced since 2016 using 3D printing. With this process, the company can repair its trains more quickly from its regional depots, located in Europe, Canada, India, Turkey and Singapore. Altogether, 150 printers are in use.

SHIPPING

Global shipping is sinking in the Red Sea

The narrow strip of water linking the Red Sea to the Gulf of Aden normally handles 10% of the world’s sea freight. But the number of ships passing through it has plummeted since a series of attacks launched by Yemen’s Houthi rebels to protest the Israeli invasion of Gaza. In retaliation, London and Washington initiated strikes that have prompted even more oil tankers to avoid the region. The Swiss company MSC, Denmark’s Maersk and Hapag-Lloyd from Germany have all stopped using the route. Their ships now circumnavigate the African continent, making the journey between Asia and Europe almost 10 days longer and costing an extra $3 million per ship. As a result, the average cost of shipping a 40-foot container from one point to another has sky-rocketed from $1,875 in mid-December to $5,650 in mid-January.

→ MAERSK → HLAG

Yemeni rebels head towards the Galaxy Leader on 5 December 2023. The cargo ship had been boarded a few days earlier, in the Red Sea.

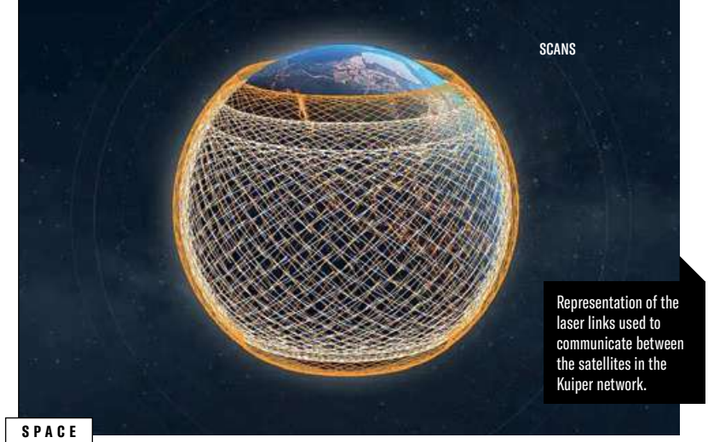
© KEYSTONE / AMAZON

MARKETING

Ad-free social media

Always looking for ways to diversify its revenue streams, Meta has begun offering its European audience an ad-free version of Facebook and Instagram for €9.99 a month. X has also launched an ad-free paid version. Snapchat is testing this model in several countries, including Brazil, France, Indonesia and Australia. This retreat from advertising comes in contrast to Netflix and Disney+, which are going in the opposite direction. Recently, the platforms have launched low-cost subscriptions that deliver content in exchange for a few ads, in a bid to broaden their user base. Amazon Prime Video is about to follow suit.

→ META



Representation of the laser links used to communicate between the satellites in the Kuiper network.

SPACE

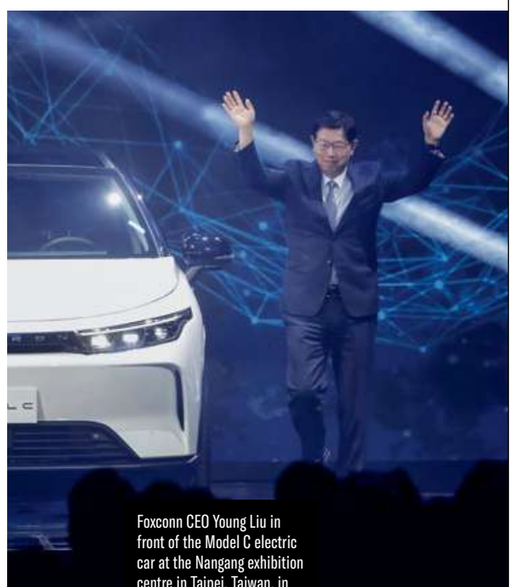
Amazon joins the satellite war

Amazon’s Project Kuiper is a network of mini satellites being developed to bring internet access to underserved communities. The online retail giant recently announced that testing on two prototypes was successful and that it was preparing to engage scale production for full deployment. But Amazon is not the only one eyeing this market. SpaceX, Elon Musk’s company, already has thousands of mini satellites in orbit. Its service via Starlink has more than 2 million subscribers and is playing a crucial role in the war in Ukraine. OneWeb, a Eutelsat subsidiary, has launched 630 satellites into orbit. Amazon does, however, have one considerable advantage: it can produce cheap satellite dishes to capture the internet signal. The group estimates that it can manufacture them for $400 apiece, three times less than SpaceX, which sells its own dishes, at a loss, for $599.

→ AMZN

JOINT VENTURES

Foxconn looking into eco-friendly cars



Foxconn CEO Young Liu in front of the Model C electric car at the Nangang exhibition centre in Taipei, Taiwan, in October 2022.

Foxconn wants to duplicate the model on which it built its fortune, namely electronics assembly, with electric cars. Last November, the Taiwanese group floated one of its subsidiaries, Foxtron, a joint venture with the car manufacturer Yulon. In early 2024, Yulon’s Luxgen N7 SUV began selling in Asia. Also, a partnership deal was signed with pickup manufacturer Lordstown Motors, which bought a General Motors plant in Ohio in 2019, serving as a door into the US market. In addition, it is also in talks with Fisker Automotive for its Pear model to be manufactured there. Foxconn is targeting a 5% share of the electric car market by 2025, and eventually up to 50%. → 2354

THE QUESTION

Despite the recent issues with the 737 MAX 9, Boeing continues to enjoy record demand for its equipment. Why is that?

“A piece of fuselage falling off an Alaska Airlines plane during a flight comes 20 months after the grounding of the 737 MAX 8 following two fatal accidents, and the pandemic, during which the group had to part with a significant number of employees and their expertise. All of the above has undoubtedly led to quality control problems. But Boeing is not at risk of losing any clients. Its order book is full, with a wait time of several years for short-haul planes. It’s also difficult for an airline to change suppliers: that requires retraining pilots, hiring new engineers and reviewing inventory of spare parts. There’s also a lack of options: aeroplane manufacturing is dominated by Boeing and Airbus. Increased costs to develop a new aeroplane have introduced high barriers to entry for this market.”

John Strickland, British expert in the air industry and founder of JLS Consulting.

"First class for many international carriers is an egotistical charitable act, which is not commercially sustainable"

Tony Douglas, CEO of Riyadh Air, which only offers economy and premium economy classes.

THE IPO

Mixue Bingcheng, the bubble tea giant

In China, you cannot walk more than a few metres without coming across a place selling bubble tea, iced tea filled with tapioca pearls. The largest chain is operated by Mixue Bingcheng, which has 36,000 stores and is gearing up for its IPO on the Hong Kong Stock Exchange. More than 20 brands compete in this fiercely competitive market, but the group stands out for its low prices and its presence in many medium-sized towns. Yet, in China's slower economy, Mixue Bingcheng is having to look beyond Chinese borders. Already operating 4,000 stores abroad, mainly in Southeast Asia, the company wants to continue expanding and move into new markets, such as Australia. The funds raised from its IPO should make that possible.

AVIATION

Supersonic flights are back

Launched in 1993, the iconic GE90 turboprop, which powers the Boeing 777 notably, paved the way for the development of wide-body engines.

The US firm GE Aerospace is working to develop a new air-breathing rotating detonation engine, moving away from the fuel and oxygen combustion engines that power conventional aircraft. This technology will make achievable speeds of up to Mach 5, five times the speed of sound. Designed thanks to advances in digital modelling and new alloys capable of withstanding extreme temperatures, the engine will initially be used in missiles. Ultimately, it could be used to develop a new supersonic airliner, the first since the demise of Concorde in 2003.
→ GE → RTX

LUXURY

Richemont, going nowhere

The online luxury fashion retailer Yoox Net-a-Porter, owned by Richemont, has weighed on the Swiss group's earnings for several years now. In the six months from April to September 2023, its sales fell 10%, and it registered a loss of €128 million. The solution was supposed to come from the sale of a 47.5% stake to its British competitor Farfetch, in an agreement signed in August 2022. But Farfetch's finances are not stellar. Its shares fell below the $1 mark mid-December, far from its peak at $73 in February 2021. Plus, rumours of bankruptcy or takeover have begun to circulate. This ended up derailing the deal in late 2023. Richemont, which wants to concentrate on its more profitable jewellery and haute couture businesses, is now back where it started, forced to reinvent its online strategy. → CFR

The Sakaka photovoltaic park, operated by Acwa Power, in Saudi Arabia.

ENERGY

Acwa Power, Saudi Arabia's new renewable energy champion

Mohammed bin Salman, the crown prince of Saudi Arabia, pledges that 50% of electricity in the kingdom will come from renewable sources by 2030. Two-thirds of this capacity, or some 40 gigawatts, will be supplied by a single company, Acwa Power. This desalination company was listed on the stock exchange in 2021. Since then, its capitalisation has increased four-fold to $50 billion. Acwa Power is implementing an extensive investment programme in solar and wind farms, backed by the Public Investment Fund and generous loans from Saudi banks. In addition to Saudi Arabia, the firm currently has projects in Bahrain, Egypt, Jordan, Oman, Turkey and the United Arab Emirates, for total capacity of 54 gigawatts.
→ 2082

6%

Percentage of GDP that Russia plans to spend on defence in 2024, a high since the days of the Soviet Union. This expenditure will add flames to an economy that is already overheating. Inflation hit 7.4% in December, forcing the Central Bank to raise interest rates to 16% to stave off the pressure.

"We are somewhere between a decade and two decades away from supply chain independence"

Jensen Huang, Nvidia's CEO, dashing American hopes for semiconductor self-sufficiency.

SWISS SCANS

AI

AI: Swisscom partners with Nvidia

In January during the World Economic Forum (WEF) in Davos, Swisscom announced it was partnering with US manufacturer Nvidia to develop a powerful Artificial Intelligence (AI) structure for its services. The Swiss telecoms leader plans to invest up to 100 million Swiss francs in AI solutions. The goal is to bring full-stack supercomputers to Switzerland that are equipped with generative AI (GenKI), using hardware and software solutions from Nvidia. Swisscom wants to develop new uses for AI for both its internal processes and client services. With this partnership, the blue giant becomes a reseller of Nvidia technologies, including its graphics cards (GPU).

→ SCMN

BUST

Facebook's Metaverse is an empty shell

Launched with a big stir in 2021, Horizon Worlds, the metaverse opened by Facebook founder Mark Zuckerberg, was originally meant to revolutionise the web. McKinsey estimated that this collection of virtual worlds would generate billions for the companies operating there. Citi valued it at $13 trillion. But in reality, users never came, finding no use for it. Leaked internal group statistics showed that only 9% of the virtual worlds are visited by more than 50 participants or players. Most of the others are empty. The majority of users spend an average of one month on Horizon Worlds before abandoning the platform. This poor performance has strained the finances of Facebook parent Meta, which has already lost $30 billion of the $36 billion invested in this parallel universe.

"AI has the potential to be the great equaliser. We have opportunities ahead of us to address pain points (in healthcare and climate) and to address the sustainable development goals"

Ruth Porat, CFO of Alphabet, during the World Economic Forum (WEF) in Davos this January.

$ 3,990 BN

Value of the National Stock Exchange of India at the end of 2023. The Nifty 50 index has edged out Hong Kong to become seventh place in the world's stock markets, reflecting the strong growth of the sub-continent's economy. Banking, energy and healthcare companies are best poised to benefit, according to HSBC.

© META

Mining for the planet

Can Bitcoin mining encourage green energy solutions? This paradox is discussed in a study from Cornell University in the United States. We take a closer look...

BY LUDOVIC CHAPPEX

© MINASSE WONDIMU HAILU, AFP

← The first of the 13 turbines of the Grand Renaissance Dam in Ethiopia was commissioned on 20 February 2022. Some of the excess electricity produced could be used to mine bitcoins.

For the past several years, Bitcoin miners have been a favourite target of environmental groups. A revolt as strong as the colossal energy impact of this ecosystem, which currently consumes more electricity than entire countries such as Poland or Malaysia to fulfil its incredible computing resource needs. That's a fact, and it is a strong argument against Bitcoin.

But the defence isn't entirely out of arguments either. Due to another fact: the electricity produced, wherever it is in the world, cannot be easily stored, and so it is wasted if it is not used or sent back to an electric grid. In certain countries, the surpluses can reach more than 10% of a region's electric production.

To benefit from this surplus at an advantageous rate, Bitcoin miners have gathered near electricity production sites in regions where energy is cheap. This practice is not new, but it continues to spread, providing regular clientele to owners of electric plants. A win-win solution, with no CO_2 emissions when the electricity is produced in a sustainable way (hydraulic plants, geothermal, wind). One point for BTC.

The study is entitled "From Mining to Mitigation: How Bitcoin can Support Renewable Energy"

But it's possible to push the argument even further. Researchers from Cornell University (in New York State) published a study in late October entitled "From Mining to Mitigation: How Bitcoin Can Support Renewable Energy Development and Climate Action". The authors identified dozens of green electricity production sites in the United States, including 32 in none other than Texas, which actually has the most potential according to the report. The idea is that a wind or solar farm that has not yet been connected to the network is still able to produce electricity, and therefore, sell that electricity. The various locations that are still in the pre-commercial stage of development could already host mining pools (containers full of machines that are relatively easy to move). In Texas alone, the Cornell researchers estimate that such a deal would bring in $47 million in profits to the plant operators. At the scale of the entire United States, the monetisation of energy surpluses could bring in hundreds of millions of dollars. Needless to say, the authors of the study suggest that this manna could be used to invest in other renewable energy projects.

A bright spot in a dark sky full of CO_2? It is indeed a concrete and applicable model, as seen in similar projects conducted in developing countries. In Ethiopia, where hydraulic energy makes up 95% of the energy production and the surplus reaches 25%, the Hashlabs Bitcoin mining company finances plants during their first years of operation. The co-founder Jaran Mellerud explained to the internet media resource Cointelegraph in January: "Ethiopia's utility is monetizing some of this excessively generated electricity by selling it to us while waiting for the country's electricity consumption to catch up (...). I think that large countries, at the government level, will soon become more amenable to mining operations and will understand its potential for energy optimisation." ◢

crypto express

Half a billion crypto holders

The number of people in the world who own cryptocurrencies surpassed a half billion in 2023, according to trading platform Crypto.com. In its annual report published in January, Crypto.com estimates that 580 million people hold cryptocurrencies, compared to 432 million a year earlier, which is a 34% increase in just 12 months. 2023 was marked by two periods of strong purchasing growth. Once in spring, when the price of Bitcoin exceeded $26,000 and Ethereum implemented the Shanghai update, making it possible to unstake ETH. And the other in autumn, when the price of BTC soared from $26,000 to $38,000, carrying some other cryptocurrencies along with it.

Race for ETF Bitcoin spot

With tens of billions of dollars in volume recorded since the launch, the ETF Bitcoin spot is doing quite well. Blackrock, the largest asset manager in the world, is leading the charge, as its fund has surpassed the symbolic threshold of $2 billion on 26 January.

On that day, Blackrock was followed by Fidelity (not far behind at $1.93 billion), Ark Invest ($596 million) and Bitwise ($587.5 million). Since these are public funds, they are subject to market opening hours, which is not the case for the crypto-currency market as it is available 24 hours a day.

Crypto crime declines?

The use of cryptocurrencies for illegal activities declined 40% in 2023 compared to 2022, according to a study by Chainalysis, a New York company that specialises in blockchain analysis. In total, illegal activity associated with money laundering, cybercrime and terrorism did not exceed 0.34% of the total volume of transactions recorded during that period. But the amount received by addresses considered to be illicit did increase in 2022, reaching nearly $40 billion. Further information from the Chainalysis report: Bitcoin is no longer the popular crypto-currency for criminals, as they have turned to stablecoins, which are now used for nearly two-thirds of illicit transactions.

STOCK EXCHANGE

“Chinese stocks are clearly undervalued”

Chinese stock markets had an “annus horribilis” in 2023. Nicholas Yeo, director and head of China Equities at abrdn, believes that the current aversion to Chinese stocks should be seen as an opportunity.

BY BERTRAND BEAUTÉ

Keeping up with stock market predictions is no easy feat... After three long years of quarantines and other restrictions, China ended its zero-COVID policy in January 2023. The announcement held promise of a vibrant economic recovery to come. And financial oracles ran with it, forecasting a recovery in Chinese stocks. But it never came. Over 2023, the CSI 300 – the index with the top 300 stocks listed on the Shanghai and Shenzhen stock exchanges – tumbled 11%, in its the third consecutive year of decline. Meanwhile, Hong Kong’s Hang Seng index fell 14% in 2023. These performances run counter to what was seen in other financial hubs. In 2023, the S&P 500 (an index of the 500 largest companies listed on US stock markets) soared by 24%, and the European Stoxx 600 (600 of Europe’s largest companies by capitalisation) climbed almost 13%. No call for alarm, says Nicholas Yeo. On the contrary, he sees the fall in Chinese stocks over the past three years as a good time for investors to move in. Based in Hong Kong, the head of abrdn’s Chinese equities team answered questions from *Swissquote* on his most recent visit to Switzerland.

With COVID restrictions lifted in January 2023, most experts were expecting Chinese equities to rebound. How do you explain why that hasn’t happened yet?

A lot of expectations were riding on the reopening of the Chinese economy. It raised hopes of a strong, V-shaped recovery in domestic spending. But in the end, the economy is taking longer than expected to turn around. And that has disappointed investors.

“Unlike in the United States, no public money was distributed in China”

Nicholas Yeo, director and head of the China Equities team at abrdn

Maybe forecasts were too optimistic, because people applied the US post-COVID recovery model to China, but that wasn’t going to work. There was definitely a big difference in the way consumers were supported in the two countries. Unlike in the United States, no public money was distributed in China, which partly explains why consumption is slower to recover.

Despite that, I remain optimistic. Today, savings and deposit rates are hitting record levels in China. And I don’t think the Chinese will be willing to keep their money in their accounts for long, because interest rates here are very low. So they will probably start investing again in the markets as well as in consumption, which is likely to accelerate in 2024, as the outlook improves for employment and incomes.

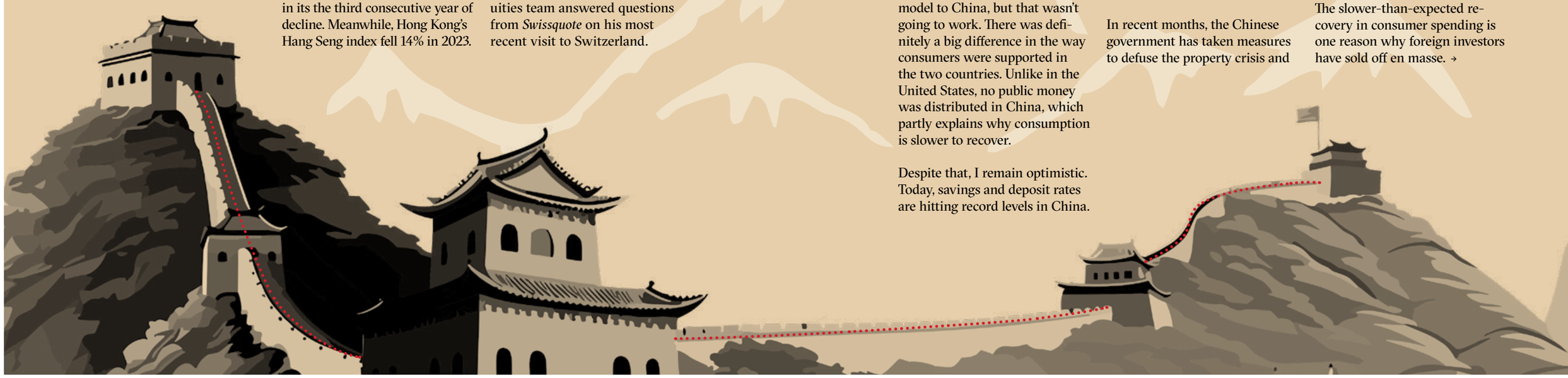
Could the property crisis affecting China thwart this recovery?

Property is the elephant in the room. Just after the post-COVID reopening, people were able to start looking at houses and flats again, which lifted the market. But that only lasted a few months before the property sector, which accounts for 20% of China’s GDP, started to decline again. The problem is that when the property market is weak, it affects wealth. For 60% to 70% of households, their wealth is in the property they own. So when the price of the house you live in falls, your confidence is impacted and you are less motivated to invest your savings.

In recent months, the Chinese government has taken measures to defuse the property crisis and limit debt in the sector. One of the most significant policies was to ease access to mortgages for second-home buyers. Beijing has also embarked on a major urban renovation programme, similar to the shantytown redevelopment plan of 2016-2017. Basically, the government will compensate people for leaving their homes so that they can be renovated. I expect the impact of these laws to increase as they gain momentum.

Due to geopolitical strains between Beijing and Washington, western investors have been snubbing Chinese stock markets. Has that had an impact on share prices?

Domestic investors still account for 90% of the Chinese market. So we shouldn’t overestimate the influence foreign investors have on Chinese stock exchanges. However, the ongoing sale of Chinese stocks by international investors has undermined domestic investors’ confidence. The Chinese have sold quality stocks low, out of fear that foreigners still have plenty of shares to sell. The slower-than-expected recovery in consumer spending is one reason why foreign investors have sold off en masse. →



But political events do in fact play a role. China currently has a bad reputation in the western world, and foreigners are selling for geopolitical reasons. Exacerbating the situation are the elections set to take place in 2024, including in Taiwan (where the separatist candidate, William Lai, was elected president in January) and in the United States.

"Alibaba share lost more than 25% of its value in 2023, while its revenue increased 2% over the same period"

Nicholas Yeo, director and head of the China Equities team at abrdn

Given this context, is now the right time to invest in China's stock markets, or are things still too uncertain?

After three years in a row of decline, the Chinese market is the cheapest of the world's major stock markets. We believe that this situation offers some very attractive opportunities from a long-term investment perspective, because the price of Chinese shares does not at all currently reflect the fundamentals. They are clearly undervalued.

Look at a company like the giant Alibaba. Its share lost more than 25% of its value in 2023, while its revenue increased 2% over the same period.

Which sectors do you think are the best to invest in?

We've identified five sectors that we believe are worth looking into. Firstly, with the increase in wealth and the growth of the middle class, the Chinese population will aspire to a better life. The first is therefore more a category of sectors, which covers all the top-of-the-range goods and services that help to improve quality of life, such as travel, food and consumer electronics. In this category, our portfolio includes, for example, Kweichow Moutai, which produces Moutai (pronounced Mao-Tai), a high-end version of China's national drink, baijiu (pronounced baidjo). I could also mention China Tourism Group Duty Free, the country's leading operator of duty-free shops.

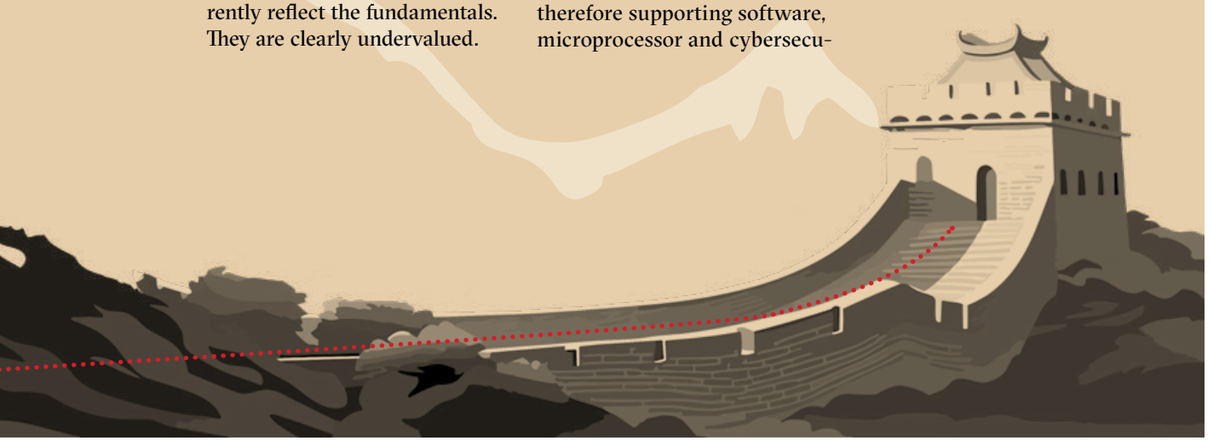
The second sector is digital technology. For several years now, China has been preparing for the worst-case scenario, i.e., being deprived of western technology. The government is therefore supporting software, microprocessor and cybersecurity companies to develop local alternatives to foreign products, such as electronic equipment manufacturer Naura Technology Group.

The third is renewable energy. China wants to develop a greener, less carbon-intensive world, and companies active in this sector have great potential, such as Contemporary Amperex Technology (CATL), the world leader in batteries, and electric vehicle manufacturers including BYD and Geely.

What are the last two sectors?

China's population is ageing, and that will bolster the healthcare sector, with companies like Aier Eye Hospital, which has a network of clinics across the country, as well as firms that develop medicines and medical equipment such as Shenzhen Mindray Bio-Medical Electronics.

The final sector is wealth management and insurance, with companies like Ping An Insurance Group, as growing prosperity means rising demand for these services. ◢



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OUTDOORS

A new life for ski resorts

US group Vail Resorts acquired Crans-Montana, an example of a growing phenomenon of ski resorts being scooped up by large companies. Is this a windfall or a dangerous new development?

BY JULIE ZAUGG

← In November, the American group Vail Resorts announced that it had bought the ski area of Crans-Montana (VS) from Czech billionaire Radovan Vitek. Here, a photo of the resort in 2023.

Announced in late November, the news came as a shock to the Swiss ski world: the US group Vail Resorts would acquire Crans-Montana. Vail acquired 84% of the station's ski-lifts, 80% of SportLife, which operates a ski school, four sport shops and 11 restaurants on the slopes. The transaction, which will be complete in 2024, is worth 118.5 million Swiss francs.

"This acquisition marks the end of a period of turbulence for the resort, which suffered from a lack of professionalism and a short-term vision," said Laurent Vanat, author of an annual report on ski resorts. Since 2013, the resort's infrastructure was owned by Czech billionaire Radovan Vitek via the CPI Property Group. The group was constantly at odds with the local authorities, going so far as to close slopes during Easter holidays in 2018 following a financial conflict with the communes.

Yet Crans-Montana is only the tip of the iceberg. The ski resort industry has been hit by a wave of consolidations over the past decade, and it is just now affecting Switzerland. Vail Resorts, the largest ski resort operator in the world, owns 41 resorts around the globe in the US, Canada, Australia and Switzerland. In 2022, it acquired a 55% stake in the ski-lifts at the Andermatt-Sedrun resort for the price of $149 million Swiss francs.

Its primary competition is US group Alterra, which owns 17 ski resorts across the US and Canada. Closer to home, Compagnie des Alpes operates 10 resorts in France and holds a stake in five others, including heavyweights such as Megève, Avoriaz and Chamonix-Mont Blanc. It also helped build various resorts such as Vedoutchi in Chechnya, and Thaiwoo in China. →

Other players in the ski resort sector include Swedish group SkiStar (six resorts in Sweden and Norway, and one in Austria). Austrian group Schröcksnadel (which owns the ski-lifts at Saas Fee and Savognin) and Greek entrepreneurs Philippe and Spyros Niarchos (who acquired Corvatsch and Diavolezza-Lagalb, in the Grisons).

The ski resorts that are targeted by these acquisitions are generally in debt and burdened by increasing operating costs

A newcomer is also making waves: Frenchman Christian Mars, whose company e-Liberty is based in Neuchâtel and specialises in online ski passes. "I chose to break into the North American market via Quebec, because Vail Resorts and Alterra are less present there," he said. After a few months of planning, he found "the perfect mountain" and in autumn 2023 signed a deal with Mont Grand-Fonds resort for a 99-year lease with construction rights. Less than three months later, he announced the acquisition of a second resort, Mont Lac-Vert, also in Quebec. "The owners of Mont Lac-Vert came to see us, as the resort was experiencing financial difficulties," he said. Discussions are also ongoing with ski resorts in Switzerland and France.

Due to the decline in the number of skiers and global warming, ski resorts are forced to reinvent themselves by developing their summer offerings. Here, a mountain bike trail in Crans-Montana. ↓

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Hiking and mountain bike trails

The ski resorts that are targeted by these acquisitions are generally in debt and burdened by increasing operating costs, in an environment affected by a decrease in the number of skiers, increased electricity costs, and a lack of snow due to global warming. Finances are therefore vital. "During an acquisition, big groups such as Vail Resorts usually agree to significant investments, usually to modernise infrastructure," said Paul Golding, an analyst who covers the US group for Macquarie.

At Crans-Montana, Vail Resorts will invest 30 million francs over five years. "This money will likely be used to improve the ski-lifts, increase our artificial snow making capacities and create a draw for the off-season, such as hiking or mountain biking trails," said Bruno Huggler, director of the Crans-Montana tourism board. The US group hopes that the resort's EBITDA will increase from 5 to 15 million Swiss francs by the end of the decade. It will also provide 110 million Swiss francs to Andermatt-Sedrun.

Similarly, e-Liberty is planning to invest at least $150 million into its two Quebec resorts. "We're going to build 50 chalets at Mont Grand-Fonds," said Mars. "At Mont Lac-Vert, we can build 170 chalets at the summit of the mountain."

The French entrepreneur plans to use the knowledge he acquired with e-Liberty to assist the ski resorts. "We developed a subscription model inspired by EasyJet's dynamic pricing," he said. When demand is low, prices go down and vice versa, in order to maximise the number of skiers on the trails. "After applying this model, Chamonix increased its revenue 40%," he said.

As for Crans-Montana, Bruno Huggler hopes to benefit from the expertise of Vail Resorts in terms of organising large sporting and tourism events year-round. "They hosted the Winter Olympic Games in Whistler in 2019 and the skiing world championships in Vail in 2015," he said. The North American resorts have also become top destinations for weddings and conferences outside of ski season.

But the most significant change for the Valais resort will be its inclusion into Vail Resorts' Epic Pass system. This annual subscription, sold at around 900 Swiss francs, grants access to all ski resorts in the Vail Resorts portfolio, as well as another 20 partnering resorts, including Verbier 4 Vallées in Switzerland, 3 Vallées in France, Ski Arlberg in Austria and Skirama Dolomiti in Italy. Vail Resorts sold 2.4 million Epic Passes this season.

↑ Located in the heart of the Gotthard massif, at an altitude of 1,444 metres, Andermatt-Sedrun became Europe's first ski resort to be acquired by the American group Vail Resorts in 2022.

"The Swiss ski market lost 30% of its clientele between 2008 and 2017"
Sébastien Travelletti, vice president of Magic Pass

Alterra also has an annual pass, the Icon Pass, with a similar system. In Switzerland, the Magic Pass, launched in 2017, includes 69 resorts and costs 899 Swissfrancs. The goal is to increase the number of skiers on the trails. "The Swiss ski market lost 30% of its clientele between 2008 and 2017, dropping from 30 million to 21 million 'day skiers' per year, essentially due to the weak euro and pound against the Swiss franc," said Sébastien Travelletti, vice president of Magic Pass.

To recreate that volume, they needed to encourage fair-weather skiers and those who only came for fresh powder to come more often. One skier brings in approximately 30 Swiss francs in revenue on average, but that number rises to 150 Swiss francs when including food and lodging. It was a successful gamble. "We went from having an average of four days skied per person per season to approximately 10 days skied per person per season," he said.

At Vail Resorts, "the Epic Pass makes up approximately $900 million in revenue, which is the majority of revenue generated by its ski lifts," said analyst Paul Golding. "And since the majority of these passes are sold before the start of the season, it ensures a constant and predictable revenue flow."

But he does warn about eroding margins associated with the many types of subscriptions. "Now skiers can purchase the Epic Pass for just a few days or for a set number of resorts," he said. "This approach caused the revenue per day per skier to plummet." For the Magic Pass, Travelletti calculated that pass holders could not use it more than 12 times per season in order to maintain the magic number of 30 Swiss francs in revenue per visit.

The resorts hope to benefit from wider visibility in markets outside Europe and an influx of foreign passholders coming to visit. "We think that this can bring us American clients, especially from the east coast where Switzerland isn't necessarily any further away than British Columbia or Colorado," said Huggler. The clientele from the United States only makes up 3% of visitors to Crans-Montana.

Despite high expectations, the influx of foreign tourists in the Swiss ski environment does come with some drawbacks. "By imposing their global rate, Swiss ski resorts lose a bit of their freedom," said Christian Mars of e-Liberty. Laurent Vanat says that to encourage customers to buy the Epic Pass, →

Vail Resorts does drive up daily prices to prohibitive amounts, up to $270.

> **“Swiss resorts have a long history and support a vibrant local economy”**
> **Bruno Huggler**, director of the Crans-Montana tourism board

While he agrees that the price of the daily pass has indeed increased at resorts affiliated with the Magic Pass, Travelletti doesn’t think that Switzerland will undergo such a change. Unlike in the United States, where resorts are often several hours drive away from each other, skiers have more choice in Switzerland. “If Crans-Montana increases the price of its daily pass to 300 francs and Anzère stays at 63 francs, clients will be unwilling to pay the higher amount,” he said.

In the United States, some resorts also have issues of too many skiers on the trails, short seasons, closed ski-lifts and staff shortages due to poor working conditions, after an acquisition from Vail Resorts. In 2021, residents from Stevens Pass in Washington state started an online petition to complain, which gathered 46,460 signatures.

The model of the American resort, based on ski lessons, lodging, sport shops and restaurants in addition to ski lifts, is also a cause for concern for some. “This model does not translate to Switzerland,” said Vanat. Our resorts are completely fragmented, with many small merchants.” But Alterra, Compagnie des Alpes and SkiStar have also adopted this model.

Faced with these concerns. Bruno Huggler seeks to be reassuring. “Vail Resorts told us several times that they weren’t here to transform everything. They know that our resorts have a long history and support a vibrant local economy.” ◢

Why did Vail Resorts expand?

→ Vail Resorts founders Earl Eaton and Pete Seibert pictured on the Colorado slopes in 1962.

The history of Vail Resorts began in 1957, when Earl Eaton, a resident of Vail, Colorado, brought real estate developer Pete Seibert to the mountain. The two men decided to build a resort there, founding Vail Associates. The ski area opened in 1962. In 1997, the group went public and was renamed Vail Resorts.

It then began a slew of acquisitions, buying 41 resorts including two in Switzerland, three in Australia and one in Canada – the massive Whistler Blackcomb. With more than 6,000 employees, the group also acquired hotel chain RockResorts, sport shops Specialty Sports Venture, real estate company Slifer Smith and Frampton in Vail and the Grand Teton Lodge Company in Wyoming. For the year ending 31 July 2023, the group generated $2.88 billion in revenue, up 14.4%.

The company’s expansion to Europe was the result of a saturated original market. “Vail Resorts and Alterra acquired all the top ski resorts in North America and Australia,” said Paul Golding, an analyst at Macquarie who covers the group. “To expand further, the only place left to go was Europe.” The opportunities are plentiful. ”Europe has 240 million day skiers per season, compared to 80 million in North America”, said Laurent Vanat, the author of an annual report on ski resorts.

Despite these appealing perspectives, Paul Golding has given a neutral recommendation on Vail Resorts, due to erosion of margins (see above) and the stabilisation of the number of customers. More alarmingly, “global warming has shortened ski season and forced resorts to invest even more into costly artificial snow equipment,” he said.

© VAIL RESORTS

© MATT CHINWORTH

DOSSIER

Swiss research under threat

Swiss research is the best in the world. But both the academic and economic sectors fear a downgrade if budgets aren't revised higher and if Switzerland doesn't partner more closely with Europe. We take a closer look... BY BERTRAND BEAUTÉ

Consistently exceptional. In September 2023, Switzerland was ranked for the 13th year in a row as the most innovative nation by the Global Innovation Index (GII). Like many other international rankings, this list, published by the World Intellectual Property Organization (WIPO), confirms the sheer excellence of Swiss R&D. This excellence is vital. "We are obligated to be a leader in R&D," said Jérôme Schupp, head of research at Prime Partners. "Given high labour costs and the strong Swiss franc, nothing could be produced here without innovation. We wouldn't be competitive. Switzerland lives for innovation. Any drop in the rankings would be disastrous for the economy."

Luciana Vaccaro, rector at the Haute école spécialisée de Suisse occidentale (HES-SO) and president of swissuniversities, agrees: "Switzerland's prosperity and success relies on the excellence of our education system and our very strong focus on research and innovation. If we lose our position as leader, the Swiss economy will suffer the consequences." →

“Switzerland has no other raw materials besides innovation”

Luciana Vaccaro, rector at the Haute école spécialisée de Suisse occidentale (HES-SO) and president of swissuniversities

To maintain its ranking, Switzerland invests heavily in the industry. According to the Swiss Federal Statistical Office (FSO), 24.6 billion Swiss francs was dedicated to R&D in 2021, which equates to 3.4%of the gross domestic product (GDP). This percentage ranks Switzerland seventh in the world, behind Israel (5.6%) and South Korea (4.9%), but above the average for other OECD countries which invested 2.7% of their GDP to R&D in 2021 (see infographic on p. 32). Most of this effort is supplied by private companies, which financed 68% of Swiss R&D in 2021. The remainder is paid for by the Hautes écoles, whose funds are primarily public, the Swiss government and private non-profit institutions.

But while all indicators seem to be in good shape, the scientific and economic communities are sounding the alarm: Switzerland’s place as the leader in innovation could now be at risk. To maintain this status, 2024 will be a decisive year.

In late February, the Federal Council will adopt the dispatch to promote education, research and innovation (ERI dispatch 2025-2028). According to the draft presented in 2023, the Confederation plans to allocate 29.7 billion Swiss francs for education, research and innovation from 2025 to 2028, an average nominal growth rate of 2%. But for the scientific community, that’s not enough.

In a joint press release published in September 2023, swissuniversities, the ETH Council, the Swiss National Science Foundation, Innosuisse and the Swiss Academies of Sciences expressed regret that the “Federal Council plans to invest less than before in education, research and innovation”. According to the group, the 2% nominal growth set by Bern will – at best – account for inflation. But it’s certainly not enough to develop new projects or finance the increase in student workforce that is expected for 2025-2028, 1.3% on average per year for universities and 1.4% for the HES. To accomplish this, the scientific community called for “average annual real growth of between 2.5% and 3.5%” over that period.

“I understand the Confederation’s financial difficulties. But applying cost-saving measures in education, research and innovation would result in serious consequences for Switzerland’s scientific and economic standing,” said Luciana Vaccaro, rector at the Haute école spécialisée de Suisse occidentale (HES-SO) and president of swissuniversities. “Education and research should not be viewed as expenses, but rather as an investment. And we could even say this is the most important investment for Switzerland, as it has no other raw materials besides innovation.”

But given that the private sector finances more than two-thirds of investments in R&D, does the public research sector have the right to request more funds? “It’s not possible to separate public research and private research,” said Vaccaro. “Private companies focus on research that produces innovation which is close to being market ready. Public funds, on the other hand, finance basic research that will generate transfers to industrial companies, albeit much later. If one part of the machine stops, the entire process is affected.”

To explain the importance of basic research and how it differs from applied research, scientists use the analogy that the light-bulb was not invented by trying to improve the candle.

American physicist Theodore Maiman developed the first laser in history at the Hughes Research Laboratory (HRL) in 1960. Years later, his invention is used in many applications, especially in the medical sector.
↓

© DR / NICOLAS ANTILLE, EPFL

Basic research also resulted in technological disruptions that were not predicted at all. When Einstein described the principle of the laser in 1917, he likely never imagined that it would be developed in 1960 by American physician Theodore Maiman and used in such a wide variety of applications, such as eye surgery and fibre optics transmission.

“Having a strong basic research system is an absolute necessity for Switzerland,” said Professor Rudolf Minsch, chief economist at Economiesuisse. “Innovation is the end of a journey that always begins with basic research.”

Horizon Europe: a €100 billion wager

The concern around Switzerland’s potential downgrade is even more serious given that the Confederation has always acted separately from European research programmes (Horizon Europe, Euratom, Digital Europe, ITER, Erasmus+). “Because of the non-association with the world’s largest research and innovation programme Horizon Europe, and the education programme Erasmus+, it has already become more difficult for Switzerland to maintain its top position. If Switzerland invests too few funds (...) at the national level, it will further jeopardise its competitiveness. This would put Switzerland’s social and economic progress and thus its above-average innovative strength at risk,” wrote swissuniversities, the ETH Council, the SNSF, Innosuisse and the Swiss Academies of sciences in their joint statement.

Yet again, 2024 will be a vital year. In November 2023, the European Commission and the Confederation announced it would begin exploratory discussions between Switzerland and Horizon Europe – the world’s largest scientific collaboration programme with a budget of nearly €100 billion from 2021 to 2027. “If negotiations go well, it is possible that a partnership could be signed as early as 2024,” said Luciana Vaccaro of HES-SO.

↑
In 2013, when Switzerland was still part of the European research programmes, EPFL’s Human Brain Project (HBP) was selected as one of the two projects funded by the FET Flagship programme. The prize: funding of €1 billion over 10 years. In September 2023, the project ended on a mixed note after receiving €600 million. Here, an illustration of the brain’s neocortical microcircuits.

The stakes are high. In May 2021, after seven years of negotiations, Switzerland removed itself from the EU talks to renew dozens of bilateral agreements on issues such as migration and trade. In retaliation, the Commission decided to demote Switzerland to a third party not associated with the Horizon Europe research financing programme (see also interviews on p. 38). Since then, Swiss researchers were no longer →

able to coordinate Horizon Europe projects and no longer have access to the prestigious subsidies from the European Research council. Swiss companies are also excluded from EU innovation programmes.

Despite all that, Switzerland remains the most innovative country in the world. "Removal from the Horizon Europe programme didn't create chaos," said Rudolf Minsch of Economiesuisse. "But it was a poison and we're only just now starting to feel the effects." A view shared by Luciana Vaccaro: "Switzerland's position of excellence is built over decades. And it cannot be destroyed in one day. Today, the situation remains good, but certain elements are already concerning."

At one university, a professor left Switzerland for a job in Europe. At another, PhD students leave and don't come back. "We don't have the data to quantify the brain drain," said Vaccaro. "But it is clear that Switzerland has become less attractive, especially for young researchers."

"Removal from the Horizon Europe programme didn't create chaos. But it was a poison and we're only just now starting to feel the effects"

Rudolf Minsch of Economiesuisse

And for companies as well. "Several Swiss companies have opened offices in the European Union, in order to participate in the Horizon programme," said Minsch. One of these is the startup ID Quantique, which opened a knowledge hub in Vienna in order to participate in the European Quantum Flagship programme, and most importantly, creating around 100 qualified jobs in Austria that could have been in Geneva (see page 49). "This is a significant loss of jobs and knowledge in a strategic sector – quantum research – which Switzerland was leading until now," said Vaccaro. "It is crucial for us to rejoin the European research programmes as soon as possible, before the damage caused by our isolation becomes irreparable." ◢

Researchers connect quantum chips the laboratory of Andreas Wallraff, director of the Quantum Center at ETH Zurich. Switzerland is one of the world's leading nations in quantum research. ↓

"My role is to inform politicians"

As president of the ETH Board since 2020, biochemist Michael Hengartner must navigate between his aspirations for Swiss science and the current political reality. We spoke to him to find out more... BY BERTRAND BEAUTÉ

On 24 February, the Federal Council has decided to reduce the ETH budget by 100 million Swiss francs for 2025. How are you handling this budget cut?
I understand that the Confederation is in a very difficult situation. It needs to generate savings to address the deficit (ed. note: 1.8 billion Swiss francs in 2023). But it's very disappointing that our budget got cut. Benjamin Franklin, founding father of the US, said: "An investment in knowledge pays the best interest." He was right. Every one franc invested into the ETH system brings in five francs for the Swiss economy. That said, the budget cut is just a proposal for now. It still needs approval by the Parliament. This afternoon (ed. note: 1 February) actually, I was at the Federal Palace to share my perspective. My role is to inform politicians of the consequences of their choices. Beyond that, the decision is up to them.

The Federal Council believes that the EPFs can borrow from their savings of nearly 1 billion francs...
Our savings are melting away. In 2023, we took 150 million francs. In 2024, we're projected to borrow 200 million. We can't keep doing this throughout the years, we need to find a financial balance. That's even more difficult now, as the bills are piling up. EPFL, for example, needs to replace its heating and cooling system that used lake water, as the system was damaged by Quagga mussels – an invasive species that originated in the Black Sea but has since spread rapidly through Lake Geneva. The cost is around 60 million francs. Moreover, higher electricity prices have increased costs by dozens of millions per year. Finally, we need to invest in our education and research infrastructure. Here too, we're talking about several hundreds of millions of francs in the coming years. In order to preserve the quality of EPFs, we need this funding.

Despite all that, Switzerland remains very high in the rankings. Are you making the situation seem worse than it is?
There's always a delay between a political decision and its effects. But we need to remember that it's always easier to destroy a reputation than it is to build it, and easier to fall in the rankings than to climb. We're playing a very dangerous game.

Europe and the Confederation have reopened discussions on allowing Switzerland back into European research programmes. Are you optimistic that an agreement will be made?
I am by nature very optimistic *(laughs)*. This is excellent news, and it had immediate positive consequences. It is very possible that Swiss scientists could be able to apply for ERC grants as early as 2024, and if the discussions go well, we may be able to participate in all programmes starting in 2025. But Europe isn't going to keep the door open for us forever. We would then need to negotiate the Bilateral III agreements. This is the political reality we're living in: science is a diplomatic tool that is used to put pressure on larger negotiations. Every scientist hates this situation. We hope that history will not repeat itself and we won't have to live in a new in/out period of European programmes. ◢

GLOBAL RANKINGS

Switzerland, among the best

Given its modest size, Switzerland outperforms in international rankings for education, innovation and research.

The top universities

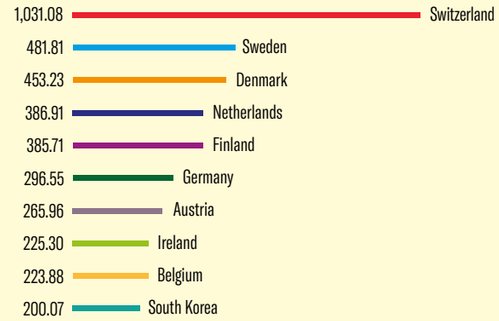
The benchmark Shanghai Ranking has listed five Swiss universities in the top 100 worldwide.

Ranking	Score	
1	100	Harvard University (US)
2	74.8	Stanford University (US)
3	69.1	Massachusetts Institute of Technology (MIT) (US)
4	67.9	University of Cambridge (UK)
5	63.4	University of California, Berkeley (US)
20	44.1	ETHZ (CH)
49	31.8	Université de Genève (CH)
54	31.3	EPFL (CH)
59	30.7	University of Zurich (CH)
81	26.8	University of Basel (CH)

Score out of 100 according to different performance criteria

Queen of the patent

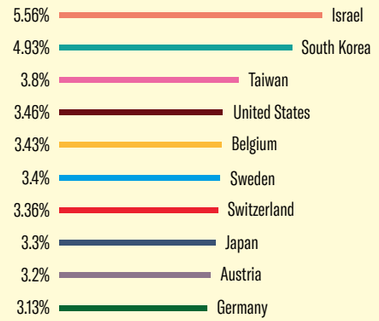
Switzerland has filed more patents per millions of residents than any other country in the world.



Patents per millions of residents (2022)

Billions invested in research

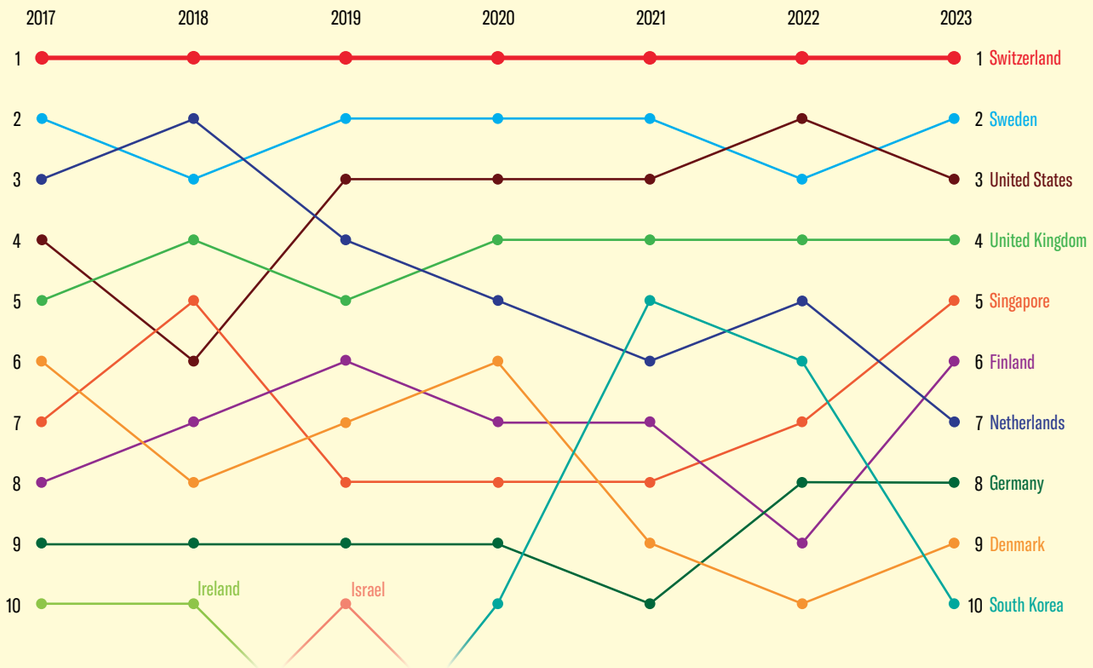
Each year, Switzerland invests 23 billion francs in R&D, nearly 3.3% of its GDP.



Percentage of GDP spent on R&D

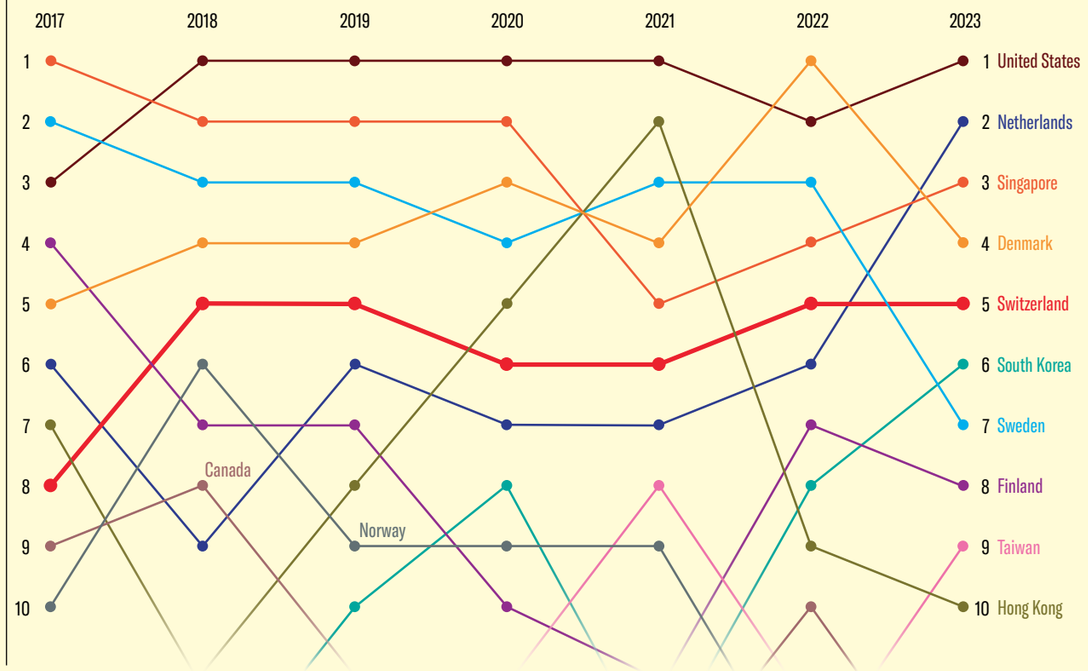
An innovation champion

For thirteen years, Switzerland has reigned at the top of the Global Innovation Index.



A digital rebound

In 2023, Switzerland was ranked fifth in the World Digital Competitiveness Ranking.



SOURCES: 2023 ACADEMIC RANKING OF WORLD UNIVERSITIES (SHANGHAI RANKING), GLOBAL INNOVATION INDEX 2023 (OMPI), EUROPEAN PATENT OFFICE, OECD (2021 DATA), WORLD DIGITAL COMPETITIVENESS RANKING 2023 (IMD)

“I’m trying to protect the Swiss system”

Created in 1855, the Federal Institute of Technology Zurich (ETHZ) has become a leading institution. The president, physicist Joël Mesot, plans to defend this enviable position at all costs. We spoke to him to find out more...

BY BERTRAND BEAUTÉ

Born in Geneva in 1964, Joël Mesot studied physics at the Federal Institute of Technology Zurich (ETHZ). After heading the Paul Scherrer Institute (PSI) from 2008 to 2018, he became president of ETHZ on 1 January 2019.

© NICOLAS RIGHETTI, LUNDI 13

In what we imagine to be a very busy start to the year, Joël Mesot kindly granted us an hour of his time to answer questions from *Swissquote Magazine* by video. The time flew by, as the president of the Federal Institute of Technology Zurich (ETHZ) loved to talk about science, research, education and innovation, while also recognising politics and budget cuts in these difficult times.

In terms of education and research, where does Switzerland fall on a global scale?

In regards to its size, Switzerland largely outperforms other countries. The general level of education is extraordinary and the university system is really very strong. If we look at the QS World University Rankings, the Federal Institute of Technology Zurich (ETHZ) is ranked year after year in the top 10 best universities in the world (ed. note: 7th in 2024, 9th in 2023 and 8th in 2022). Swiss industry as a whole is also very innovative and we have access to a financing system that allows for the creation of new startups. Finally, we are very open to recruiting international talent. This entire ecosystem makes Switzerland a champion of innovation. But this is just the current situation, and there’s no guarantee it will last. Right now, the situation is becoming tenuous on all fronts, which puts our excellence at risk.

Why is that?

Budget cuts. Education and research rely on support from the Confederation. The government took on debt in recent years for several reasons such as the COVID-19 pandemic, the influx of Ukrainian refugees, rising energy costs and an increased military budget.

> “Our budget could fall by nearly 10% in 2025 and that’s a hole we can’t climb out of”

In 2001, the Swiss population voted in favour of the debt brake, which doesn’t allow for the government to end up in a chronic deficit. This mechanism is a good thing, as Switzerland has very little debt and is therefore in an enviable position on that front compared to the rest of the world. But as spending has increased and inflows have decreased, the Confederation is now obligated to look at budget cuts. The cuts primarily affect education, research, and innovation, as this spending is not tied up. At ETHZ, our allowance will decrease 4% in 2025 – the equivalent of 50 million Swiss francs per month. If we add inflation to that, as well as the increased number of students by 4% or 5% each year, our budget could fall by nearly 10% in 2025 compared to 2022. And that’s a hole we can’t climb out of. I understand the situation at the government level, but I am concerned for the impacts on Switzerland’s society. We must not forget that innovation is our main advantage. Without it, our economy would not be as strong as it is.

What savings measures are being taken at ETHZ?

We’re in the process of launching our third round of budget cuts – we have already completed two rounds. Concretely, we’re going to refocus on our priority missions: education, research, and the transfer of technologies. Some side programmes could be cut. For example, in June 2023, we launched the Coalition for Green Energy and Storage with EPFL (ed. note: this collaboration with industry and political partners seeks to develop innovative solutions for renewable energies). Today, we need to decide if we can continue that coalition. Furthermore, the professor/student ratio has gotten worse over the past several years. Ten years ago, there were 29 students per 1 professor. Now, there are 37 students per 1 professor. The ongoing budget cuts will absolutely have consequences on the quality of research and education.

EPFL is thinking of limiting the number of new students to reduce costs (see p. 42). Is that a viable option for ETHZ?

For now, we want to avoid that at all costs. We’re considering alternative solutions instead. For example, we’re looking at potential applications of artificial intelligence in education – we opened a centre on the subject. While remaining a top-tier university, we’re investigating how AI can be used to help reduce costs. But what concerns me even more than limiting the number of students is the possibility that one day we would have to increase our tuition costs. Currently, one year at ETHZ costs 1,500 Swiss francs. It’s very little, but that’s by design in order for everyone to be able to access the university. I would hate for students to have to pay 100,000 Swiss francs someday like at American universities. You know, I was the first in my family to go to university. I would never have been able to study at ETHZ if tuition costs were high. We have a wonderful education system in Switzerland, a social model. I would like to protect it.

Two-thirds of R&D in Switzerland is financed by companies. Is it really necessary to dedicate so much public funding to research?

ETHZ was founded in 1855 to advance the industrialisation of modern Switzerland. Our DNA is in conducting basic research, and then transferring the technologies from that basic research to industry. That’s our model, which is very successful. In 2023, for example, 43 spin-offs were created by researchers from our university – a record number that far exceeds our previous record (34 startups in 2019). So why do we need public funding for the system to function properly? Industry focuses schematically on applied research, where economic impacts are expected in the short- or medium-term. But basic research is too risky for industry. It takes a long time, which is fundamentally incompatible with the economic cycle of a corporation. The role and the strength of the two ETH universities (Lausanne and Zurich) is to conduct basic →

research. These universities play a critical role, because often technological disruption comes from basic research.

Can you give us an example?

I particularly like the story of the MRI. It all started with basic research conducted by American physicist Isaac Rabi in the 1940s, who experimented with the magnetic properties of atomic nuclei. Then more research was done by Felix Bloch, who studied at Federal Institute of Technology Zurich. His research, still purely basic, led him to propose the Bloch equations in 1946, which are the basis of NMR spectroscopy (ed. note: a technique that uses the magnetic properties of certain atomic nuclei) and won him the Nobel prize in 1952. Years later, two other Nobel prize winners from ETHZ (Kurt Wüthrich and Richard Ernst) would continue the work of Felix Bloch, leading to the development of magnetic resonance imaging (MRI) which is now commonly used in medicine. So it took 80 years from the first beginnings of fundamental research to reach an application that revolutionised medical diagnostics!

Here's another example: Albert Einstein is well-known today for his work on relativity, but we often forget that he won the Nobel prize in 1921 for his research on the photoelectric effect. This effect is what we now use to power photovoltaic cells, which are incredibly important for the energy transition. As you can see, basic research is absolutely essential, particularly for an advanced society such as Switzerland that has very few other natural resources.

For the past three years, Switzerland has been excluded from the European research programme Horizon. What are the financial consequences of that for ETHZ?

The financial impact isn't that significant. Following the exclusion, the Swiss National Science Foundation (SNSF) introduced interim measures. Before, we were receiving approximately 100 million Swiss francs per year, via the European ERC grants. Now, we receive a similar amount thanks to SNSF grants. But there's still a bit of a difference. When you receive a grant, there are additional costs for ETHZ. At that level, the Swiss government gives half of what Europe does, which results in a shortfall of 12 million Swiss francs per year for ETHZ.

"Technological disruption comes from basic research"

But the biggest problem is that the compensation from SNSF is temporary. What will happen if Switzerland does not partner with the Horizon programme again? How long will the Confederation continue to pay, given its financial difficulties?

Besides the financial aspect, what other impacts did the Horizon exclusion have on Swiss research?

There were many. An ERC grant is much more than just financing, especially for researchers who are at the start of their careers. It's a prestigious distinction that opens doors and networks and acts as a professional springboard. Furthermore, while our researchers are still able to participate in certain programmes, they can no longer coordinate large European projects.

By being excluded, Switzerland has lost its attractiveness, especially for young talents. I don't know the reasons behind why a researcher may turn down a position at ETHZ, but every time we conduct a recruiting interview, every candidate always asks us about Europe. We have also lost some researchers who have left us for prestigious institutions such as the Max-Planck Institute in Germany.

But Horizon Europe is not only focused on basic research. It's also a programme to support industry and startups. We have some innovative Swiss companies which have moved some of their business activities to Europe in order to continue to receive access to European funding. Even though the immediate consequences may not seem that dramatic, I am concerned about the gradual erosion of our competitiveness.

In some sectors that are deemed sensitive by the European Union, such as quantum, Switzerland is entirely excluded. It can no longer participate in research projects at all...

For quantum, it's a lose-lose situation. Everyone loses. Our researchers no longer even receive invitations to conferences on the subject. On one hand, Europe is shooting itself in the foot because Switzerland is one of the best in this sector. But on the other, even if Switzerland rejoins the Horizon programme, we don't yet know if we will also be reintegrated into the sensitive sectors, of which quantum is one. I think that will be part of the discussions between the European Commission and the Swiss Confederation.

© ETHZ

↑ The main building of ETHZ was built between 1858 and 1864 by Gottfried Semper, who was also the architect of the Semperoper Opera House in Dresden.

IN NUMBERS

25,000
The number of students enrolled in ETHZ in September 2023

1.349 BN
In Swiss francs, the overall budget for ETHZ in 2022

43
The number of startups from ETHZ that were created in 2023

22
The number of Nobel prizes associated with ETHZ

12,000
The number of people working at ETHZ

To compensate for the exclusion from Europe, the Confederation announced in 2021 that it wished to begin scientific partnerships with other countries, such as China and the United States. Can you tell us more about that?

We have wonderful partnerships with the United States, the United Kingdom and Asia. But we can't delude ourselves – any partnership like the one we had with Europe cannot be replaced in just three years. It takes many years. Furthermore, in the Horizon programme, all the parameters – particularly intellectual property rights – are settled in advance. With the United States, this aspect is very complicated. We need to negotiate from scratch for every project, which results in significant costs for the École.

And we can't forget where Switzerland is located geographically. We're in the heart of Europe. For certain things, it makes no sense to work with countries on the other side of the world. For example, in the energy sector, we're not going to solve electric grid stability with China. We need to do that with Europe.

In November 2023, Switzerland and the European Commission announced it would resume negotiations on reintegration to Horizon Europe. How did you take the news?

We're quite happy that the discussions are starting up again. The two parties hope to reach an agreement soon. I hope that it will result in a long-term agreement. Because the worst case scenario for us is if we sign an agreement for just one year and then we're excluded again a few months or years later. We need stability.

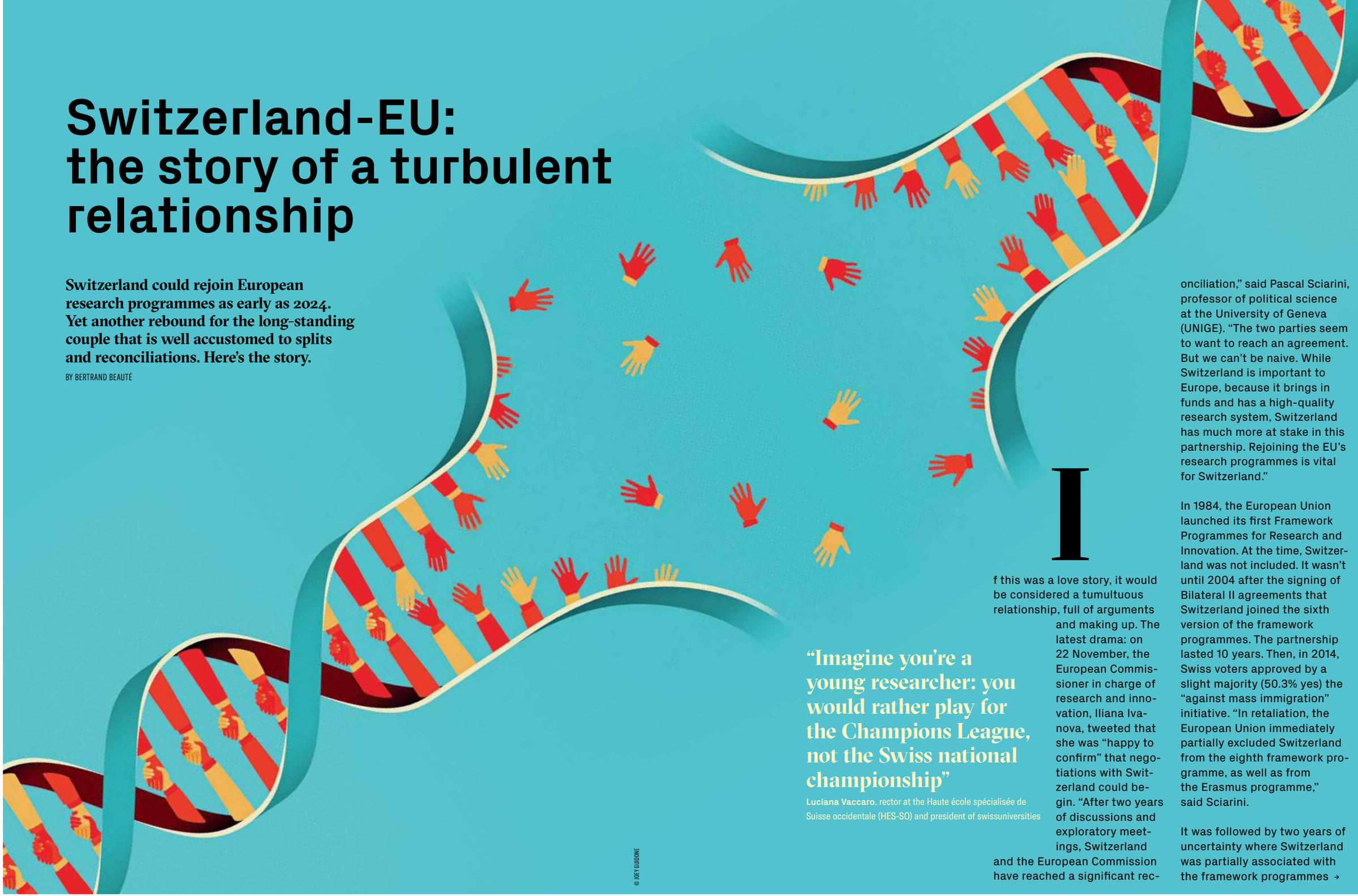
In the end, surely the Swiss voters will decide...

Yes. If the Federal Council decides to sign an agreement with Europe, we will then move to a popular vote and that's a good thing. In 2021, when the Federal Council decided to end negotiations, the Swiss people didn't have a voice in the matter. I hope this time they can be heard. Some people are already positioning themselves very strongly against a possible agreement with the EU. That's a societal debate we must have: do we wish to continue our model of education, research and innovation that has made Switzerland so successful, or not? When we present the two options, the Swiss population will always side with clear-sightedness. ◢

Switzerland-EU: the story of a turbulent relationship

Switzerland could rejoin European research programmes as early as 2024. Yet another rebound for the long-standing couple that is well accustomed to splits and reconciliations. Here's the story.

BY BERTRAND BEAUTÉ



© JOEY GUIDONE

If this was a love story, it would be considered a tumultuous relationship, full of arguments and making up. The latest drama: on 22 November, the European Commissioner in charge of research and innovation, Iliana Ivanova, tweeted that she was "happy to confirm" that negotiations with Switzerland could begin. "After two years of discussions and exploratory meetings, Switzerland and the European Commission have reached a significant reconciliation," said Pascal Sciarini, professor of political science at the University of Geneva (UNIGE). "The two parties seem to want to reach an agreement. But we can't be naive. While Switzerland is important to Europe, because it brings in funds and has a high-quality research system, Switzerland has much more at stake in this partnership. Rejoining the EU's research programmes is vital for Switzerland."

> **"Imagine you're a young researcher: you would rather play for the Champions League, not the Swiss national championship"**
>
> **Luciana Vaccaro**, rector at the Haute école spécialisée de Suisse occidentale (HES-SO) and president of swissuniversities

In 1984, the European Union launched its first Framework Programmes for Research and Innovation. At the time, Switzerland was not included. It wasn't until 2004 after the signing of Bilateral II agreements that Switzerland joined the sixth version of the framework programmes. The partnership lasted 10 years. Then, in 2014, Swiss voters approved by a slight majority (50.3% yes) the "against mass immigration" initiative. "In retaliation, the European Union immediately partially excluded Switzerland from the eighth framework programme, as well as from the Erasmus programme," said Sciarini.

It was followed by two years of uncertainty where Switzerland was partially associated with the framework programmes →

without being a full member. "The Federal Council's approval to extend the Free Movement of Persons to Croatia and the very partial implementation of the initiative against mass immigration allowed for Switzerland to be completely reintegrated on 1 January 2017," said UNIGE's Pascal Sciarini. But this reintegration was temporary, conditional on the last signature of the largest bilateral agreements that included agreements on migration, trade and the power of the European Court of Justice."

In 2021, after seven years of negotiations, the Federal Council abruptly pulled out of negotiations. It was traumatic for the European Commission, which excluded Switzerland from the framework programmes once again. "In 2018, the negotiations were closed. The Federal Council opened Pandora's box by launching a consultation on the agreement made with Europe," said Sciarini. "The SVP (ed. note: Swiss People's Party) and the trade unions came out against the agreement. There was such opposition that there was no way the agreement would pass if left up to a popular vote, which caused the Federal Council to take over in 2021."

As a result, Switzerland was not able to participate in the ninth framework programme, named Horizon Europe, the most ambitious scientific cooperation programme in the world. With a budget of €95.5 billion from 2021 to 2027, this programme supports basic research, as well as innovation and industry, with four pillars. The first, with a budget of €25 billion, is dedicated to basic research and finances the prestigious European Research Council (ERC) grants as well as the Marie Skłodowska-Curie Actions (MSCA). Concretely, European researchers can respond to calls for proposals. The best projects are selected by European experts and receive funding. Swiss researchers can currently participate in approximately two-thirds of European calls for proposals.

Following the exclusion, the Swiss National Science Foundation immediately adopted interim measures by launching its own grants – SNSF grants – based on the European model. "SNSF grants cover the financial aspect, but they don't have the same prestige as their European counterparts," said Luciana Vaccaro, president of swissuniversities. "Imagine you're a young researcher: you would rather play for the Champions League, not the Swiss national championship."

> **"Europe, and particularly France, did not like Switzerland's decision to buy American F-35s"**
>
> **A European diplomat,** speaking on the bitterness that remains behind the scenes

The second and third pillars of the Horizon programme, with budgets of €53 billion and €13 billion respectively, are dedicated to industry, startups and innovation. Once again, the Confederation created an equivalent with the Swiss Accelerator in 2022. That didn't stop some Swiss startups from opening branches in Europe, such as the Zurich-based regenerative medicine specialist Cutiss, which in 2022 opened a laboratory in Sophia Antipolis, near Nice, France. As a result, it received a €300,000 grant from the Provence-Alpes-Côte d'Azur region. Even if very few officially state that their new branches are due to Switzerland's removal from the Horizon programme.

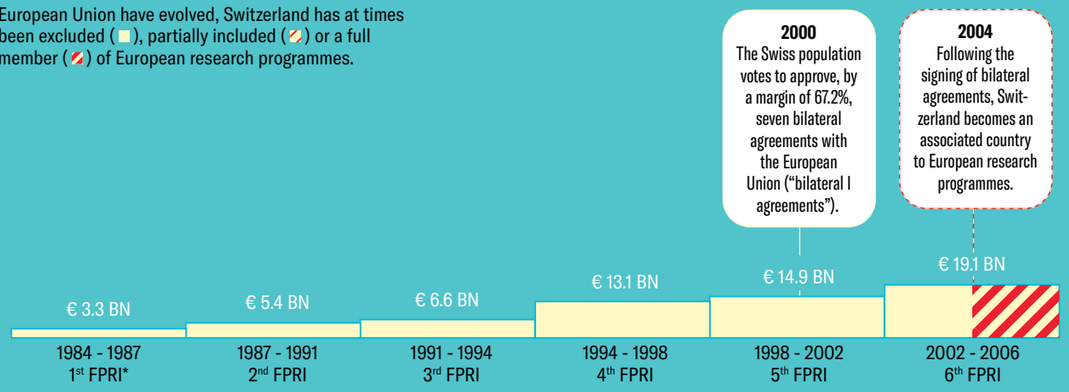
The last pillar, with a more modest €3.3 billion budget, focuses on the European research space. In order to measure the consequences of the removal from the Horizon programme, the State Secretariat for Education, Research and Innovation (SERI) launched a survey in 2022 for researchers, companies and Swiss institutions affected by the situation. 880 people responded and the answers speak for themselves: 60% of respondents said that their career prospects were worse and more than 80% said the financing opportunities were not as good. "The UK, which left the Horizon programme after Brexit, did everything it could to be reintegrated. And it succeeded. They are now a member again as of September," said Vaccaro. "That shows the importance of being part of the programme."

In this context, the renewed discussions between the European Commission and the Confederation were warmly welcomed in the Swiss scientific and economic communities. And in both Brussels and Bern, there's officially a sense of optimism surrounding these negotiations. But behind the scenes, bitterness remains. "Europe, and particularly France, did not like Switzerland's decision to buy American F-35s instead of a European fighter jet, like the Dassault Rafale or the Eurofighter Typhoon from Airbus-BAE-Leonardo," said a European diplomat.

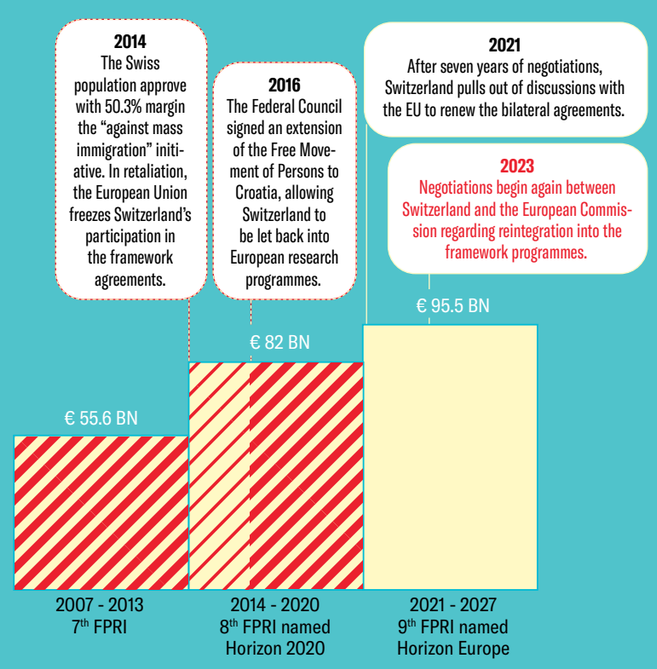
For Pascal Sciarini, Switzerland has found itself in a situation similar to 2016: "The Federal Council must negotiate an agreement with the European Commission. Both parties must make concessions, but in the end I think they will reach an agreement. So let's begin the internal discussions in Switzerland, and as you can see, the SVP is already strongly against negotiations with Europe as it views them as a loss of sovereignty. An agreement would not be possible unless a large coalition, including the SP and the Greens, was able to form and isolate the SVP on this European issue." ◢

The long history of the Horizon programme

As relations between the Swiss Confederation and the European Union have evolved, Switzerland has at times been excluded (□), partially included (▨) or a full member (▨) of European research programmes.

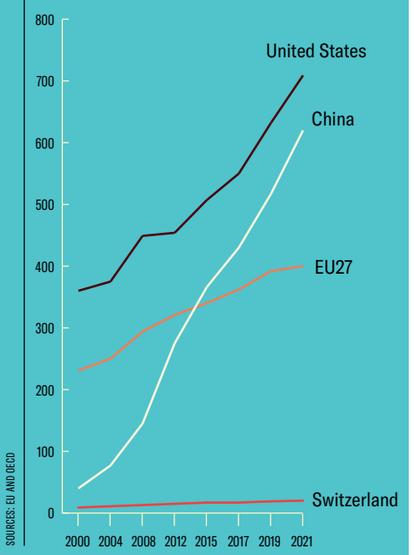


* Framework Programme for Research and Innovation



Is Switzerland too small to remain independent?

R&D spending in billions of dollars.



“Science is a competition”

Martin Vetterli, president of the École polytechnique fédérale de Lausanne (EPFL), has concerns about budget cuts for the institution. Read on for our interview.

BY BERTRAND BEAUTÉ

The day of our interview was quite significant, but not in a good way. On Thursday 25 January, Martin Vetterli drank his morning espresso and received a press release from the Swiss Federal Council. Due to a deficit that could reach 2.5 billion Swiss francs starting in 2025, the Confederation announced several budget cuts. One of them was for the EPFs. In 2025, the two schools will receive 100 million less than expected. One more piece of bad news for Swiss research. But the president of EPFL is not going down without a fight. In the hour he spent with *Swissquote Magazine* in his office, Martin Vetterli passionately defended research, innovation, and education, the fields to which he has dedicated his life.

In recent months, the scientific and academic communities are sounding the alarm. Switzerland could be at risk of losing its excellence. But it is still very highly regarded in international rankings. Is Switzerland truly at risk?

We are very good, that is true. But this excellence in education, research and innovation didn’t just fall from the sky. It is the product of 50 years of investments. This knowledge is not unshakeable. If we want to remain at the top, we need to continue to invest in education, research and innovation, which are essential for the future. I’m not the only one who believes this: industry and economic sectors are saying it as well.

But the situation is beginning to break down. Before, Switzerland was always among the top countries that receive the most ERC grants – the very prestigious European grants awarded to researchers. Today, we’re no longer even in the ranking, because we’ve been excluded from European research programmes for the past three years. On a national level, the budgets allocated to us are getting smaller. In this context, it will be difficult to maintain Switzerland’s excellence in the years to come.

Science is a competition. Today, we are the leader, but many countries would love to take our place. And they’re investing massive amounts to do just that. To maintain our position, we cannot rest on our laurels. We need to continue to work and to invest. It’s a challenge every day.

© KEYSTONE

Born in Solothurn in 1957, Martin Vetterli was educated in the canton of Neuchâtel, before studying at the ETHZ and then the EPFL. After serving as President of the Swiss National Science Foundation (SNSF) from 2013 to 2016, he was appointed President of EPFL by the Federal Council in 2016.

From 2025 to 2028, the Federal Council plans to invest 29.7 billion Swiss francs in research, education and innovation, a 2% increase in nominal value. Is that not enough?

Let’s start by acknowledging the fact that for the first time, the Federal Council submitted its education, research and innovation funding proposal (ERI dispatch 2025-2028) to a consultation process. That’s a very good thing, because it opened public debate on the subject. To me, this proposal is missing several key elements.

The actual budget increase will only be 1.6% for the EPFs, which includes the two technology institutions ETH Zurich and EPFL as well as four other research establishments (the PSI, the WSL, Empa and Eawag). We’re hit on both sides: the funds allocated by the Confederation are barely an increase, if at all, and expenses are rising. Salaries for our employees, for example, were indexed to inflation, at 2.5%. That’s excellent for them, but it has an impact on our budget. Furthermore, inflation directly affects us: we can see that when we pay our electric bills and when we buy equipment for our laboratories. →

We also need to invest to ensure new missions and cover new subjects such as artificial intelligence. But there is no budget for that. The initial proposal from the Federal Council is a 360-page document in which the words “artificial intelligence” only appear one time. In 2023, such an omission is quite surprising.

“Before, Switzerland led many projects and many networks. Now, it is becoming increasingly isolated”

Finally, the number of students at EPFL increases by 4% to 5% per year, which also increases costs. In a way, EPFL is a victim of its own success. In 12 years, the number of undergraduate students has more than doubled, going from 5,283 in 2010 to 10,894 in 2023. In this context, the Federal Council’s financing proposal for the 2025-2028 period is not ambitious at all. It is a decrease in funds, and that means we will have no choice but to reduce our offerings.

In this context, are you planning ahead?

Absolutely. In January 2024, for example, we launched a consultation until 18 March in order to limit the number of new students. Starting in 2025 and for a period of four years, the number of undergraduates admitted to EPFL could be limited to 3,000. With this interim measure, we want to return to the situation we had in 2020 and therefore ensure a quality education and the best learning conditions possible. Concretely, anyone passing their Swiss A-levels, whether a Swiss national or not, will continue to have unlimited access to EPFL. However, access for international students with different diplomas will be limited. I do regret this decision, because it shuts us out from many talents and deprives Swiss industry from highly qualified graduates. But we don’t have any other choice.

For the past three years, Switzerland has been excluded from the European research programme Horizon. What are the financial consequences for EPFL?

Before Switzerland was excluded from European programmes, European funds made up approximately 6% of our budget. So the impact is limited, especially given that the Swiss National Science Foundation implemented interim measures to replace the prestigious European Research Council (ERC) grants. But it is worth noting that with the European grants, 50% of the funds allocated to Switzerland were returned back to the EPFs. When Switzerland grants the equivalent funds, only 25% makes it back to the EPFs. The further we get from the decision, it becomes more a matter of expertise rather than politics. The competition is more difficult, but also more transparent, at a European scale rather than limited to just Switzerland. I must say I am a fan of the European ERC grants. The programme is a well-oiled machine.

© ROLEX

↑ The Rolex Learning Center, an emblematic building at EPFL, was designed by the Japanese architecture firm SANAA and built between 2007 and 2010.

IN NUMBERS

13,445
The number of students enrolled in EPFL in 2023

1.142 BN
In Swiss francs, the overall EPFL budget in 2022

22
The number of EPFL startups created in 2023

3
The number of Nobel Prizes and Fields Medals associated with EPFL

6,530
The number of EPFL employees in 2023

Beyond the financial aspect, what are the other consequences of Switzerland’s exclusion from the Horizon programme?

We can’t do research alone in a corner. We need to collaborate with other research institutions. Before, Switzerland led many projects and many networks. Now, it is becoming increasingly isolated. Students and professors continue to come to EPFL, but the question of our relationship to Europe for research is always asked during hiring interviews. Human resources at ETHZ is seeing the same thing (read the interview with Joël Mesot on p. 34). Furthermore, several Swiss startups have moved some of their business activities to the European Union in order to maintain access to European funds.

To compensate for the split from Europe, the Confederation announced in 2021 that it would begin scientific collaborations with other partners such as China and the United States. Can you tell us about that?

That’s not a good idea. Of course we can sign scientific collaboration agreements with India, China, Brazil and the United States. But in the end, Switzerland remains in the centre of Europe and it is much easier to collaborate with our neighbours than to make friends on the other side of the world.

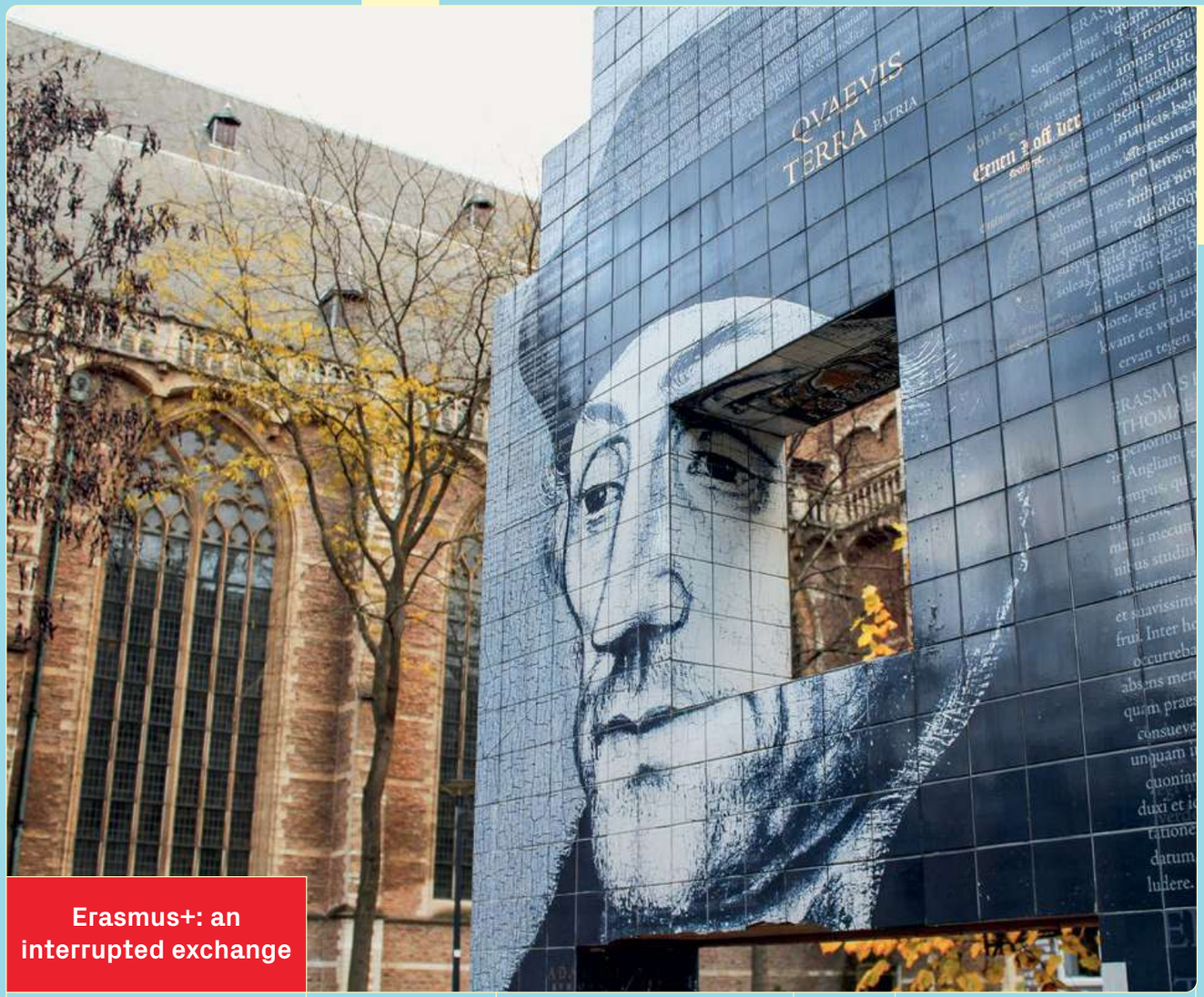
Last November, Switzerland and the European Commission announced that talks would begin again regarding re-integration into Horizon Europe. How did you take this news?

It’s wonderful news. Switzerland could potentially rejoin Horizon Europe as early as 2024. But we’re always going to have a sword of Damocles over our heads. The risk is that Switzerland and the European Union may not agree on the other subjects, which have nothing to do with research, education and innovation. In any event, this debate will likely be decided by a popular vote. And that’s great. The Swiss people need to ask the right questions: “who are we?” and “where are we going?” In my opinion, we’re in the centre of Europe and not on an island somewhere in the middle of the Atlantic. ◢

3 textbook examples

Switzerland's exclusion from European programmes has very concrete consequences for research and education. Here are a few examples.

BY BERTRAND BEAUTÉ



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↑ The Erasmus monument, inaugurated in 2016 in Rotterdam, marks the site of the house where the Dutch scholar was born in 1466.

Erasmus+: an interrupted exchange

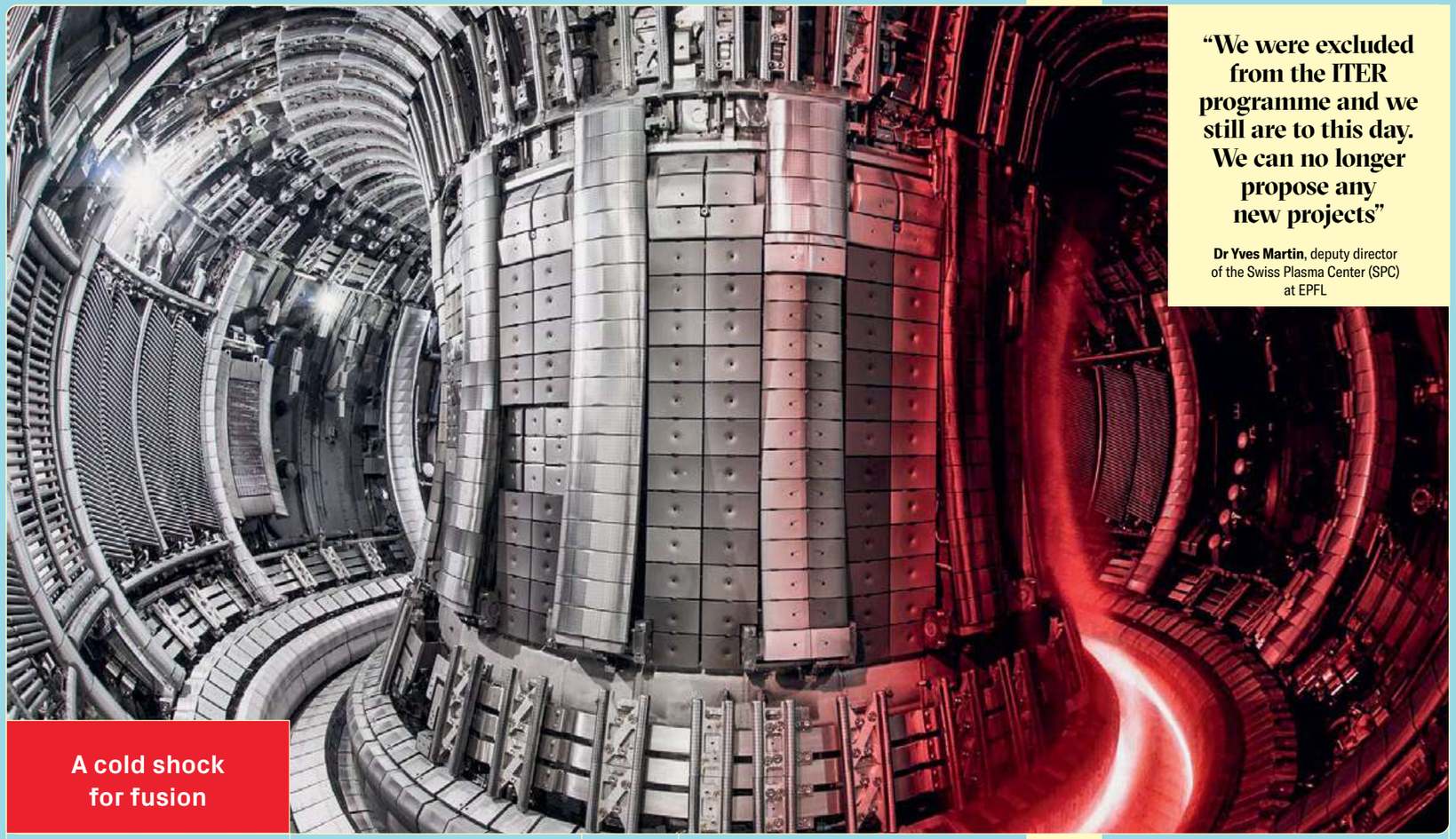
On 9 February 2024, a handful of students meet at the Federal Palace of Switzerland. The goal is to make their voices heard, on a day that marks a sad anniversary. On that day 10 years ago, Switzerland was no longer part of the Erasmus+ programme. For many, the name of the Dutch monk Erasmus is now entirely associated with foreign exchange semesters for European students to spend studying at exotic universities between parties. "The programme is a victim of a stereotype from the film *The Spanish Apartment*," said Olivier Tschopp, director of Movetia, the Swiss national agency for exchanges and mobility. "But Erasmus+ is much more than that. Firstly, it is not limited to only university students. Erasmus+ offers exchanges at all levels of higher education. Secondly, it's not just a mobility programme; it's an education programme for life, which also includes offers of cooperation."

Switzerland left the programme in 2014 in order to create a parallel system established by a new agency called Movetia. "At the time, Switzerland thought that it could do without Erasmus+. Now, the numbers show that we were wrong," said Luciana Vaccaro, president of swissuniversities. "The Federal Council aimed to have 20% of students studying abroad. Ten years later, we're only at 15%." Comparatively, the mobility rate in Austria – a country similar to Switzerland – is 24%.

> **"Switzerland thought that it could do without Erasmus+. Now, the numbers show that we were wrong"**
>
> **Luciana Vaccaro**, president of swissuniversities

"If we stayed in Erasmus+, our mobility rate would be higher," said Tschopp. Why is that? Exchanges are now dependent on the agreements that each Swiss Haute école makes with its foreign counterparts, which quickly becomes tedious: "To use a metaphor, it would be like travelling on the Swiss train network and buying a ticket for each trip, rather than buying one pass to go everywhere," said Tschopp. "Countries in the Erasmus programme pay once and have easy access to all destinations."

And in terms of cooperation, Swiss students and establishments do not benefit from the same tools and opportunities (technical platforms, user networks, alliances between establishments) that their European counterparts do. "It becomes very difficult to start any type of cooperation project between Swiss universities and European universities, and there are serious administrative limitations, which has an impact on what institutions can offer and therefore the quality of education," said Tschopp. "It's even more unfortunate because a good education, with international exposure, is the baseline for good research. It is in our best interest to rejoin Erasmus+."



A cold shock for fusion

“Incredibly disappointing to no longer be able to collaborate with our European colleagues.” This is how Dr Yves Martin, deputy director of the Swiss Plasma Center (SPC) at EPFL, described the exclusion of Switzerland from European research programmes in 2021. At the time, more than 50% of financing for the Swiss Plasma Center came from European funds. Three years later, the situation continues with mixed results.

“Regarding Eurofusion (ed. note: the organisation that oversees European research on nuclear fusion), we were able to find a solution quickly,” said the researcher. “We became affiliated partners, which meant that we could still propose projects to Eurofusion, just like we did previously. If the projects are accepted, we complete them and send the bill to Bern to pay. Everything operates just as it did before, with a slightly higher administrative fee, except that we no longer receive money from the European Union.” The cooperation is so close that professor Ambrogio Fasoli, director of the Swiss Plasma Center, became the new director of the Eurofusion programme on 1 January 2024. As for the International Thermonuclear Experimental Reactor (ITER) programme – the world’s largest scientific project towards nuclear fusion energy – Switzerland’s situation is less than ideal. “We were excluded from the ITER programme and we still are to this day,” said Martin. The contracts that were in place in 2021 were completed, but we can no longer propose any new projects. We don’t even receive calls for proposals any more. It’s truly problematic.”

There is one bright spot, however: “ITER needs us, needs our expertise,” said Martin. “With no false modesty, we are among the best in the world in nuclear fusion.” EPFL has a considerable advantage up its sleeve: the variable configuration tokamak (TCV). “This machine can create and study plasmas in any form, a flexibility that can be found virtually nowhere else,” said Dr Martin. As a result, since 2022, the Swiss Plasma Center can once again be considered for certain projects associated with ITER. “But Swiss industry remains completely excluded from the ITER programme,” said the researcher. For example, the company VAT Group, listed on the Swiss exchange, supplied gates to the ITER programme before Switzerland was excluded. They no longer do so.

> **“We were excluded from the ITER programme and we still are to this day. We can no longer propose any new projects”**
>
> **Dr Yves Martin**, deputy director of the Swiss Plasma Center (SPC) at EPFL

↑ The interior of the Joint European Torus (JET), a tokamak located at the Culham Science Centre in Abingdon, UK. EPFL also has its own tokamak.

© EUROFUSION

The quantum battle

“The potential for applications of quantum physics is astronomical. It would be devastating if Switzerland misses this technological shift,” warned Nicolas Gisin, honorary professor at the University of Geneva and Constructor University in Bremen, and co-founder of ID Quantique. “Right now, every country is investing heavily to be at the cutting edge of this field.” In 2018, the United States launched the National Quantum Initiative, with a budget of approximately $1 billion per year ($968 million projected for 2024). China invested $10 billion into its national quantum laboratory. The European Union has Quantum Flagship, a programme that began in 2018 with €1 billion allocated over 10 years, or €100 million per year. This is in addition to the investments each European country is making on their own (in 2021, Germany announced a €400 million investment yearly until 2025, and France invested €200 million).

And where is Switzerland in all this? In May 2022, the Federal Council announced the Swiss Quantum Initiative, with a budget of 5 million Swiss francs yearly for 2023 and 2024. “The amounts invested by each country are not comparable, because they don’t take into account the same things,” said Gisin, president of the Swiss Quantum Initiative. “But no matter how you calculate it, our investment is ridiculously low compared to other countries. It’s a bit pathetic. Switzerland needs to wake up, because the time to act is now.”

In this context, the exclusion of Switzerland from European programmes is significantly affecting Swiss competitiveness in this field. “Basic research wasn’t impacted too much because the SNSF compensated for the financial aspect,” said Gisin. “But applied research and industry were significantly affected. Startups can no longer receive EU subsidies to finance their R&D and the companies that are already selling products are seriously hindered, because the EU is considering reserving access to the quantum market to European suppliers only.”

> **“Switzerland needs to wake up, because the time to act is now”**
>
> **Nicolas Gisin**, president of the Swiss Quantum Initiative

As a result, the Geneva-based startup ID Quantique announced in February 2022 that it was opening a branch in Vienna, Austria in order to continue to participate in the Quantum Flagship programme. “Of course it’s very important that Switzerland rejoins Horizon Europe, but it’s even more important that it is also included in the Quantum Flagship programme and that our companies active in quantum technologies have full access to the entire European market. Our Swiss politicians who negotiate with Brussels need to know that: the problem is much larger than just Horizon Europe.”

LITHIUM ORE

The great lithium rush

Lithium is a metal used to power smartphones and electric cars. These days, everyone is scrambling to get their hands on some, and mines are springing up all over the planet.

BY JULIE ZAUGG

Seen from the air, evaporation ponds look like a colourful mosaic. The huge square pools, lined up side by side in the middle of the Atacama Desert in Chile, range in colour from yellow or green to turquoise or midnight blue. They are filled with brine, a mineral-rich underground water that has been pumped to the surface. The water evaporates for 18 months in the sunlight to leave a lithium-rich powder. This white gold is what powers most of our everyday gadgets: smartphones, laptops and electric toothbrushes. It is also a key ingredient in electric car batteries. →

→ Aerial view taken of evaporation ponds, containing lithium carbonate, in the Atacama Desert, Chile.

© TOM HEGEN

This context has driven up demand for lithium. Between 2010 and 2022, the quantities produced worldwide rose by 363%, from 28,100 to 130,000 tonnes. But this will not be enough to cover needs, which will reach 3.8 million tonnes by 2035. "There has been a lithium shortage for over three years," says Joe Lowry, who founded the advisory firm Global Lithium. "And the situation is only going to get worse as the decade progresses."

In November 2022, the price of lithium carbonate suddenly spiked, reaching almost CNY 600,000 per tonne in China, before falling back to CNY 100,000 in early 2024. This nevertheless means that it has doubled since January 2020. The tense situation has triggered fierce competition between mining groups as they seek to get their hands on deposits of the precious metal.

↑ The Greenbushes open-pit mine in Australia is the world's largest hard rock lithium mine. It is pictured here in May 2022.

"Australia currently dominates lithium production, with 61,000 tonnes produced in 2022, followed by Chile, with 39,000 tonnes, and China, with 19,000 tonnes," says Craig Johnson, a lithium extraction expert from the University of Guelph in Canada. These three countries alone account for 92% of global production.

Lithium is extracted from brine in Chile but comes from hard-rock spodumene in Australia. "The rock has to be finely ground and then heated to 1,100°C before the lithium can be extracted using sulphuric acid," says Gleb Yushin, professor at the School of Materials Science and Engineering at Georgia Institute of Technology. In China, lithium can be found in both brine and hard rock.

The country also dominates refining and the manufacture of electric batteries. "China owns the entire production chain, mainly due to its low wages, abundant and cheap energy and efficient transport infrastructure," says Pablo Cortegoso, a lithium specialist with the mining consultancy SRK Consulting.

Unsurprisingly, China is also leading the campaign to find new sources of lithium. Worldwide, 98 million tonnes of the mineral have been identified, 53% of which are in three Andean countries (Chile, Bolivia and Argentina), according to the United States Geological Survey. China, which only holds 7% of the precious metal, has embarked on a wave of acquisitions in what is referred to as the "Lithium Triangle".

"Tianqi Lithium Group has secured access to the Atacama Desert deposit in Chile by acquiring a stake in SQM, the Chilean company that exploits it," Craig Johnson points out. In Bolivia, a country with 21 million tonnes of largely untapped lithium resources, the government has commissioned a consortium of Chinese firms to develop the extraction of this white gold. In Argentina, Tibet Summit Resources, Ganfeng Lithium and Tsingshan Holding have all opened or are about to open lithium mines.

However, these projects could run into political obstacles. "Last spring, Gabriel Boric's government in Chile announced that it would partially nationalise the mining industry," Craig Johnson says. "In the future, private partners will have to share their profits with a new state-owned national company." A similar arrangement is already in place in Bolivia. →

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Workers extract lithium at the Sandawana mines in Mberengwa, Zimbabwe, July 2023. ↓

COMPANIES TO WATCH

ALBEMARLE
The mining giant

The chemical group owns 49% of the Greenbushes site in Western Australia, the world's largest lithium mine. It alone produced 37,500 tonnes of lithium in 2022. Albemarle also owns a vast extraction site in the Atacama Desert in Chile and a smaller one in Clayton Valley, Nevada. In 2022, its revenues rose 120% and are expected to increase by another 77% in 2023, due to demand. Most analysts recommend purchasing shares.

FOUNDED: 1994
HEADQUARTERS: CHARLOTTE (US)
EMPLOYEES: 7,400
2022 REVENUE: $7.32 BN
→ ALB

SQM
The king of the *salar*

Originally founded by the Chilean government, Sociedad Química y Minera de Chile was privatised in 1983. In the mid-1990s, the company began extracting lithium from brines in Chile's Atacama Desert. This site produced 29,500 tonnes of the metal in 2022, which sent the company's revenues soaring by 274%. At the end of 2023, SQM announced that it was buying the firm Azure Minerals, which is developing a mine in Australia. Most analysts recommend purchasing shares.

FOUNDED: 1968
HEADQUARTERS: SANTIAGO (CL)
EMPLOYEES: 7,000
2022 REVENUE: $10.7 BN
→ SQMS

This has pushed Beijing to explore new horizons. Chinese companies have invested in lithium mines in Australia, Canada and Mexico. More recently, they have turned their attention to Africa, which has an estimated 5 million tonnes of the mineral. In 2023, Huayou Cobalt started mining operations on a deposit in Zimbabwe. In the Democratic Republic of Congo, Zijin Mining has acquired a stake in the Manono project, "one of the largest deposits in the world", says Anouk Borst, a geologist with the Royal Museum for Central Africa and assistant professor at KU Leuven university in Belgium.

"Some countries are now prepared to pay more for lithium extracted and refined at home, if it means they can reduce their dependence on China"
Pablo Cortegoso, from SRK Consulting

Ganfeng Lithium is involved in a project in Mali and another Chinese company, Xingeng Investments, in Namibia. However, these projects are rife with complications. "These countries are known for their rampant corruption, and it isn't easy to secure mining concessions," Anouk Borst explains. In a report on African lithium mines, Global Witness describes cases of child labour, unsafe working conditions and bribery.

In response to this Chinese growth, Europeans are not just sitting idly by. In Germany, home to 3.2 million tonnes of lithium, the British group Zinnwald Lithium and Australian company Vulcan Energy Resources both have mining projects in the works. Another Australian company, European Metals Holding, is developing a project in the Czech Republic, while three local companies have begun prospecting for the precious metal in Cornwall and the north of England.

"Europe is looking to establish a few regional hubs so that it can break free from Chinese domination and protect its lithium supplies," says Pablo Cortegoso of SRK Consulting. Europe came to the realisation that action was needed after the Chinese government's decision in mid-2023 to ban exports of two rare minerals in protest to Washington's tariff war, as well as the disruptions in supply chains passing through China during the pandemic.

"Some countries are now prepared to pay more for lithium extracted and refined at home, if it means they can reduce their dependence on China," the expert adds. The European Union even passed a regulation requiring lithium-based batteries to meet sustainable and circular standards for lithium extraction. "This decision will favour European mines," Craig Johnson says.

However, local populations hardly support the cause. "In Serbia, Rio Tinto was forced to abandon a major mining project in 2022 following a wave of protests over fears of potential pollution," Borst says. In reaction to the unrest, Belgrade cancelled its mining concession. UK firm Savannah Resources is also up against strong popular resistance in Portugal, where it wants to develop a lithium mine.

Like Europe, the United States wants to squeeze China out of the estimated 12 million tonnes of lithium in its subsoil. "Lithium clay deposits are concentrated in the volcanic rock along the border between Nevada and Oregon," says Christopher Henry, a geologist at the University of Nevada. Exploration has begun, led by the pure player Lithium Americas.

"To execute the project, a new extraction process that is profitable on an industrial scale will have to be developed," Borst says. Opposition from indigenous tribes, for whom the site is sacred, is another hurdle. And not even this will cut the United States loose from China's grip, as Lithium Americas' majority shareholder is the Chinese company Ganfeng Lithium.

Geopolitical considerations aside, developing mines in the West could have a positive environmental impact. "Lithium ores would not have to be transported all over the globe," Pablo Cortegoso explains. "At present, lithium is often mined in Australia, refined in China and then incorporated into electric vehicle batteries assembled in Europe."

Several western companies are also working on perfecting the "Direct Lithium Extraction" technique, which can be applied even when the brine contains only a tiny amount of the metal. This is often the case in Europe. The process is faster and uses less water. "Water is returned to the ground once the lithium is extracted, rather than evaporating," Craig Johnson says. Countries along the Andes Mountains, whose lithium reserves are located in an extremely arid region, have begun to show interest in the technology. In any case, the rush for this white gold shows no signs of slowing. ◢

↑ From 2028, French company Imerys plans to extract 34,000 tonnes of lithium hydroxide a year from its kaolin quarry near Vichy (France). This would be enough to power 700,000 electric vehicles a year.

GANFENG LITHIUM
The Chinese firm aiming high

Owner of several lithium mines in the desert regions of western China, the group has embarked on a global takeover spree. The Chinese firm now has projects in Argentina, the United States, Australia, Mexico and Mali. Production is primarily channelled towards supplying its EV battery factory. The company's revenues shot up by 275% in 2022. But, due to China's economic slowdown, analysts are split between a buy, hold and sell recommendation.

FOUNDED: 2000
HEADQUARTERS: XINYU (CN)
EMPLOYEES: 10,201
2022 REVENUE: CNY 41.82 BN (CHF 5.1 BN)
→ SZSE: 002460
→ SEHK: 1772

ARCADIUM LITHIUM
The group that does it all

This lithium processing group is the result of the merger between the mining groups Livent and Allkem at the beginning of 2024. Along with its two sites in Argentina and one in Western Australia, it is developing projects in Argentina and Canada. Arcadium also operates lithium processing and battery manufacturing plants in the United States, China and Japan. With its expansive vertical integration, the new entity will benefit from synergies that should make it more competitive. Most analysts recommend buying shares.

FOUNDED: 1944
HEADQUARTERS: PHILADELPHIA (US)
EMPLOYEES: 2,600
2022 REVENUE: $1.9 BN (TOTAL REVENUE AFTER MERGER)
→ ALTM/LTM

REPORT

El Salvador: the Bitcoin laboratory

The small central American country is the first in the world to make the leading cryptocurrency its official currency, alongside the dollar. While the general public doesn't have much access to it, local entrepreneurs are trying to turn a profit. Report.

BY BLANDINE GUIGNIER, SAN JOSÉ

On 4 February 2024, the president of El Salvador, Nayib Bukele, was re-elected with over 80% of the vote. The massive support from Salvadorans is thanks to a return to calm for the country of 6.3 million residents, which was destroyed by years of civil war and then gang violence. The 42-year-old head of state, recently called out by Amnesty International for his authoritative drifts, is a communications expert. He almost exclusively uses social networks such as X (formerly Twitter) and TikTok to publish his political results and believes himself to be a modern president. His big economic stunt goes back to September 2021. He was in the spotlight as the country announced that Bitcoin would be an official currency, alongside the dollar.

"The Salvadoran economic communities themselves were taken aback," said Erick Chacón. In the small office of his startup in San Salvador, the president of the country's FinTech association (AsaFintech) recalls the excitement that followed: "Everyone was thinking about the best way to break into this segment." Chacón himself created the Bitcoin payment solution PaySea.net, which allows restaurants, hotels and service providers to exchange Bitcoins for dollars that are transferred to a bank account the next day. "The Bitcoin Law, adopted in September 2021, the Digital Assets Law of January 2023 and the Tech Law of June 2023 all led to the creation of more than one hundred companies in El Salvador. We can't deny the positive impact on the ecosystem."

© MARVIN RECINOS, AFP

"What we're trying to do with the Bitcoin Law is to link our country to the rest of the world"
Nayib Bukele, president of El Salvador

In addition to enthusiasm from local fintechs, this unprecedented legal framework also attracted foreign companies, such as Lemon Cash. The Argentinian startup has $45 million in fundraising and offers a virtual wallet with a Visa card to pay in either a traditional currency or in cryptocurrency. "We chose El Salvador because we want to encourage growth in Latin America and to support the first country that fully supported the cryptocurrency industry," said the co-founder on X. With the change in location of the head office, Lemon Cash would be required to declare any transactions with crypto-assets and its users to the tax authorities in Argentina.

A sign promoting bitcoin transactions, photographed in August 2022 in front of the beach in El Zonte, El Salvador, one of the places where the use of bitcoin has been most encouraged. ↓

An early adopter village

While Nayib Bukele made the bold decision to make Bitcoin a national currency, El Salvador didn't start from scratch in the sector. The president could look to the work already done in El Zonte. In this fishing and surfing village, located barely one hour by car from the capital, cryptocurrencies have been booming since 2019. A circular economy known as "Bitcoin Beach" was formed, following anonymous donations processed via the intermediary of an American living there. The enthusiast Jorge Valenzuela, one of the pioneers of Bitcoin Beach, paused work on his renovation of the Hope House, the physical hub of the project, to explain further. "President Bukele used El Zonte as an example when he launched Bitcoin as a national currency. He followed the movement that we started in 2019 to improve daily life in our community."

At that time, residents of El Zonte started to work for the common good and receive salaries in Bitcoin from Bitcoin Beach. They are working to improve infrastructure, serve as lifeguards, clean the beach, help elderly people, etc. A campaign to educate businesses to receive and utilise payments made in cryptocurrencies was also implemented. But one condition was set by the anonymous donor: it is not possible to pay in dollars. To facilitate payment in Bitcoin, an application built on the "Lightning Network" was developed with help from French native Nicolas Burtey and his company Galoy. Today, the app is called Blink and is the second most used Bitcoin application in El Salvador. Other circular economies, in Guatemala and Ghana for example, also have access to Blink now.

At the Hope House, young people can take classes on computing, cryptocurrency use, sport and even driving lessons to receive their permit. "What we started takes time, but little by little, the quality of life for more than 500 families gets better," said Valenzuela. "They gain autonomy and a bigger perspective."

Valeria, a thirty-something Italian, works at the co-working space at Hope House. This is the second time in recent months that she has come to El Zonte as a digital nomad. She rents a desk and also teaches English classes. "Young people in Bitcoin Beach often don't have a bank account, so Bitcoin allows them to receive money digitally for small jobs and, if possible, save a bit of money or help their parents save." →

Promoting tourism

The Bitcoin Beach experience has put this region of El Salvador on the map, which previously was only known by local tourists and surfers. Now, the beach is home to conventions, such as the one that brought Valeria and her German "bitcoiner" partner to El Zonte for the first time. "My partner already paid in Bitcoin whenever possible, but I started using Bitcoin when I got here with the Blink application. Look, I just transferred about 250 dollars in Bitcoin from my bank account, via another application called Relai. With that, I can buy groceries, eat at a restaurant, sleep in a youth hostel, etc." In just one year, Valeria has already seen changes underway at El Zonte. "There are more hotels and businesses. Prices have increased as well." Tourism is the short-term goal as described by Bitcoin Beach on its website: "Our longer term goal is to attract upwardly mobile Bitcoin enthusiasts looking for a Bitcoin friendly region to buy a second home or permanent relocation."

Not far away, MiChianti regularly hosts meet-ups or weekly meetings of bitcoiners in the coastal village. "It's usually foreign tourists that use Bitcoin in our establishment," said an employee. The hotel installed the PaySea application in order to receive money into a bank account, directly in dollars the following day. In a small t-shirt shop selling locally-made goods just a few steps away, employees confirm: "since the launch of Bitcoin Beach, the economy of El Zonte has blossomed."

Locals are still hesitant

Tourist profits, on which there isn't yet any official data, was an important aspect of the 2021 Bitcoin Law. "What we're trying to do with the Bitcoin Law is to link our country to the rest of the world, to attract foreign currencies, investments and tourism, and to stimulate our economy," said Nayib Bukele. Another important point is that the legislative change aimed to have the entire population of El Salvador adopt Bitcoin. The president plans to facilitate money transfers between the many Salvadorans living in the US and their families remaining in El Salvador (source of 25% of the GDP, according to the International Monetary Fund), by reducing transfer fees that can be as high as 10% of the amount. The reform also allows residents to have access to a digital wallet, as two-thirds of the population do not have a bank account.

In 2021, El Salvador installed hundreds of ATMs to change Bitcoins to dollars. It also created a specific app called Chivo (meaning "cool") that can be downloaded and users can sign up using their national identification number. Every Salvadoran received $30 in Bitcoin, financed by the government, in their virtual wallet. But several bugs were found and documented by local investigative journalists. According to an opinion poll by the Universidad Centroamericana José Simeón Cañas (UCA), nearly one-quarter of Salvadorans used Bitcoin in El Salvador in 2022 to purchase goods and services, compared to only 12% in 2023.

For Erick Chacón of AsaFintech, the drop in the price of Bitcoin and its volatility during the crypto-winter of 2022-2023 may have contributed to scaring people off. "Some of the population may have been hesitant, as many people have difficulty stretching their money to the end of the month (ed. note: 1.8 million Salvadorans live in extreme poverty according to the World Bank). It's very difficult for people to imagine saving money to use it later." Education is the only way to improve Bitcoin usage and technologies in the country, according to Chacón. "And it needs to be handled on a large scale, with the help of companies, the government and foundations. President Bukele even included Bitcoin in the academic curriculum starting in 2024."

"President Bukele even included Bitcoin in the academic curriculum starting in 2024"
Erick Chacón, president of the association AsaFintech

Bitcoin bonds

Despite the weak adoption of the cryptocurrency and a mixed reputation amongst the local population, Bukele reiterated his commitment to Bitcoin in December 2023. He was thrilled to announce the purchase of approximately 2,770 Bitcoins by the state, (approximately $1.2 billion at the current price). He wrote on X that the price had increased and journalists must now apologise. "It would be responsible of the opponents and journalists to retract their statements, apologise, or at least recognise that El Salvador is now making a profit, after they didn't stop saying how much money we would lose."

Propelled by the high price of the virtual currency, the government also reactivated its Bitcoin bond megaproject. It stated on X that the bonds would be issued "during Q1 2024". →

El Salvador's President Nayib Bukele at the closing ceremony of a congress for cryptocurrency investors in Santa Maria Mizata, El Salvador, on 20 November 2021. ↓

Demonstrators protest against President Nayib Bukele's pro-bitcoin policy on Independence Day in San Salvador, 15 September 2021. ↓

A woman shops at a store that accepts Bitcoin in El Zonte, September 2021. ↓

The company Bitfinex, a cryptocurrency trading platform available in 52 countries and registered in the British Virgin Islands, recently obtained a license in El Salvador for the bonds. As a reminder, Nayib Bukele announced in 2021 that he wanted to issue $1 billion in "volcano bonds". The goal of this money is to create a geothermal plant that runs on energy from the Conchagua volcano, that would be capable of supplying sustainable energy for Bitcoin mining, which consumes a lot of energy. It also plans to build an airport and infrastructure capable of welcoming tech companies to make a "Bitcoin City". Additionally, the president wants to use part of the funds to pay off some of the country's debt.

Concern from international institutions

But in the region, there is growing concern over the fraudulent use of Bitcoin for illicit electoral campaign financing and money laundering by organised crime. The *Georgetown Journal of International Affairs* recently published a study on the subject. According to the study, many Latin American criminal groups, including MS-13 (Mara Salvatrucha) active in Honduras, Guatemala and El Salvador, "are discovering the growing faults in the regional architecture in the fight against money laundering", which "makes the transition to cryptocurrencies ever more attractive". For the American NGO Global Financial Integrity which analysed El Salvador's legal framework, more transparency is needed in the virtual asset sector in order to ensure assets are not used for nefarious purposes.

Several global organisations have criticised El Salvador's Bitcoin policy since 2021

Several global organisations have criticised El Salvador's Bitcoin policy since 2021. Last year, the International Monetary Fund (IMF) wrote in a release that given "the legal risks, the fiscal fragility and the largely speculative nature of the cryptocurrency markets, authorities should reconsider their plans to increase governmental exposure to Bitcoin". It also called for "more transparency in government transactions made in Bitcoin and in the financial situation of the Bitcoin portfolio belonging to the State (Chivo)". Despite his re-election and his bold statements on social media, Nayib Bukele cannot completely disregard his critics. In fact, he is currently negotiating a $1.3 billion loan with the IMF, which may be vital to keep the country on track. ◢

A man walks past a Chivo government ATM, which converts Bitcoins into dollars, in September 2021. ↓

© CAMILO FREEDMAN, AFP

Vespa

A BRAND A STORY

An Italian legend

The Tuscan scooter brand, owned by Piaggio, has seduced many generations of fans due to its original aesthetic and mass-market strategy. Valued at more than €1 billion, it is now forging a new path towards a wealthier clientele.

BY BLANDINE GUIGNIER

© ALAMY

↑ The 1971 Vespa Rally

Audrey Hepburn gets on a scooter. Clearly a novice, she starts riding all over the streets of Rome, laughing. The actor Gregory Peck is somehow miraculously able to jump on the back of the scooter. This scene from the film *Roman Holiday*, a love letter to freedom and Italy, made Vespa a legend. Approximately 100,000 models were sold after the film was released in 1953. "70 years later, Vespa still has a very strong fan base, attracted by the concept of *bella vita*," said Daniele Preite, president of the Vespa Club Lausanne. In the club, members come together to share tips and organise rides together. "Many different types of people of all ages participate in our club." Some love Vespas because it was the first vehicle of their youth, while others love the mechanics and are interested in the older gear models, as they are easy to repair. Everyone loves Vespa's vintage aesthetic."

Creating a new form of transport that was affordable, reliable and easy to use for everyone was the goal for the Piaggio Group in 1946. At the end of World War II, the Pontedera-based company was forced to give up manufacturing planes. The engineer in charge of designing the scooter used spare aeronautics parts and made good use of his aeroplane expertise. He created a scooter that allowed the driver to not get dirty, and even to wear elegant clothing while riding. Unlike a motorcycle, there's no need to step over a scooter. The engine (and any resulting oil leaks) is hidden by a hull. The large front that supports the handlebars provides protection for the driver's legs. The brake is on the floor and the speeds are on the handlebars. During development, the CEO Enrico Piaggio said it resembled a wasp ("vespa" in Italian) due to the sound of the engine, which at the time did not exceed 60 km/h.

Iconic design

The original model was followed by others, going from 98 cm^3 to 125 cm^3, and even 300 cm^3 for certain versions. The popularity of the scooter in post-war Europe continued to grow, and soon spread around the world. The company sold one million vehicles in 1956, then two million in 1960, and then four million in 1970. "The design changes somewhat radically depending on the time period," said the president of the Lausanne club. "Many Vespa lovers consider the models from the 1980s to be a failure."

The Piaggio Group, listed on the Milan stock exchange generated record results from January to September 2023

Indeed, sales decreased in the 1970s and 1980s. But the drop wasn't solely due to the design. At that time, several countries now required helmets and many people's standard of living increased, causing consumers to purchase cars instead of scooters. Competition from Japan also increased during this time.

At the turn of the 21st century, Vespa returned to its rounded shape and vintage aesthetic. It also began partnerships with fashion houses such as Dolce & Gabbana and Givenchy. Vespas became popular again and the Piaggio group saw sales increase from 16 million in 2006 to 19 million in 2021 for the brand's 75th anniversary.

Valued at one billion

Today, Vespa targets a rather high-end market. The price of its models (50 cm^3, petrol-powered) starts at €4,000, compared to €2,000 for the French competitor Peugeot, or even €1,000 for some Chinese brands. This positioning and strong marketing has caused the brand valuation to increase 19% in two years. By the end of 2023, it was worth €1.079 billion, compared to €906 million in 2021. "Vespa confirms its place as leader on the European market and is gaining significance in the United States and Asia, with sustained growth in Indonesia, where the Piaggio Group recently opened a new factory for the local market," said the firm Interbrand, which conducted the study. The Piaggio Group, listed on the Milan stock exchange (PIA.MI), also generated record results from January to September 2023. Its EBITDA increased 13.8% year over year to reach €269.3 million. The company also manufactures the Piaggio, Aprilla and Moto Guzzi motorcycles.

Despite the nostalgia, the scooter brand has embraced significant technological advances. For example, in 1996 Vespa moved from a manual to automatic transmission, and in 2018 released electric models. "The electric Vespas are targeted towards a wealthier clientele, and for some fans such as myself, the driving experience just isn't the same," said Daniele Preite. "It lacks the very characteristic sound and smell of the engine."

The second-hand market is also booming. "A 1953 model goes for 12,000 to 20,000 Swiss francs, and 1949 models can even go for up to 100,000 Swiss francs," said Preite. "Specialised garages now offer the possibility, for example, to put new electric motors into old scooters." The Lausanne fan says there's increased interest in older Vespas in Switzerland. "We're always receiving invitations to participate in demonstrations with our scooters, and our members have only increased since we reopened the club in 2004." Thousands of "Vespisti" from around the world, including representatives from the 40-odd clubs in Switzerland, will meet in Pontedera, Tuscany, in April 2024. Together, they will celebrate the 100th anniversary of the Piaggio factory where new Vespas are still made. ◢ → PIA

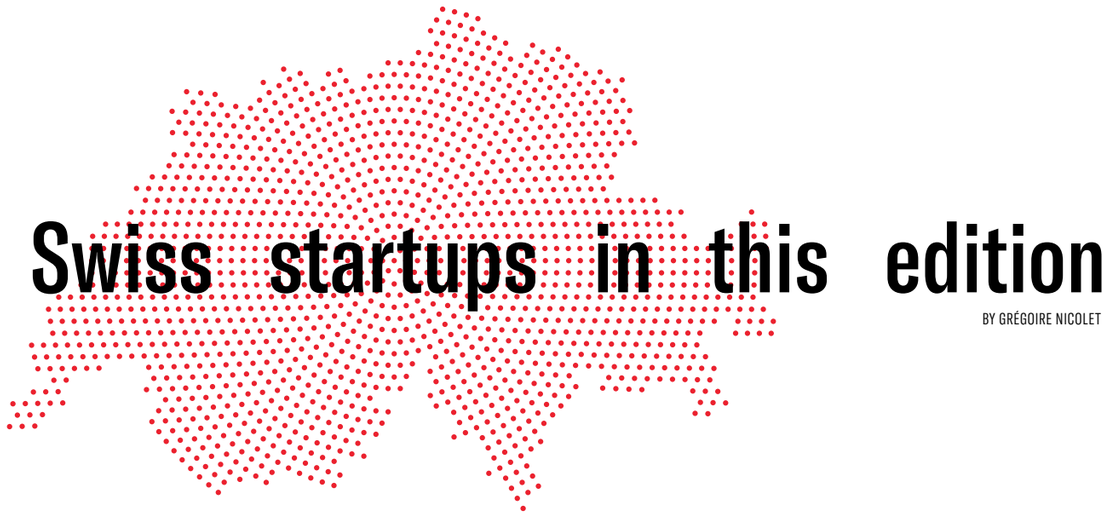
KEY DATES

1884
Piaggio Group is established

1946
The MP6, the first Vespa, is launched

2006
Piaggio enters the Milan Stock Exchange

2019
The Vespa Electtrica makes its debut



Swiss startups in this edition

BY GRÉGOIRE NICOLET

Metafuels

Towards greener skies

NUMBER OF EMPLOYEES
8

HEAD OFFICE
ADLISWIL (ZH)

FOUNDED
2021

Air traffic makes up approximately 2% of global CO_2 emissions, so many companies are trying to decarbonise the sector by developing sustainable aviation fuel (SAF), including the Zurich-based startup Metafuels. By 2030, Metafuels hopes to produce a 100% synthetic substitute to current fuels. Its technology transforms green methanol, produced from green hydrogen (H_2) and renewable carbon oxides (CO/CO_2), into SAF using nanotechnology. Perfect timing, as several facilities that produce green methanol are being built around the world.

The new fuel, dubbed "Aerobrew", also has the advantage of being compatible with current aeroplanes and can be used for both short-haul and long-haul flights, whereas hydrogen-powered planes, for example, would require an entirely new fleet. A recent $8 million fundraising round confirms the interest from investors for this type of fuel. A large amount of the fundraising is dedicated to a pilot plant that the startup is currently launching at the Paul Scherrer Institute (PSI), based in Villigen (AG), in order to confirm the technology. The plant is expected to be operational by early 2025, according to CEO and co-founder Saurabh Kapoor.

Ascento

The vigilant AI-powered robot

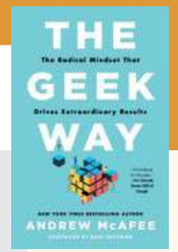
NUMBER OF EMPLOYEES
10

HEAD OFFICE
ZÜRICH (ZH)

FOUNDED
2023

The startup Ascento develops robots that are capable of patrolling exteriors independently, offering a solution to challenges for security companies, such as shortages of qualified employees and high turnover. Ascento Guard, the company's latest robot, weighs less than 30 kg and travels on two wheels at walking speed (approx. 5 km/h). It is equipped with an infrared camera and a thermal camera, and its artificial intelligence is designed to report security problems to a central hub operated by humans. After being tested by the SFF, these robots have already patrolled more than 3,000 km via commercial contracts.

With a potential market of $100 billion according to the platform Gitnux, this EPFZ spin-off founded in 2023 raised $4.3 million this past autumn during a pre-seed fundraising round. The CEO and co-founder Alessandro Morra announced that Ascento is already working with the top security companies and Fortune 500 companies as end users: "We're in the best possible position to become a leader in robotics and AI for this industry, as Ascento Guard offers a real alternative to the endemic problems faced by security companies."



R E A D

The Geek Way

The Radical Mindset that Drives Extraordinary Results

BY ANDREW MCAFEE
LITTLE, BROWN AND COMPANY
NOVEMBER 2023

This book explores the world of people who are passionate about technology and offers a riveting perspective on how they create our future. Author Andrew McAfee is a researcher at MIT specialising in the digital economy, as well as an author of several successful books. In his latest work, he unveils the mentality and skills of geeks, highlighting their impact on innovation and society. With inspiring stories and anecdotes, McAfee celebrates the creativity and determination of geeks.

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L I S T E N

How I Built This

BY GUY RAZ

In his podcast, Guy Raz explores the hidden stories behind some of the largest companies in the world. In each episode, he invites well-known entrepreneurs to understand how they built their famous brands. The entrepreneurs explain how they are able to overcome all sorts of challenges, but also share their moments of doubts and failure. *How I Built This* is a behind-the-scenes look at entrepreneurship, innovation and creativity through the eyes of founders of mega-companies.

CHARTABLE.COM/PODCASTS/HOW-I-BUILT-THIS-WITH-GUY-RAZ

F O L L O W

Mad Money On CNBC

@MadMoneyOnCNBC
There's always a bull market somewhere, and @JimCramer is here to help you find it. Weekdays on @CNBC at @ 6pm EST from the @NYSE.

X (TWITTER) **1,080** FOLLOWING **553.3K** FOLLOWERS

The show *Mad Money* premiered on CNBC in 2005 and is hosted by the charismatic Jim Cramer, a former hedge fund manager. His X (Twitter) feed is a collection of highlights from the programme, which offers knowledge and tools to become a better investor. According to CNBC, Jim Cramer is not authorised to hold stocks that could be discussed during the show.

D O W N L O A D

Artifact: Feed Your Curiosity

A news feed summarised by AI

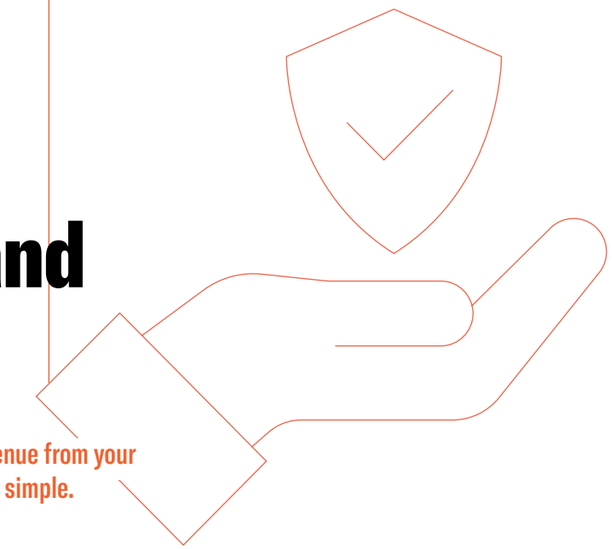
Developed by the co-founders of Instagram, Artifact is a news content aggregator powered by AI. After choosing topics of interest, users can access a feed with links to news articles that AI summarises and chooses a headline for. The application also offers predefined categories such as Crypto, Tech, or EVs. It can also review a user's subscriptions and recommend articles based on the subscription sources.

APP STORE, GOOGLE PLAY
FREE

ADVERTISING

SECURITIES LENDING

Lend your securities and earn more



It is possible to generate additional revenue from your existing portfolio, and it's actually quite simple. Read on to learn more.

While relatively unknown to the general public, securities lending is a financial transaction that allows you to generate additional revenue from your portfolio. The holder of the securities (such as stocks or bonds) lends them to a borrower for a set amount of time, in exchange for a price and a guarantee.

Borrowers are generally motivated by the need to cover short positions or use securities to settle transactions that are on hold, to arbitrate, or to conduct other investment strategies.

Swissquote makes it possible to lend your securities to trustworthy third parties, that pay fees during the lending period. Your securities will only be lent if you choose to do so, and you can activate this feature via electronic signature on your Swissquote platform. The result is additional passive income generated monthly. Swissquote finds reliable borrowers, which are top-rated banks or financial institutions, and we deposit the revenue right back into your account each month. During the length of the loan, we also maintain a collateral of 105% of the value of your borrowed securities as a guarantee. And you continue to receive your substitute dividends.

Another advantage is that you can stop the loan at any time, as Pierre-Yves Mingam, product analyst in charge of this project at Swissquote notes: "You can stop the loan with just one click, effective immediately. Clients can sell their securities at any time just as they normally would." The revenue generated by securities lending stems from demand, or the probability of having a borrower that corresponds to your profile. In practice, the net return rate can be as high as 2%, and can exceed 5% in rare cases. To access this service, go to the Securities Lending section of our trading platform, then follow the instructions to fill out the contract, sign electronically and send back to us. The service will then be activated on your account in the coming working days.

For more information, go to:
swissquote.com/securities-lending

A webinar to learn more

How do you lend securities? Who borrows them and why? What types of assets are eligible? Does this service come with any risks or inconveniences? Stefano Gianti, our Education Manager, answers your questions in a webinar available on demand at:
swissquote.com/webinars

How securities lending works

Securities lending is the temporary transfer of ownership of a stock, bond, or ETF from a "lender" (you) to a "borrower" (a financial institution).

→ The financial institution or "borrower" requests a loan.

→ The securities are then borrowed after the borrower provides a guarantee.

→ The borrower executes their investment strategies.

→ The lender generates additional passive income and is compensated for any regular revenue from the borrowed securities (including dividends).

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AUTO

Egg of Columbus

The Microlino is a simple, ingenious solution for sustainable individual mobility in urban settings, with a fun round shape and more safety features than a motorcycle.

BY RAPHAËL LEUBA

SYNCHRONOUS ENGINE
12.5 KW (17 HP), 89 NM

TRANSMISSION
REAR-WHEEL DRIVE, SINGLE GEAR

BATTERY
LI-ION, CAPACITY 5.5/10.5/15 KWH, MAXIMUM CHARGE AC 2.6 KW

PERFORMANCE
0-50 KM/H IN 5.0 SECONDS, TOP SPEED 90 KM/H

PRICE
5.5 KWH STARTING AT CHF 16,490, TEST CAR 10.5 KWH WITH OPTIONS CHF 19,570

Every millennial had a foldable Micro scooter with either two or three wheels. Like Victorinox, Stöckli, Bamix and Stewy, the Micro brand symbolises a quality Swiss product with strong likeability. So why not make the most of this feeling and go from mobility options for kids, to more as they become teenagers and adults? With expertise gleaned from electric scooters, Micro Mobility Systems has pushed the envelope even further with the Microlino, a two-seat rechargeable micro-car that has just finished its first year on the market in Europe. It is well ranked in the motor-powered (L7e) heavy quad bike category with 3,000 models sold. This is lovely news for Merlin Ouboter, co-founder of the project: "After Europe, we're looking at breaking into the North American market." He continues: "Our vehicle has an integrated self-supporting metal hull, which is unique to the market and increases safety." This is a trademark of the Micro products: a significant amount of aluminium and meticulous design. It even looks as though it was crafted from a single block. There are no lateral doors, and for good reason: the front is the primary opening, as inspired by the Iso Isetta from the 1950s.

MICROLINO

This configuration is quite practical if you cross-park, as you can get out directly on the pavement. Even though the steering column is anchored to the floor, it is quite easy to get out of the spacious vehicle, as it is compact (2.52 m long and 1.47 m wide). This heavy steel door, which supports the windscreen wiper and TFT instrument display, is assisted by a sturdy jack. The light rear hatch opens onto a trunk whose volume (230 l) varies according to the position of the one-piece bench. The lack of backrest and steering wheel adjustment makes for a slightly exotic but not uncomfortable driving position. Visibility would be even better with an interior mirror and larger side mirrors, but it is easy to merge into traffic, even if you feel a bit silly at first. Then the speedy engine takes over; up to 50 km/h, the Microlino can keep up with larger cars, even more so in sport mode symbolised by a rocket icon. Handling is downright joyous. As per the goal – Micro wants to minimise the vehicle's carbon footprint – there is no driving assistance, but it's not really necessary.

When leaving the city, the Microlino transforms into a small "commuter vehicle" capable of reaching 90 km/h flat and approximately 60 km/h on mountain roads (6% inclination), averaging a bit of patience, as well as noise tolerance, since the mechanical components do whistle. Perfect timing to plug a smartphone into the mobile speaker, and both have plugs and dedicated USB connections. Qualified for the motorway, the electric chip is a little more at ease on smaller roads, with the handling inspiring confidence despite the narrow rear track and short wheelbase. We're more circumspect about the absence of anti-lock braking systems (ABS), which are widely used on scooters such as the new BMW CE 02 and CE 04 electric scooters. In wet weather, the rear wheels lock up a bit with the brakes applied heavily. In wintry weather, we also noticed some loss of traction on snow, despite winter tyres. But even though it's nothing like riding a motorcycle, it is thrilling to be driving a Microlino, covered from the elements, with a defrosted windscreen and proper heat. The touchbar control panel also allows for a few gimmicks. In warm weather, the top can open to enjoy the sunshine.

The low energy consumption is a major advantage of the half-tonne engine

The test model, with a 10.5 kWh capacity intermediary battery, could theoretically drive 177 km, or a good hundred kilometre marker under real conditions, or even more in a city and without the heat on. The low energy consumption is a major advantage of the half-tonne engine. While it is not possible to play with the intensity of the energy recovery or the charging speed (via a type 2 cable, 2.6 kW maximum), it doesn't take more than half a day to recharge the battery. All in all, it is quite easy to fall under the spell of the Microlino, a beautiful object that you need to take for what it is: a second or third frugal and practical vehicle, which can go anywhere without even needing a helmet. Service is provided by the AMAG network. ◢

T R A V E L

MADAGASCAR

JOURNEY THROUGH THE BIG ISLAND

Madagascar is famous for its incredibly diverse flora, fauna and landscapes. The best way to explore the country is in a 4×4, from the high plateaus to the turquoise waters of the Indian Ocean. Come along for the ride.

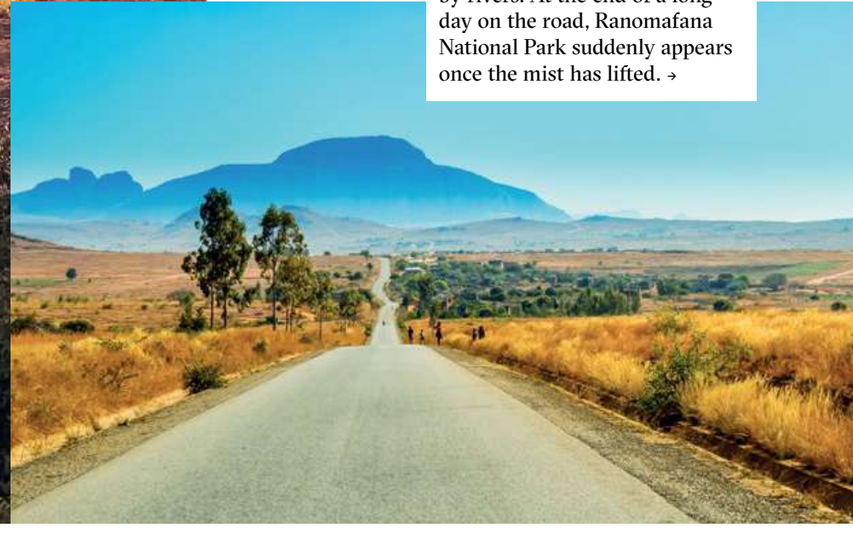
BY JULIE ZAUGG

The Isalo National Park and its spectacular canyons.

© JULIE ZAUGG / ISTOCK

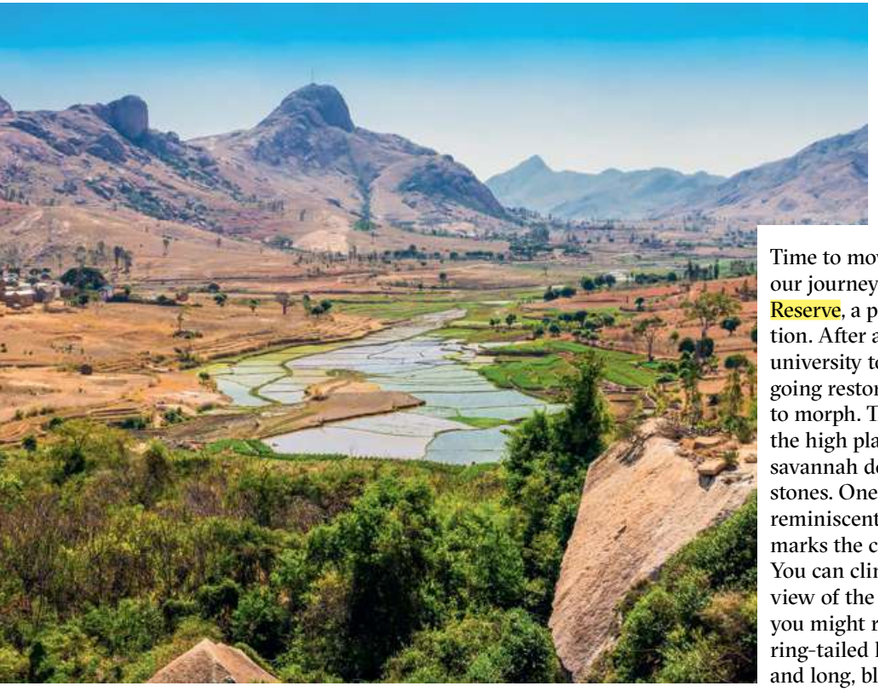
The RN7 is the country's only paved road, cutting diagonally through the middle of the huge island. Just after leaving Madagascar's capital, Antananarivo, the road begins to wind through the fluorescent green rice paddies and tranquil villages that dot the high plateaus in the centre of the island. The air is cool, even though it's summer. From time to time, you come across a "gargote", the local name for a restaurant serving home-made foie gras. This delicacy has become a speciality by local farmers in this rice-producing region that serves the country's 29 million inhabitants.

After four hours on the road, we reach Antsirabe, a colonial town known for its hot springs, where we will stay for the night. The next day, the landscape becomes more rugged. Below, deep, wild valleys have been carved out by rivers. At the end of a long day on the road, Ranomafana National Park suddenly appears once the mist has lifted. →



This primary rainforest, at altitudes ranging between 800 metres and 1,200 metres, is home to no fewer than 13 types of lemur – an animal native only to Madagascar – including the very rare hapalemurs with their rust-coloured fur and the large black-and-white ruffed lemurs. Strolling through the park for a few hours is the perfect way to observe them, as they jump from branch to branch or chomp on leaves in the trees.

Ranomafana is also home to 90 species of butterflies, 112 frogs, 22 lizards, 22 snakes and 118 birds, 30 of which are endemic to the park. If you walk along the RN7 at night, you might catch chameleons hidden in branches, but they change colour to blend into their environment. Located on the edge of the park is a biodiversity research station created by Stony Brook University in New York. The centre regularly discovers new species in this haven of tropical rainforest.

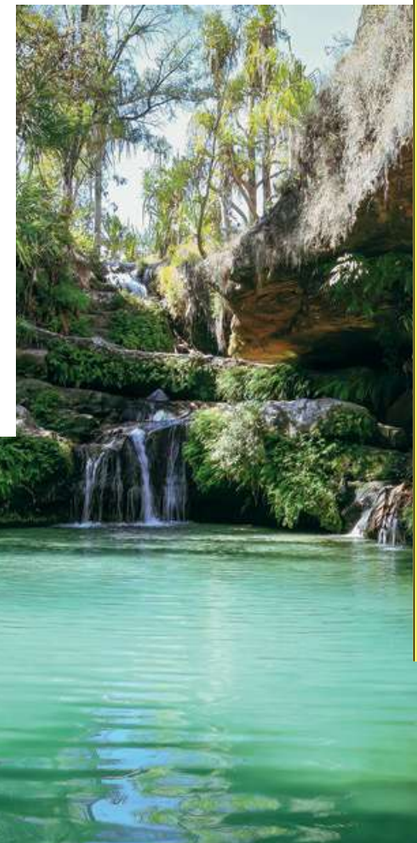


Time to move on, and we continue our journey towards Anja Community Reserve, a park run by the local population. After a stopover in Fianarantsoa, a university town whose Old City is undergoing restoration, the landscape begins to morph. The abundant vegetation of the high plateaus gives way to a grassy savannah dotted with large round red stones. One of the largest, an oval rock reminiscent of Ayer's Rock in Australia, marks the centre of the Anja Reserve. You can climb it to get a breathtaking view of the surroundings. Along the way, you might run into a friendly group of ring-tailed lemurs, with their yellow eyes and long, black-and-white striped tails.

© PIERRE BAMIN / ISTOCK

The RN7 now stretches straight across the savannah, which has become even more arid. The temperature is climbing, close to 30°C. Along the roadside, you spot herds of zebu being led by young herdsmen carrying a stick. Soon, the Isalo National Park comes into view. This wind-carved sandstone massif has been sculpted into a spectacular canyon, not unlike those of the western United States. The serrated walls of rock spike upwards, like something out of a Star Wars set. You can hike here for anything from an hour and a half to several days. Some trails take you to natural rock pools where you can go for a dip.

The park offers a unique opportunity to observe the many plant species endemic to the island, such as the Pachypodium rosulatum, with its bulging, bulbous trunk that looks swollen with water, the Isalo periwinkle (Catharanthus ovalis), a medicinal plant, and the Isalo palm. →



GETTING THERE

Air France offers regular flights to Antananarivo from Switzerland with a stopover in Paris. In Madagascar, Madagascar Airlines operates daily flights between Antananarivo and Toliara.

On the ground, the best option is to hire a local driver and guide, with a 4x4 vehicle. Andry, a keen traveller and nature enthusiast, can customise trips just for you: madagascar-tour-guide.com

TOP SPOTS

Hotel Thermal
Ranomafana National Park
This establishment has 21 rooms, laid out around a tropical garden, and a restaurant serving local and international dishes. Two jacuzzis filled with thermal water are ideal for soothing aches and pains after a long hike in the national park.

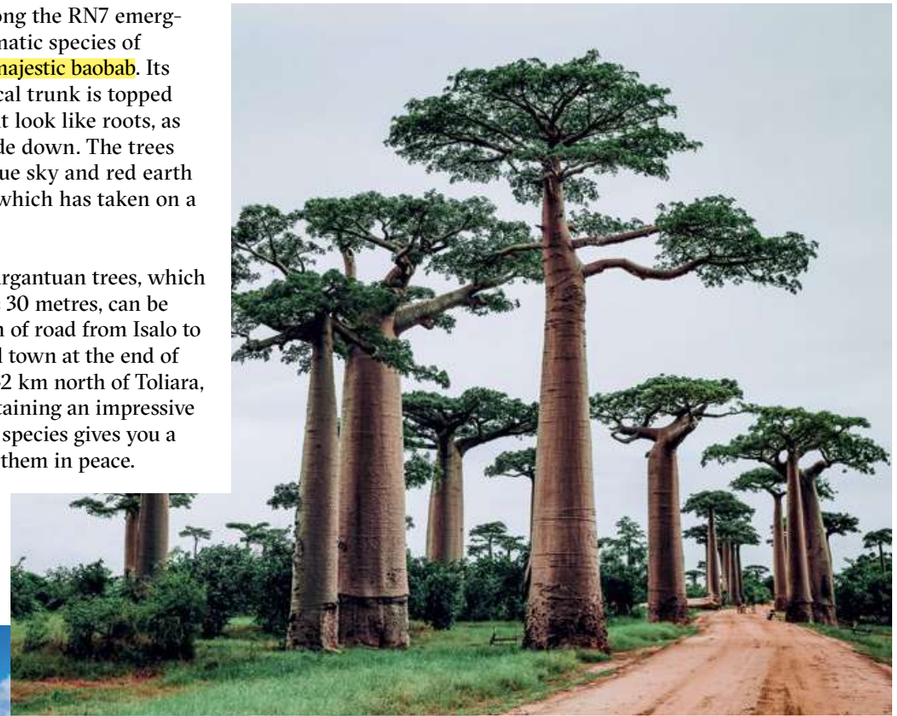
Betsileo Country Lodge
Anja Reserve
Offering stunning views of the large rock in the Anja Reserve, this family-run hotel has a restaurant serving fine, French-inspired cuisine using local ingredients. Its spacious bungalows are set around a swimming pool.

Le Relais de la Reine et le Jardin du Roy
Isalo National Park
These sister hotels offer a haven of peace in the heart of Isalo National Park. The rooms are located in large, tastefully decorated stone houses, near the beautiful swimming pool, and the restaurants serve food worthy of Michelin stars.

Anakao Ocean Lodge
The luxurious white seafront bungalows have their own private beach. The hotel is run by an Italian native who has trained several chefs in gourmet cooking. The result is meticulously prepared dishes of fresh fish and seafood caught daily by local fishermen.

A little further along the RN7 emerges another emblematic species of Madagascar: the majestic baobab. Its immense cylindrical trunk is topped with branches that look like roots, as if they stand upside down. The trees pop against the blue sky and red earth of the landscape, which has taken on a desert-like feel.

Several of these gargantuan trees, which can grow as tall as 30 metres, can be seen on the stretch of road from Isalo to Toliara, the coastal town at the end of the RN7. At Ifaty, 32 km north of Toliara, an arboretum containing an impressive collection of plant species gives you a chance to observe them in peace.



Here is where we change modes of transport, leaving the 4×4 for a boat that heads south along the coast to Anakao beach. Edged by a coral reef, Anakao features a long sliver of white sand that welcomes the turquoise waters of the Indian Ocean. In the morning, we explore the underwater life, snorkelling or scuba diving, as well as the small island of Nosy Ve with its flocks of "straw in tail", an endemic bird. In the afternoon, the wind picks up and the beach becomes a kitesurfing paradise.

After a few days' rest, we fly from Toliara back to the capital Antananarivo. We take advantage of the stopover to visit the beautiful Madagascar Photography Museum and the Rova, the Royal Palace overlooking the city from the upper town, which has recently reopened after a devastating fire.

boutique

The Hermès Yo-Yo

To celebrate 100 years of its flagship Parisian location 24 Faubourg, Hermès has launched a special collection of chic and quirky items, including a bookbag, beach tennis rackets and... a yo-yo. The yo-yo plays with the concept of the colourful wheel of the R.M.S suitcase, an iconic model from the Parisian fashion house. The yo-yo's string is trimmed with leather, and it comes with a round storage case in Barénia calfskin, closed with a Clou de selle snap fastener.

hermes.com
CHF 1,100.-

For fans of the 60s

After its retro-chic bicycles, the Annecy-based start-up Ateliers HeritageBike has created an electric motorcycle inspired by the legendary models from the Steve McQueen era. With a maximum range of 80 kilometres, it is available in two speeds (up to 45 km/h or 130 km/h). Instant yet silent acceleration with no toxic emissions.

ateliers-heritagebike.com
Starting at CHF 17,725.-

Recycled anorak

The Swedish brand Houdini is focused on the circular economy with its outdoor collections designed from recycled materials. The Shelter anorak is made from an innovative fabric that is 70% recycled polyester, making it waterproof, windproof and breathable. The very compact jacket is complete with a hood that can fit a helmet underneath and a kangaroo pocket with an internal compartment for mobile phones. It can be worn for a variety of activities including skiing, biking and kayaking.

houdinisportswear.com
CHF 589.-

Write on stone

Reducing paper waste is the goal for Dutch startup Moyu, which creates reusable notepads made from crushed stone. The notepads, which are printed and bound in Amsterdam, have very sturdy pages that can be erased and reused up to 500 times. For each notepad sold, the company has committed to plant a tree with the NGO Trees for Kenya.

moyu-notebooks.com
Starting at CHF 19.-

Back support

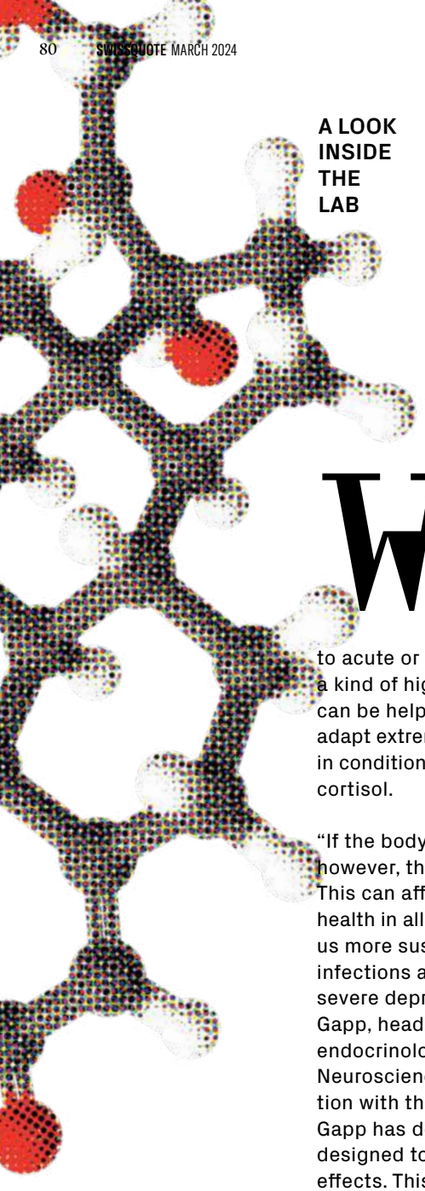
Swedish sport equipment brand Flaxta specialises in sport protection and now offers back protection vests. Very thin and low-profile, the Behold model is equipped with detachable elastic bands and provides the most ventilation possible. Ideal for skiers and snowboarders seeking more protection without sacrificing comfort and freedom of movement.

flaxta.com
CHF 229.-

AI-powered binoculars

Austrian brand Swarovski Optik used the CES 2024 conference to unveil the AX Visio, the first pair of intelligent binoculars designed to observe animals. Birds, mammals, butterflies and even dragonflies can all be viewed and identified in real time along with more than 9,000 other specimen with the simple push of a button. Viewers can also share their discoveries instantly and immortalise the moment thanks to a built-in camera with a 13 MP sensor and 4K video resolution.

www.swarovskioptik.com
Starting at CHF 4,600.-



↑
Cortisol molecule

A LOOK INSIDE THE LAB

A new way to tackle stress

Researchers at ETH Zurich are developing a promising agent capable of selectively inhibiting our body's natural response. BY CHRISTINA HUBBELING

We all know how it feels to be weighed down by stress; it rears its head whenever we feel overstretched or under pressure. Yet stress is also the body's natural reaction to acute or persistent threats, putting it on a kind of high alert. This stress response can be helpful in itself, as it enables us to adapt extremely quickly to danger or a shift in conditions thanks to the stress hormone cortisol.

"If the body produces cortisol constantly, however, the system can go into overdrive. This can affect our physical and mental health in all kinds of negative ways, making us more susceptible to everything from infections and cardiovascular diseases to severe depression," explained Katharina Gapp, head of the Epigenetics and Neuroendocrinology group at the Institute for Neuroscience at ETH Zurich. In collaboration with three other ETHZ research groups, Gapp has developed an agent specifically designed to counteract these negative effects. This new and promising approach could make it easier to treat illnesses caused by chronic stress in a much more targeted way – and with fewer side effects.

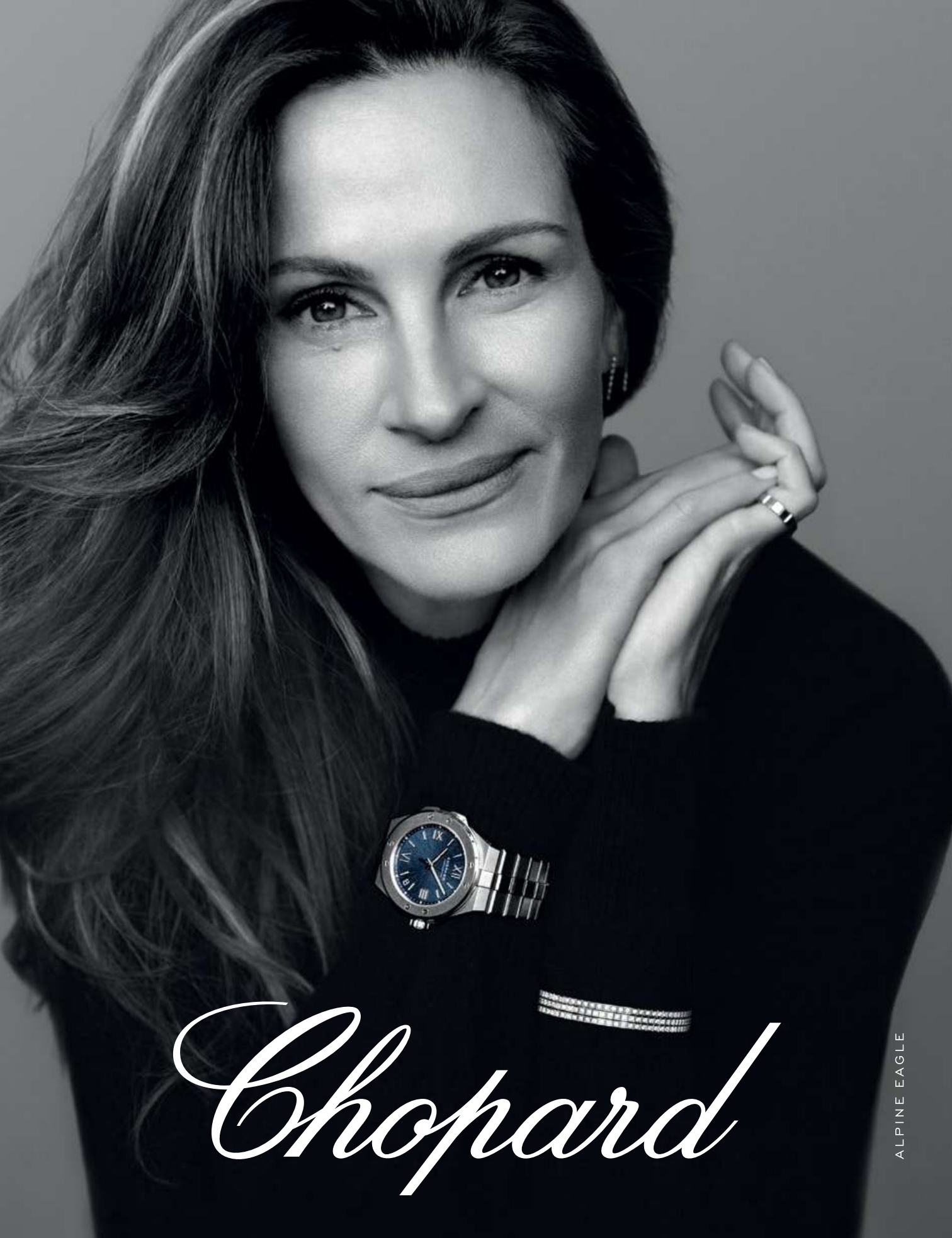
It is important to note that, up to now, medical treatment has focused almost exclusively on the symptoms of secondary conditions. "However, the only approved medication that directly intervenes in the regulation of stress responses has a host of unpleasant side effects. It was actually developed as an abortifacient [a drug designed to induce abortion] and its impact on stress is merely a side effect," Gapp explained.

Fewer side effects expected

The new agent developed by ETHZ pinpoints and eliminates the control centre of the stress response – known as the glucocorticoid receptor – in cell cultures and animal models. By eliminating the receptor protein, the agent prevents the stress hormone cortisol from triggering the reaction in the first place. This is because the genes responsible for the stress response can only "activate" when cortisol bonds with the glucocorticoid receptor. This is when the body experiences the typical symptoms of stress such as elevated pulse rate, increased blood flow to muscles, a surge in metabolic activity, decreased pain perception and heightened concentration.

Katharina Gapp has spent the last three-and-a-half years developing this new agent. In contrast to the aforementioned abortifacient drug, this new molecule essentially affects only the glucocorticoid receptor. This is thanks to what is known as the proteolysis-targeting chimera (PROTAC) method, which allows the agent to target the receptor proteins and supply the cells with a natural degradation system. "Our molecule only has to dock on to the glucocorticoid receptor briefly to send out a signal in the body that triggers a natural chain reaction to degrade the proteins," explained Gapp. By acting as a catalyst, the agent gives the body a helping hand to spring into action itself. As a result, any future medication based on the new ETHZ molecule should be effective in small doses – and the smaller the dose, the milder the side effects.

Yet making it a reality in the laboratory is extremely challenging. Even if all goes well, it will still be several years before the first applications are ready for patients. ◢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