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FINANCE AND TECHNOLOGY UNPACKED

PORTRAIT**HeiQ, the Swiss
hero of high-tech
masks****COMEBACK****The flamboyant
comeback of
Japanese equities****ANALYSIS****Convertible
bonds: back
in fashion**

DOSSIER

THE BOOMING DNA BUSINESS

The madness of mass testing

The potential of synthetic DNA

The revolution of messenger RNA

► ILLUMINA ► BIONTECH ► TWIST BIOSCIENCE ► CRISPR THERAPEUTICS ► INVITAE ► MYRIAD GENETICS ►

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BIG BANG INTEGRAL

Titanium case with integrated bracelet.
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Genetics emerges from the lab



By Marc Bürki,
CEO of Swissquote

“If you want to find areas to invest in, go to laboratories,” a Swiss scientist recently told me. I recalled this discussion at the time of writing this editorial, and it completely resonates with what is happening in the world today. Now let’s back up a bit. Just 18 months ago, before the coronavirus brought the planet to a halt, no one was talking about **messenger mRNA**. Big pharmaceutical companies were barely interested in the technology. And yet, a handful of researchers have been fully aware of its tremendous potential for almost 30 years. One pandemic later, two little-known biotech firms, Moderna and BioNTech, raced past industry giants as the first to bring SARS-CoV-2 vaccines to market. It has been a turning point.

p.38

On its own, the vaccine developed by Moderna is expected to generate close to \$15 billion in sales by 2021. This would make it one of the biggest blockbusters in pharmaceutical history. Not bad for a company launching its first ever drug on the market! But now, mRNA technology is thought to be capable of revolutionising not only prophylactic vaccines, but also many therapeutic applications, as pioneering mRNA researcher **Steve Pascolo** explains in this issue. No doubt that the

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pharmaceutical industry, especially Swiss giants, will start taking a serious look at the technology.

One positive aspect to come from this pandemic is that it has thrust into the spotlight the booming sector of genetics. Like mRNA technology, this field of research is moving out of the laboratory and into the world of business. Of course, we have already heard of genetic engineering applications, such as genetically modified organisms (GMOs). But for this issue, we chose to look at new **solutions** being developed. For example, synthetic biology is believed to be able to use artificial bacteria within the next few years to produce materials such as leather for our clothing, but without sacrificing animals. And by 2040, our data might be stored in DNA instead of data centres.

p. 44

Genetics offers immense possibilities, but just as many potential misuses. Companies are already offering ways of finding love based on genetic characteristics. Apart from lacking any scientific basis and defying ethics, this so-called “**DNA dating**” is not without risk. Today, genetic data is just as valuable as digital data, if not more.

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Happy reading!

ANALYSIS



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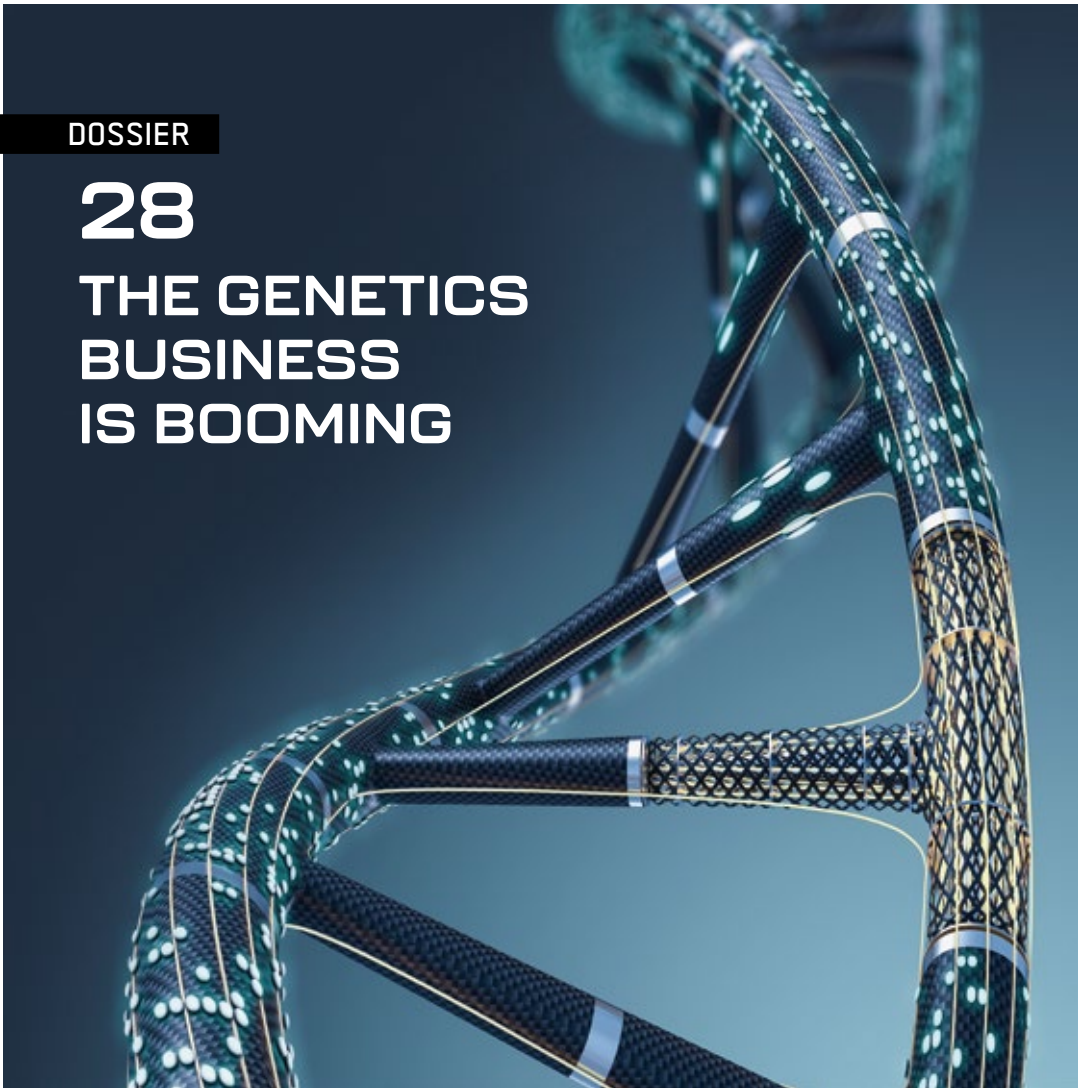


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SCANS



“Brexit is still a divorce. Both sides come out weaker. It’s a lose-lose situation”

Michel Barnier, chief negotiator for the European Union on Brexit, 19 January 2021

media

2021, YEAR OF THE PODCAST



The *Dirty John* true crime podcast has been listened to more than 40 million times since its publication in late 2017.

Podcasting is the new darling of tech giants. In December, Amazon bought the US podcasting network Wondery, the force behind the detective thriller *Dirty John*, whose television adaptation was broadcast on RTS in late 2020. Wondery will be integrated into Amazon Music, which added podcasts to its streaming services in September 2020. In the past two

years, Spotify has also acquired a total of five podcasting companies. Apple, which popularised podcasts, and Google continue to develop their own platforms. Meanwhile, Twitter is testing an audio platform. In early January, the social media network snapped up Breaker, a start-up that has developed a podcast app.

AMZN MKS MSFT AMZN CRM

robotics

HYUNDAI TAMES SPOT

Boston Dynamics, designer of the robot dog Spot, is now officially a member of the Hyundai family. The \$1.1 billion deal assigns a majority 80% stake to Hyundai Motor Group, while the Japanese holding company SoftBank will hold on to the remaining 20%. The robotics company has changed owners three times in just seven years. After moving to Google in 2013, Boston Dynamics became a subsidiary of the SoftBank empire in 2017. For Hyundai, the acquisition comes under its “Elevate” project first presented at CES 2019 to create an electric Ultimate Mobility Vehicle, or UMV, equipped with four retractable legs that can move across any type of terrain.



YOSHIO TSUNODA / AFLO / NEWS.COM



€1,000 BN

The estimated value of the global green bond market in 2021, i.e. growth of €300 billion compared with 2020, according to NN Investment Partners.

digital

ABB IN THE CLOUD

After partnering with Microsoft Azure in 2016 and Salesforce in 2018, ABB is moving forward with its cloud-first strategy. This time the Swiss-Swedish firm is partnering with Google Cloud to optimise data centre management. ABB especially hopes to leverage Google Cloud’s artificial intelligence and machine learning capabilities. In an initial phase, Google Cloud will migrate ABB’s data before moving to the automation phase. This is an important victory for Google, as the tech giant strives to outstrip Microsoft as second-largest provider of cloud services to businesses, with Amazon Web Services (AWS) still ranking first.

ABB MKS MSFT AMZN CRM

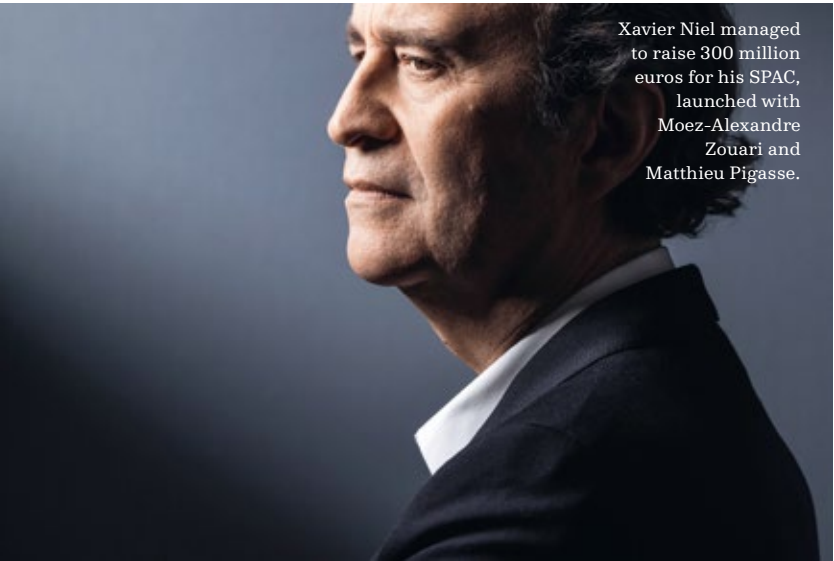


-70%

The estimated discount granted to Ryanair for buying 75 Boeing 737 Max jets, or roughly \$30 million apiece instead of \$125 million at list price. That was the least the aircraft manufacturer could do to jump-start sales on a plane that was grounded for nearly two years.

stock exchange

SPACS MOVE INTO EUROPE



Xavier Niel managed to raise 300 million euros for his SPAC, launched with Moez-Alexandre Zouari and Matthieu Pigasse.

JOEL SAGET / AFP

Special Purpose Acquisition Companies had a banner year on the US IPO market in 2020. With no commercial operations, these vehicles, better known as SPACs, go public solely to buy companies and facilitate the process of taking them public (see *Swissquote Magazine* no. 5 2020). Enjoying that momentum, French businessmen Xavier Niel, Moez-Alexandre Zouari and Matthieu Pigasse founded

2MX Organic, a SPAC created to acquire companies focused on sustainable and responsible consumer goods. On its first day of listing in December, the company raised the maximum authorised amount of €300 million, making it the largest IPO of 2020 in Paris. Swiss newspaper *Finanz und Wirtschaft* reports that several Swiss banks are currently developing SPACs, and local investors are interested.

RANKING

TOP 5 US IPOs OVER THE PAST FIVE YEARS

(valuation at the time of the IPO)

1. UBER (9 MAY 2019)	\$82.4 BN
2. AIRBNB (9 DECEMBER 2020)	\$47 MRD
3. SNAP (2 MARCH 2017)	\$33 BN
4. LYFT (29 MARCH 2019)	\$24 BN
5. SLACK (20 JUNE 2019)	\$23 BN

Source: Crunchbase

TOP 5 LARGEST FUNDING ROUNDS IN 2020

(based on a series of qualitative criteria)

1. RELIANCE JIO	\$5.7 BN
2. RIVIAN	\$2.5 BN
3. KE.COM	\$2.4 BN
4. WAYMO	\$2.25 BN
5. SPACEX	\$1.9 BN

Source: Crunchbase

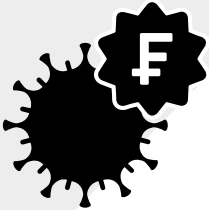
NUMBER OF COVID-19 DRUGS AND VACCINES IN DEVELOPMENT

(as of 16 December 2020)

1. SORRENTO THERAPEUTICS	12
2. IMMUNOPRECISE ANTIBODIES	9
3. ROCHE	8
4. ASTRAZENECA	7
5. GLAXOSMITHKLINE	7
6. NOVARTIS	7

Source: Statista

SCANS



CHF 500 M

The amount of the COVID bill for Swiss health insurers in 2020.



Produced by Sony, the animated film *Demon Slayer*, released in October 2020, became the biggest hit at the Japanese box office.

SONY

entertainment
LEADER IN JAPANESE ANIME

In January, Sony bought the Californian streaming service Crunchyroll, leader in Japanese anime, for \$1.175 billion. The brand was previously owned by AT&T subsidiary WarnerMedia. The Japanese giant hopes that subscriptions will provide a steady revenue source to reduce its dependence on electronics sales, which tend to fluctuate with economic cycles. The acquisition echoes a wave of takeovers in the industry, with several large groups taking over streaming platforms in 2020. In March, Fox snatched Tubi TV. In June, China's Tencent acquired the Malaysian platform iflix. And in November, Baidu bought the Chinese service YY Live for \$3.6 billion.

6758 T FOX 0700 BIDU

minerals
IRON, FLYING HIGH

In December 2020, the price of iron hit \$176 per ton for the first time since 2011. That's a 70% increase over the year. Several factors explain this rise, including the post-pandemic recovery in Asia and continued decline in exports from Brazil, one of the largest producers of high purity iron. But the spike in prices mainly comes from robust demand in China. The world's largest steel producer, China Baowu Steel

Group, produced a record-breaking 100-plus million tonnes in 2019 and 2020 to serve its big-name customers such as BHP Group and Rio Tinto. However, the country needs to import 80% of its iron ore needs. Australian bank Westpac expects the price of iron to fall, but strong Chinese demand is likely to maintain its price at \$100 per ton until the end of 2022.

600019 BHP RIO



Iron ore being imported into the port of Rizhao in China, in 2019.

STR / AFP



"We've seen mental health reasons for people who want to come back to work (in the office). I'm a firm believer that the office is an important part of everyday living"

WeWork Chief Executive Sandeep Mathrani, in an interview with Reuters on 13 January 2021

data
FACEBOOK DRAGS DOWN WHATSAPP



On 10 April, 2018, Mark Zuckerberg had to explain himself to the United States Senate over several scandals related to the lack of data protection on Facebook.

DOULIERY OLIVIER / AGACIA / NEWS.COM

By trying to scrape a profit from WhatsApp, acquired in 2014, will Mark Zuckerberg break his toy? Since the announcement of a new personal data policy on January 6, the green messaging app has been caught up in mayhem. Its users have interpreted the new clauses as forcing them to share their WhatsApp data with Facebook, a company that does not have the best track record in terms of privacy. And they have been leaving in droves. According to Sensor Tower, the number of WhatsApp downloads between the first and second week of January dropped by 14%. Meanwhile, downloads of competing services, namely Telegram and Signal, exploded by 90% and 3,400% respectively. Signal is the messaging service that WhatsApp founder Brian Acton joined in 2018, after storming out on Facebook in disagreement over its monetisation strategy. FB

KICKSTARTER



GOAT STORY

ARCO 2-IN-1
ALWAYS WELL-GROUNDED COFFEE

The start-up Goat Story offers a range of high-end coffee products. Now it is launching a new elegant and versatile electric grinder. The hand grinder is small, to be carried around easily and features a matte black aluminium exterior shell with a sleek design. Its dispenser-collector has the dimensions of a standard espresso filter holder. The machine can grind up to 50 grammes of coffee at once and offers 120 grind settings in its basic model, with an upgraded version featuring 180 different settings. For the lesser connoisseurs, four grinds are pre-set for different brew methods: espresso, filter, ibrik and cold brew. The best part is that the electric grinder can be easily converted into a manual system (included) for grinding coffee on the go. Perfect for camping.

FUNDS RAISED
\$1,000,759

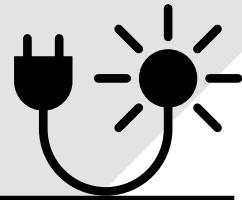
AVAILABLE
JUNE 2021

SCANS



“We’ll move from a car company working with tech to a tech company working with cars, making at least 20% of its revenues from services, data and energy trading by 2030”

Luca de Meo,
CEO of Renault,
14 January 2021

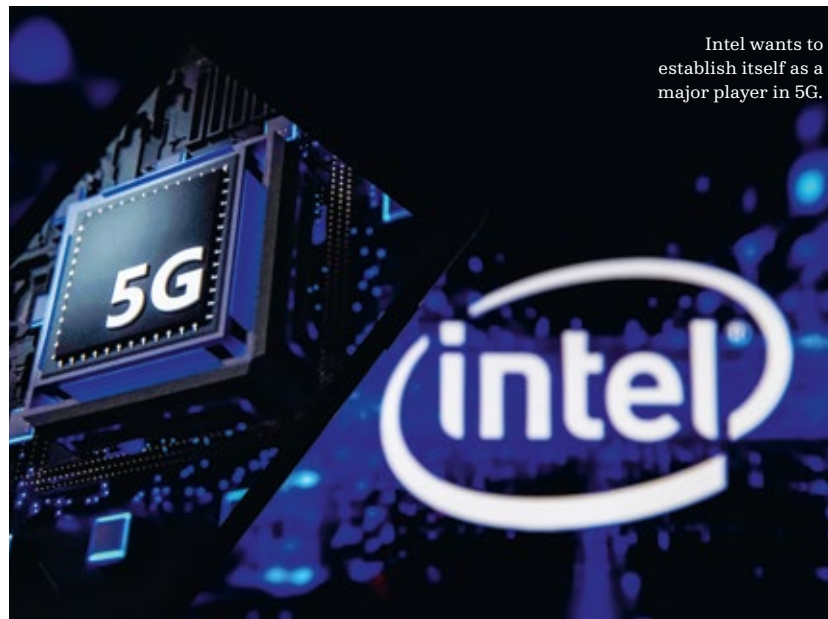


-89%

The drop in the price of electricity from solar power over the past 10 years, as reported by OurWorldinData.org.

telecoms

INTEL IS GETTING RICH OFF HUAWEI



Intel wants to establish itself as a major player in 5G.

ALI / BALIKI / ADALOU AGENCY / AFP

With the ban against the Chinese firm Huawei, telecoms operators are turning to other suppliers for their mobile antennas, mainly Nokia, Ericsson and Samsung. Indirectly, this paradigm shift is also good for Intel. The world leader in semiconductors released a new chip at the beginning of 2020 specifically designed for 5G antennas. The Snow Ridge 5G chip is already used by Nokia, Eric-

sson and ZTE, but Huawei designs its own circuits for 5G antennas. With the chip's success, Intel targets a 40% share of the chipset market for telecommunications equipment in 2021. That should help it catch up with the 7-nanometer process technology for PCs and the loss of the contract from Apple, which decided to produce its own chips.

— INTC — NOKIA — ERIC-B — 0763

THE FLOP

Norwegian's long-haul flights

In 2012, Norwegian Air Shuttle, Europe's third largest low-cost airline, revolutionised transatlantic travel by applying the low-cost model to long-haul flights. However, the airline has been struggling financially since 2019 following the flight ban on its Boeing 737s and was granted bankruptcy protection in Norway in December 2020. Its new business plan will withdraw its long-haul

operations to focus on its core business in the Nordic countries. Flights will therefore be cancelled to France, Great Britain, Italy and the United States, and the decision could affect more than 2,000 jobs. This comes after the airline axed 4,700 flight crew positions in the spring of 2020. In 2019, the share lost 60% of its value and in 2020 nearly 98%.

— NAS



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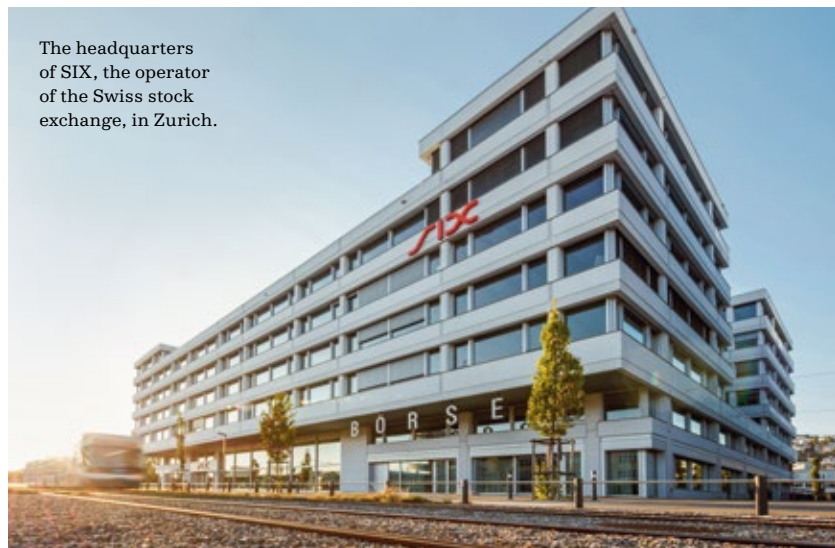
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finance

A SWISS GATEWAY FOR DIGITAL ASSETS

The headquarters of SIX, the operator of the Swiss stock exchange, in Zurich.



The Swiss stock exchange operator SIX is taking a significant stake in Custodigit, the joint venture founded in 2018 by Swisscom and Sygnum, a digital asset management company with a banking license in Switzerland. The partnership will provide banks and their customers with institutional access to cryptocurren-

cies and digital assets. SIX and Custodigit's Institutional Digital Asset Gateway will cover the entire asset value chain: trading, smart order routing, settlement, custody and access to secondary markets. Specifics of the deal were not disclosed, but the service will be available in the first quarter of 2021. — SCMN



“Among publicly available consumer health devices, the Halo appears to collect an unprecedented level of personal information”

Minnesota Senator **Amy Klobuchar**, a lawyer, expressed concern in an open letter to the US Department of Health and Human Services over Amazon's new health tracker, on 11 December 2020



9.3%

Cash injections from the Fed, the US central bank, over the first three quarters of 2020 equalled 9.3% of global GDP, i.e. three times more than during the 2008 financial crisis.

IPO

HEMPFUSION, THE CBD COMPANY, SMOKES THE TORONTO STOCK EXCHANGE

As major hemp producers saw their share prices soar at the end of 2020, HempFusion took the opportunity to go public at the beginning of January. The Colorado-based firm is one of the leaders in the field of CBD-based health and wellness products. The company owns several brands – including HempFusion, Probulin Probiotics and Biome Research –

which are distributed to some 4,000 retailers across all 50 states of the United States and other countries. The American data provider SPINS reports that HempFusion is developing 30 additional products, and its subsidiary Probulin Probiotics is one of the fastest-growing probiotics companies in the United States.

— CBD.U



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The figure

CONRAD KEIJZER

A chemical industry veteran leading Clariant

Position
CEO

Age
52

Nationality
Dutch

The role was vacant for a year, but the Basel-based chemical products and pigments company finally found its new CEO in Conrad Keijzer. The Dutch citizen previously spent 24 years at AkzoNobel, a Dutch company specialising in paints and chemical products. He was a member of the Executive Committee and CEO of its performance coatings division. He then spent nearly a year and a half as CEO of French company Imerys, a leader in mineral-based speciality solutions.

Keijzer's first task will be to manage the lay-off of 1,000 employees, announced in November, following a series of disinvestments. Barclays' analysts believe that Clariant now has become a potential M&A target. Asked about this at a press conference, the CEO responded that he expected future organic growth and acquisitions.

Keijzer, who speaks Dutch, English, French, German and Spanish, has a Master's in industrial engineering from University of Twente in the Netherlands. He also completed the Advanced Management programme at Harvard Business School in the United States.



The country

BURKINA FASO

Solar to save the country

Burkina Faso is the first country in West Africa with a solar panel production and assembly facility. With a daily yield of 200 panels, annual production is expected to provide 30 megawatts of energy, which is 3% of the country's total energy consumption. This factory is the first stage in the Yeelen project ("Yeelen" means "light" in Bambara). The plan is to build 16 solar power plants in order to take advantage of the strong sun in the Sahelian country. By 2030, Burkina Faso aims to cover 30% of its electricity needs with solar energy. The country currently depends heavily on electricity imports from its neighbours. Unfortunately, electricity is not the only commodity in short supply: two million people, or one in 10 Burkinabe, suffer from hunger due to a recurrence of terrorist attacks (1,600 deaths in six years) combined with the economic consequences of COVID-19 and climate change.

Population
20,321,378
(2019)

GDP per capita
\$786.896
(2019)

Growth in 2020
+2% (2018)
2021 estimate:
+5.8%

Main economic sectors
agriculture:
harvesting
and farming
sorghum, corn
and especially
cotton; diaspora;
mining: copper,
iron, zinc and
especially gold

The Mojo Lens, a smart contact lens, features a MicroLED display with an anticipated resolution of 14,000 pixels per inch (ppi).



The innovation

MOJO LENS

Smart contact lenses that display data

Mojo Vision, a California start-up, has developed a prototype smart contact lens dubbed the Mojo Lens. With a miniature screen, the lens can display images and text in the centre of the wearer's field of vision. In December, Mojo Vision partnered with Japanese contact lens

manufacturer Menicon to make the prototype marketable. Mojo Vision also raised \$51 million in April 2020 to finalise a more advanced prototype, since the current version had only one monochromatic screen. While we wait for these lenses to be available, several models of aug-

mented-reality lenses should be on the market in 2021: a model called Nreal by Vodafone, the first connected Ray-Bans in partnership with Facebook, and Apple Glass.

Manufacturer
Mojo Vision
and Menicon

Availability
not disclosed

Price
not disclosed

ANALYSIS

THE VIEWPOINT OF SPECIALISTS

FOCUS

Songs: the popular new asset class

Musical artists' catalogues are being targeted by investment funds, which are attracted by the royalties and predictable returns.

BY ANGÉLIQUE MOUNIER-KUHN

Receive a regular return by investing in the enduring success of our favourite songs... This is the promise of a growing category of investment vehicles: funds that invest in the discographies of musical artists in order to profit from the royalties of each song. These royalties can come from streaming services, radio play, album sales, or placements in films, advert spots or video games. While artists selling some or all of their catalogues and the associated rights is not a new phenomenon, the market has seen unprecedented activity recently. In the past year, barely a week has gone by without a well-known artist, from various eras past and present, concluding this type of transaction.

Universal Music Publishing Group purchased the rights to Bob Dylan's catalogue: nearly 600 songs – representing the Nobel-winning artist's entire discography. The transaction, which went public in December

2020, was valued at more than \$300 million by the US press. But traditional music industry players are no longer the only ones interested in these types of deals. In early January, the private equity platform KKR – known more for its investments in companies struggling to reach their potential – acquired a majority stake in the extensive catalogue of Ryan Tedder, singer of pop-rock group OneRepublic. That same week, Hipgnosis Songs, another investment firm, announced that it had acquired all 145 songs in Shakira's catalogue and their associated content rights.

The deal with the Latin bombshell is just the latest in an astonishing series of acquisitions. Created and managed by Merck Mercuriadis, a music industry professional who once managed Beyoncé, Iron Maiden and Elton John, Hipgnosis is particular in that it is public on the London Stock Exchange, with an

IPO in July 2018 and a capitalisation of €1 billion (January 2021). In late September 2020, the company announced it had invested €1.18 billion so far to build its library of 117 catalogues and 58,000 songs. In the first two weeks of the year alone, in

In 2020, the Hipgnosis fund, which pays 4.17% in dividends, saw its share price increase by 12%

addition to the Shakira deal, Merck Mercuriadis also signed contracts for the rights of producer magnate Jimmy Iovine (Eminem, Lennon, Springsteen), Fleetwood Mac guitarist Lindsey Buckingham and rock star Neil Young. Hipgnosis also holds

The Hipgnosis Songs investment fund acquired the rights to Shakira's catalogue. The singer, pictured here with Jennifer Lopez at the Super Bowl halftime concert at Hard Rock Stadium in Miami Gardens on 2 February, 2020.



JOHN ANGELLLO / UPI / NEWS.COM

the rights to songs by Blondie, Barry Manilow and Mariah Carey.

Another fund recently went public: Round Hill Music Fund, an offshoot of the eponymous US music publishing company that already owns several private royalties funds with songs by the Beatles, Celine Dion and the Rolling Stones. The IPO raised €212 million on the London Stock Exchange in November 2020.

These funds are an example of a relatively simple investment theory: in the era of paid streaming (56% of revenue in the global music industry according to IFPI, the industry's promotion organisation), songs that are well-loved by the general public generate predictable revenue that is uncorrelated with the economic situation. Music is consumed in both good and bad times, as the coronavirus crisis has made clear. Furthermore, the funds are proof that an "active management" of songs in

the portfolio (i.e. monitoring their visibility and promoting their use) can be a source of capital gains. In 2020, the Hipgnosis fund, which pays 4.17% in dividends, saw its share price increase by 12%. This is a remarkable performance compared to the downturn of the FTSE 250 (the 250 UK companies whose capitalisation is between 101st and 350th place), which recorded a 6.4% loss. Round Hill Music Fund has generated nearly 4% growth since its IPO and set a dividend target of 4.5%, a blessing in this time of negative bond yields.

Since musical artists cannot hold live concerts due to the pandemic, they have lost a significant source of revenue. It's a safe bet that many will seek to monetise their art by selling their song rights. They will be even more encouraged to do so now that catalogue valuation has gone up again, after sinking for more than a decade due to illegal downloads.

But it is difficult, or maybe even impossible, to accurately analyse the trend, since the amounts of these musical transactions are never made public. Last summer, the *Wall Street Journal* said that these deals are commanding multiples of around 10 to 18 times their annual royalties depending on the catalogue and musician, compared to between eight and 10 times previously.

Hipgnosis credits all the assets in its portfolio to an acquisition multiple of 14.8 (+1.2 compared to March 2020), but this figure could not be verified. This artistic vagueness is concerning to analysts from Stifel, one of the rare firms that follows this industry. In a note published in January, it downgraded its recommendation for Hipgnosis shares from "buy" to "neutral". It questions in particular the fund's valuation methods and is worried about the general lack of transparency prevalent in the music industry. ▲

FOCUS

Convertible bonds: back in fashion

Halfway between equities and bonds, this hybrid security outperformed most other asset classes in 2020. And that performance is expected to continue in 2021.

BY ANGÉLIQUE MOUNIER-KUHN

They had become a sea snake, overused in financial forecasting. Between unpredictable volatility, equity valuations encouraging cautious investment, and increasingly rare opportunities for returns on fixed income markets, each year promised to be the year of the big comeback for convertible bonds. And each year ended, looking back at a lacklustre performance. Except that in 2020, to the great satisfaction of supporters of the hybrid asset class, the prophecy finally came true. Even more exciting, performance shows no sign of stopping in 2021.

“2020 was clearly a memorable year for convertible bonds, at all levels. In terms of performance, convertible bonds stood out spectacularly during both the stock market correction and bullish phases, which is even more remarkable. Issuance records were also broken,” says Scarlett Claverie-Bulté, investment specialist

at Union Bancaire Privée (UBP). The figures speak for themselves: the Refinitiv Global Convertible Bond (EUR hedged), one of the most widely monitored indices among professionals, shot up 32%, outperforming the MSCI World Net TR (EUR hedged)

“2020 was clearly a memorable year for convertible bonds”

Scarlett Claverie-Bulté,
investment specialist at
Union Bancaire Privée (UBP)

global equity index (up 11.9%) by 20 points. The European convertible bond market also came out a winner, with the Refinitiv Europe Convertible

Bond (EUR hedged) up 6.2%, compared with a 1% decline for the Stoxx Europe 600 NR (EUR hedged). Meanwhile, the primary market had not shown such vigour since the last major financial crisis in 2008. At the end of November 2020, total issues came to \$154 billion, well above the approximate \$100 billion issued every year over the past decade. “The coronavirus crisis has compelled companies in industries such as tourism, transport and retail to issue convertible bonds in order to meet urgent cash needs, as their revenue streams suddenly dried up. And the primary market has the advantage of being much more responsive than the traditional bond market,” explains Marc Basselier, head of convertible bond management at UBP.

To understand why, we need to go back to basics. Convertible bonds are debt securities that can be converted

into shares of the issuing company. So it's a hybrid security that combines the characteristics of both bonds and shares. This gives convertibles an asymmetric return profile compared to traditional shares. In financial jargon, that's referred to as convexity. But in fact, we could call that a good compromise: the convertible bond gives the investor the option of capturing part of the growth on equity markets, while limiting the investor's risk of capital loss with the fixed income part. Available to individual investors via diversified funds, these securities effectively fulfilled their role to absorb market shocks between February and March 2020. During those tumultuous weeks as stock markets crashed, the Refinitiv Global index curbed its decline to 20% while the MSCI World plummeted 31%.

For issuers, convertible bonds provide a source of financing at a reasonable cost. Due to the conversion option, coupons paid to security holders are lower than for traditional bonds. This makes convertible bonds particularly popular with high-growth companies. These firms prefer to minimise their financial costs – coupon payments – and funnel as much of the funds raised as possible into financing their development. Even though the universe has diversified with the arrival of new issuers in 2020, tech companies remain over-dominant. At the end of November 2020, they accounted for

more than 25% of the \$477.5 billion in total convertible capital, according to BofA Merrill Lynch Global Research. That partly explains the impressive outperformance of convertibles last year, especially when stock markets recovered.

In these early days of 2021, it seems risky to expect that this feat could be repeated in the same proportions. But based on experts' analysis of potential downside risks that could impact the market, indicators are pointing upwards. “Growth stocks are expected to continue to benefit from the accelerated transition to the digital economy. If the good news announced at the end of 2020 materialises, namely protection offered by the vaccine, stocks from more cyclical sectors, i.e. those companies that urgently resorted to the convertible market last spring, should also benefit from a recovery effect,” Marc Basselier points out.

The outlook is all the more encouraging given that intrinsic values are adequate. “Usually, such strong performance would drive up the valuations of convertibles... as much as 3% to 6% above fair values, but this did not happen. The significant primary market liquidity kept valuations low.... So there is scope for positive performance in the event of either strong or weak equity markets,” experts at Schroders said in a December article on the outlook for 2021.

Another factor is likely to satisfy investors' appetite for convertible bonds. Slowly but surely, these securities are joining the shift towards meeting ESG (environmental, social and governance) criteria. Last year, the European primary market launched its very first “green” issues, including those in France by Neoen, a renewable energies producer, and by electricity giant EDF last September. Set to finance projects that contribute to the ecological transition, this €2.4 billion “jumbo” size operation marked both the largest convertible bond issue on the European market since 2003 and the world's largest green issue ever.

Of course, no one knows what the COVID-19 pandemic holds in store. “2020 has proved that extreme events can remain out of our control. Another reason why we should include securities in our portfolios that have demonstrated their ability to capture market gains while softening the blow of market declines,” says Scarlett Claverie-Bulté. ▲

INTERVIEW

“UK stocks are highly undervalued”

The uncertainty surrounding Brexit is over, meaning investors are now free. Time for the market to recover.

BY JULIE ZAUGG

After long being overlooked due to the uncertainty about Brexit, UK stocks are finally regaining strength. They are ideal for investors seeking value over growth. Joachim Klement, investment strategist at Liberum Capital, explains why the FTSE 100, the share index of the 100 UK companies with the largest capitalisations on the London Stock Exchange, is expected to return to form.

Now that the United Kingdom and the European Union have come to an agreement, uncertainty around Brexit has finally dissipated. How will that affect the FTSE 100?

The idea of leaving the European Union (EU) without a deal has been hanging over the United Kingdom (UK) for the past four years. Many investors had stopped trading on the FTSE 100 because of this uncertainty. To compensate, they're now showing a lot of interest in FTSE stocks, which will drive up demand in the months to come. Many of these companies operate internationally and have held back from investing in machinery or renovation in recent years due to all the unknowns regarding the future of their exports. The value of these “lost” investments is estimated at £5 billion. With the Brexit deal, companies will start investing in equipment once again. That will stimulate growth for industrial manufacturing and machinery firms, and there are a lot of them on the FTSE 100.

As the UK is one of the first countries to roll out a COVID-19 vaccine, a large portion of its population has already been vaccinated. How will an end to the pandemic impact UK equities?

I'm very optimistic about their potential. They're currently highly undervalued and present a lot of opportunities for investors. FTSE 100 shares are trading at 15 times their earnings (P/E ratio = 15), compared to a P/E of 23 for the S&P 500 and 18 for Euronext. But they will recover later this year as the UK economy emerges from the deep recession caused by the COVID-19 crisis. As soon as lockdown restrictions are lifted, the British will rush back to pubs, fitness centres and stores, generating a strong economic recovery. FTSE 100 stocks will also benefit from the recovery elsewhere in the world. The index includes many companies operating in raw materials, especially metals. Demand is expected to be strong for these materials from China, whose economy is already on the road to recovery. **The FTSE 100 could even grow by as much as 20% in 2021.**

It's not just stocks that are undervalued. The pound sterling is also very low.

Yes, the pound is estimated to be trading at 10% below its actual value, compared to the euro. It is also undervalued against the US dollar and the Swiss franc. That's a huge advantage for foreign investors interested in trading on the FTSE 100.

In the background, the view of the City from London City Hall. Many analysts predict a revival of the UK economy in 2021.



ISTOCK

The pound is expected to regain some of its value in 2021, which would produce a neat capital gain for investors who buy UK shares now.

How will the composition of the FTSE 100 affect its performance in the coming months?

2020 was a particularly good year for high-growth stocks, such as technology, media and telecom companies. They didn't suffer as much, and sometimes even benefited, from the pandemic, which increased their value. But 2021 will be the year of value investing (ed. note: taking a medium- to long-term strategy by investing in undervalued stocks), so most of the constituents of the FTSE 100 are a good place to start. The food service, physical retail and transportation sectors, as well as mining, oil and commodities, are well represented. Currently undervalued, these firms are expected to soar this year. However, high-growth stocks have already priced in a sort of COVID-19 premium, which will gradually vanish as we emerge from the pandemic.

Tell us more about the best opportunities for investors on the FTSE 100.

I'm highly in favour of the mining groups BHP Billiton, Glencore and Anglo American over the next 12 months. I'd also recommend the packaging manufacturer Mondi Group and the manufacturing group Melrose Industries. In the second part

of the year, I'd go for the travel firm TUI, the fitness group The Gym Group, the pub chains Marston's and Young's, as well as retailers with a lot of physical stores, like Next and JD Sports. The valuation of these firms will explode in the second half of 2021. However, I'm more sceptical about a company like Rolls Royce, as orders for aircraft – and therefore for the engines the company produces – are not going to recover any time soon.

And what about dividends for investors who want exposure to the FTSE 100?

The UK is moving towards 0% interest rates. This is now the norm in countries such as Switzerland or Germany, but it is a new thing across the Channel. Many UK companies are likely to take advantage of this and scale back their dividend yield. While often as high as 3% in the past, it probably won't exceed 2% or 2.5% in the future. ▲



JOACHIM KLEMENT
INVESTMENT STRATEGIST
LIBERUM CAPITAL

HeiQ: the Swiss hero of high-tech masks

This Zurich-based company saw sales skyrocket in 2020 thanks to its antiviral treatment for textiles. At the end of the year, it went public on the London Stock Exchange.

BY JULIE ZAUGG

On 23 January 2020, 11 million residents of Wuhan were placed under a strict lockdown and videos began circulating on Chinese social media. They showed long lines at A&E, dead bodies abandoned in hospital corridors and people collapsing in the middle of the street. From Zurich, Carlo Centonze watched it all with a mix of terror and disbelief. He quickly realised that the world was about to enter a new pandemic. “We decided to pull from our archives a technology we developed in 2013 during the Ebola epidemic,” said the co-founder of HeiQ. When the haemorrhagic fever was rampant, the company, which specialises in innovative textiles, developed an antiviral treatment called Viroblock that could be used on surgical masks, medical gowns and gloves. Viroblock was used particularly widely in Guinea.

IN NUMBERS

+95%

The price increase of HeiQ shares from its IPO in early December 2020 to late January

\$10.5 BN

The total value of the antimicrobial textile industry

500 M

The number of clothes that are treated each year with HeiQ Pure technology, which neutralises odours

200+

The number of different products in HeiQ’s collection

This product makes masks at least 30 times more effective against COVID-19, compared to an untreated mask

Once the Ebola crisis passed, however, there was low demand for this type of product. “We put this technology away again,” said Centonze. But as soon as coronavirus appeared, it was ready and waiting to be used. “We began large-scale production in

six weeks,” he said. In March 2020, HeiQ began supplying the first antiviral masks. Since then, demand has exploded. “Now, more than 1 billion masks have been treated with our Viroblock solution,” said the CEO. “It is even used on Burberry cloth masks and gloves made by the brand Cornelia James, worn by Queen Elizabeth II.”

Viroblock was also produced in spray form to be used on surfaces. The W Hotel in Verbier is the first establishment to use it. “We sprayed the entire hotel,” said Pierre-Henri Bovsovers, the general manager. “Disinfecting a room takes less than one minute and after a few weeks, we reapply the spray once a month.”

To ensure the efficacy of the product, HeiQ called on the Peter Doherty Institute, which is affiliated with the University of Melbourne. “We tested samples of fabric treated with Viroblock and found that the product killed 99.98% of the SARS-CoV-2 virus after 30 minutes of exposure,” said Julie McAuley, the researcher who conducted the tests. This product

makes masks at least 30 times more effective against COVID-19 compared to an untreated mask. It also solves the problem of its contamination when placed on a surface that contains the virus or when it’s touched.

“The leaders of HeiQ are top-notch scientists, but they are also very good at business”

Paul Jourdan, CEO of Amati Global Investors

The Viroblock technology consists of a combination of silver molecules – which attract viruses with an opposite charge and destroy them – and vesicles, which break down the viral membrane by reducing the amount of cholesterol. It is also effective against other pathogens (avian flu, H1N1) and bacteria. For example, it destroys more than 99.5% of staph

bacteria within 20 minutes, according to a test conducted by Zurich company Microbe Investigations.

Viroblock is not the first treatment of this type on the market, but it is the most durable. “Viroblock is effective for up to 30 washes at a temperature of 60 degrees, whereas most similar products degrade sooner,” said René Rossi, a specialist in innovative textiles at the Swiss Federal Laboratories for Materials Science and Technology.

This product now makes up more than half of all sales for HeiQ, but it is far from the only innovation in its pipeline. The company was created in 2005, following a long hike completed by Carlo Centonze and his colleague Murray Height from ETHZ. “We had only one t-shirt each,” said Centonze. “Suffice to say after five days of hiking, our shirts didn’t smell very good.”

Centonze and Height decided to put their scientific knowledge to good use and developed an antimicrobial molecule – made from silver – that neutralises odours in fabrics. They signed their first contract with sport clothing manufacturer Odlo, and then another with medical group B. Braun, which used their solution to create a net that could be implanted in a hernia patient to minimise the risk of infection.

Named HeiQ Pure, the technology was soon followed by a series of specialised coatings that make fabric waterproof or reproduce the soft feel and glossy look of silk. HeiQ also created a line of smart textiles that regulate body temperature and retain heat, as well as solutions to reduce the environmental footprint of polyester dyes. “HeiQ’s assortment of products is a treasure trove. Its technologies are diversified and very high-quality,” said Paul Jourdan, CEO of Amati Global Investors. “And there are already several promising innovations in the pipeline.”



Co-founder and CEO of HeiQ, Ticinese Carlo Centonze poses with his daughter, wearing masks treated with the company’s antiviral technology.

Today, the company has 130 employees and more than 200 available products. It supplies products to more than 300 brands, including big names such as Zara, Uniqlo, Gap, Patagonia, The North Face and Puma. In December 2020, it went public on the London Stock Exchange, raising 70 million Swiss francs.


This success is particularly due to its model combining cutting-edge innovation and large-scale production capacities. “We have partnerships with 15 universities and provide scholarships to doctoral students from all over the world,” said Centonze. The company also has its own factories. In late 2019, it acquired Spanish mask manufacturer MasFabEs to be able to produce its own masks.

This structure allows HeiQ to innovate very quickly: it generally takes 18 to 24 months from the discovery of a new technology to placing it on the market. “The leaders of HeiQ are top-notch scientists, but they are also very good at business,” said Jourdan.

“They are gifted at finding gaps in the market and providing solutions.”

In the future, Jourdan believes that the Viroblock technology will continue to drive sales for HeiQ. “The COVID-19 pandemic is far from over and even when it is, people will be used to wearing masks. It will continue to be part of their routines, like in Asia after the SARS epidemic in 2003.” According to him, the technology

can also be used in mattresses, air filters, aeroplane seats and furniture.

HeiQ will also benefit from the growth of the rest of its portfolio. “The fashion world is increasingly interested in functional textiles,” said Centonze. The textile chemicals market is expected to grow 4.5% yearly to reach \$30.7 billion by 2025, according to the firm Grand View Research. 

ANALYST ADVICE

ENORMOUS GROWTH POTENTIAL

HeiQ sales more than doubled in the first six months of 2020, thanks in large part to sales of Viroblock. This trend is expected to continue in 2021 at a slightly lower rate as the pandemic subsides, according to financial analysis group Cenkos, which notably served as a broker to coordinate the company’s stock market listing. The company’s other products – HeiQ Fresh, HeiQ Smart Temp and its eco-friendly polyester dye solution – will also see strong growth, approximately 15% according to the firm. Cenkos also highlights HeiQ’s high margins (+59% expected in 2020), which are 10 to 15 points higher than its competitors (other big names in the chemical industry such as Dow, BASF and Du Pont, as well as companies developing innovative textiles such as Lycra, Polygiene and Gore-Tex). In the medium term, Cenkos believes that HeiQ will be able to increase its revenue from \$30 million to \$300 million per year. It recommends purchasing shares.

DOSSIER

THE GENETICS BUSINESS IS BOOMING

The cost to analyse the human genome has plummeted, opening the door to many medical and also recreational applications. We examine a phenomenon combining science, business and ethics...

BY BERTRAND BEAUTÉ

Dossier prepared by:
Bertrand Beauté and
Stanislas Cavalier

- 34. Infographic: genetics, a journey from the lab to our everyday lives
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- 56. The astounding potential of synthetic biology

Our vocabulary expanded considerably in 2020. We now talk about PCR tests, sequencing and messenger RNA over family dinners, as if this scientific terminology were part of everyday language – all thanks to the coronavirus. We have also begun discussing genetics. Although this change could initially appear to be due to the current situation and expected to soon pass, it actually reflects a more profound shift. Genetics, a subject which has long been confined to specialised laboratories, is starting to move beyond the science world and become part of our daily lives.

“Genetics is playing an increasingly important role in medicine. It’s a rapidly expanding field,” says Professor Marc Abramowicz, head of the Genetic ▶

Medicine division at Geneva University Hospitals (HUG) and director of the Centre for Genetic Medicine. “Approximately 5% of the population has a genetic disease, and often doesn’t know it. That’s really high, affecting 400,000 people in Switzerland.”

And medicine is far from being the only domain affected by genetics: “Since DNA is present in all organisms – both plants and animals – there are many applications for genetic engineering, particularly in farming and the seed industry,” says Hervé Chneiweiss, chairman of the Ethics Committee at France’s health research organisation Inserm [Institut national de la santé et de la recherche médical]. “It’s not a niche market. In fact, it’s worth hundreds of billions of dollars.”

And the impacts of this trend have been felt on the stock market: in 2020, ARK Genomic Revolution – an ETF from asset management firm ARK Invest that includes about 50 genetic engineering stocks – increased 180%, whereas the NASDAQ rose by 43% over the same period. This increase could continue, since the potential of these technologies seems limitless. For evidence, look no further than the internet. In just a few clicks, you can order a DNA analysis kit that reveals your genealogical origins or predispositions to diseases, or even how to improve your athletic performance (see also p. 52).

Technological advances have made genetics accessible to everyone

Élise, a student in Zurich, has first-hand experience. In November 2020, she took advantage of a deal on the site MyHeritage and ordered a genealogical DNA test for about 50 Swiss francs. “I am Swiss, but I have mixed European and South American heritage,” she says. “I wanted to understand the biological components of my identity.”

Can a DNA analysis give you a better understanding of yourself? Not long ago, this was strictly the stuff of science fiction. But technological advances have made genetics accessible to everyone. In 2001, reading the entire human genome – a process called sequencing – cost \$100 million and took months. Today, the latest machines can complete the same operation in just a few hours, for less than \$700 (see infographic on p. 31).

Since the start of the pandemic, sequencing has become extremely important because it can be used to track variants of the SARS-CoV-2 virus. But it also has potential in human medicine. Studying the human genome has made it possible to detect small changes that play a role in the origin or development of diseases.

In 30 years, mutations in nearly 4,000 genes were linked in varying degrees to more than 7,300 diseases, according to figures from HUG. This number will only continue to grow, as scientists are able to identify 200 genes each year whose mutations are linked to a pathology. “We can now diagnose hundreds of genetic diseases,” says Abramowicz. “Sequencing has become a common medical test.”

But reading the entire genome is often not necessary in medicine. For the simplest pathologies that only involve a few very precise mutations, companies have developed low-cost tests that only analyse a specific part of the genome. In

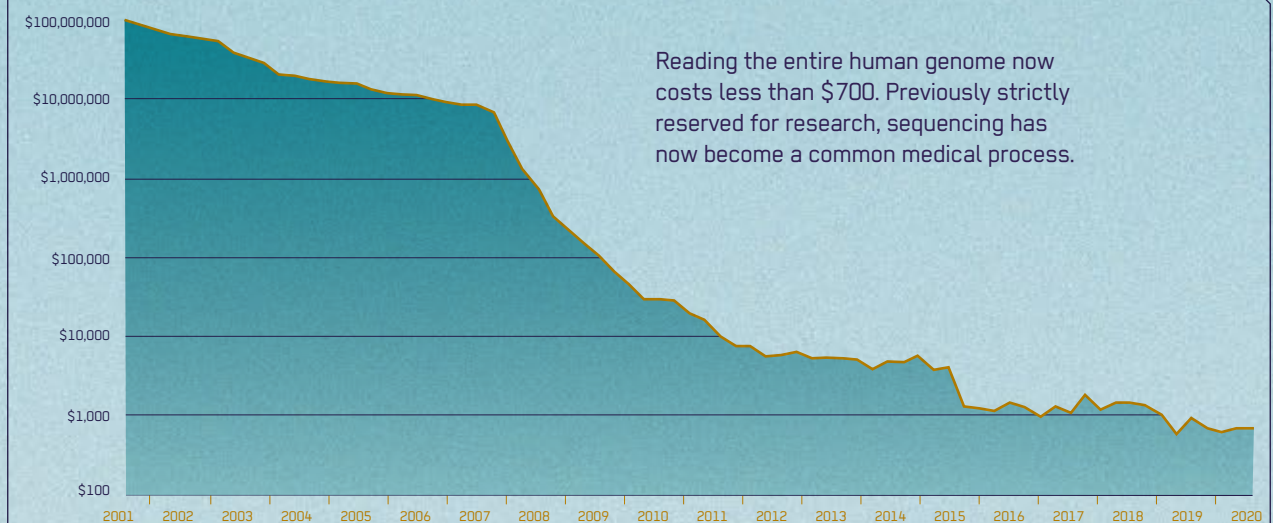
1996, US company Myriad Genetics launched the first test to determine predisposition to breast and ovarian cancer, and it is one of the most prescribed tests in the world today. “The simple, lucrative tests never made it to the public

sector but instead fell into the hands of private laboratories,” says Abramowicz. “Conversely, hospitals still handle the more advanced analyses that require sequencing a large part of the genome and cost CHF 5,000 to 6,000 per patient.” >

Cloud giants are eagerly waiting

The study of the human genome generates a gigantic mass of data, and the quantity doubles each year, according to a study published in the *Journal of Informatics in Health and Biomedicine* in July 2020. This has caused web giants to take an interest in this particular cloud sector. Google, via its service Cloud Life Sciences, and Amazon, via

The stunning drop in sequencing prices



Source: National Human Genome Research Institute

Key words in the dossier

DNA

Deoxyribonucleic acid, or DNA, is a molecule found in every animal and plant cell. DNA stores the genome, which contains the complete set of instructions for living beings to develop and function. However, in certain viruses, such as SARS-CoV-2, the genome is made of ribonucleic acid (RNA). DNA molecules come in the shape of two strands twisted around each other to form a double helix.

GENOME

The genome is all the genetic material of an organism encoded in its DNA. The genome is often compared to a book, written with four letters (A, C, G, T) that stand for adenine, cytosine, guanine and thymine, the four bases (nucleotides) that make up DNA.

SEQUENCING

If the genome is a book, sequencing is the method for reading that book. In other words, determining the sequence of the four letters (A, C, G, T) that make up DNA. The human genome is made of 3.2 billion pairs of letters.

RNA

Ribonucleic acid, or RNA, is a molecule found in virtually all living things that is involved in cellular metabolism. Like DNA, RNA consists of four letters (A, C, G, U), but contains uracil instead of thymine present in DNA. RNA has only a single strand, which makes it less stable than DNA. Note: several types of RNAs exist, but here only messenger RNAs are discussed.

MESSENGER RNA

Keeping with the analogy of the genome, or DNA, being a book stored in a library (the cell nucleus), messenger RNA is like a photocopy of a page from that book. Once taken out of the library, this photocopy can be used as the basis for instructions on how to make proteins, before being destroyed.

PCR

Cells contain a small amount of DNA. The Polymerase Chain Reaction (PCR) is a method used to make enough copies of a DNA fragment that allow it to be studied. For example, PCR is used to measure the viral load of HIV patients.

RT-PCR

Derived from PCR, RT-PCR (reverse transcription-polymerase chain reaction) is a technique for producing RNA strands. The process gained widespread public attention in 2020, as it is used in diagnostic testing for SARS-CoV-2.

According to Global Market Insights, the global medical genetic testing market, which was virtually non-existent 20 years ago, was worth over \$13 billion in 2019, and is expected to grow to more than \$28.5 billion by 2026. This potential has not gone unnoticed by companies that are more interested in lucrative business than patient health. Founded in 2006 by Anne Wojcicki (the former spouse of a Google co-founder), 23andMe was the first company to sell DNA tests directly to consumers without a prescription. Health is just one of the product areas being explored by 23andMe, which focuses primarily on genealogical testing.

These are just some of the companies active in the recreational DNA market – a sector that is even attracting investment funds

And it is not alone: MyHeritage, Ancestry, FamilyTreeDNA are just some of the companies active in the recreational DNA market – a sector that is even attracting investment funds. In August 2020, Blackstone spent \$4.7 billion to acquire the site Ancestry.com. Meanwhile, 23andMe is expected to go public soon, through a SPAC – a transaction that would value the company at \$3.5 billion. This proves that genetics has become a real business, and DNA is now just another item of data that can be ordered online with a smartphone, read, shared and sold. ▲

Markets abound

The use of DNA offers many commercial opportunities, some of which are currently booming. A selection below.



\$21.26 BN

The value in 2018 of the global market in human insulin, the main treatment for diabetes. Indeed, it is thanks to a genetically modified bacterium that artificial insulin can now be produced



\$8.4 BN

The value of the market for the PCR method, which is used among other things for certain diagnostic tests, in 2019. It is expected to reach \$13.8 billion in 2027, according to the firm Verified Market Research



\$8.41 BN

The value of the global sequencing market in 2020. It is expected to surpass \$40 billion by 2030, according to the firm Precedence Research



\$21 BN

The value of the global genetically-modified seed market in 2018



\$13 BN

The value of the medical genetic testing market in 2019. It is expected to reach \$28.5 billion in 2026, according to Global Market Insights



\$1.24 BN

The value of the market for direct-to-consumer DNA tests in 2019

GENETICS: A JOURNEY FROM THE LAB TO OUR EVERYDAY LIVES

Genetics has long been the subject of fundamental research, but it has now become a flourishing business. Here's the story.

BY BERTRAND BEAUTÉ

1865

The Austrian monk Gregor Mendel, commonly known as the father of genetics, studies pea plants and discovers the hereditary transmission of certain characteristics, such as if the pea is wrinkly or smooth.

1869

DNA is isolated for the first time by Swiss doctor Friedrich Miescher. He named the substance nuclein.

1944

American scientists Oswald Avery, Colin MacLeod and Maclyn McCarty discover that the DNA molecule is the basis of heredity.

1953

James Watson, Francis Crick, Maurice Wilkins and Rosalind Franklin discover the double helix structure of DNA, which makes it possible to understand how DNA replicates. In 1962, Watson, Crick and Wilkins received the Nobel Prize in Medicine for this discovery, which laid the foundations of modern genetics.

1960

French Nobel laureates Jacques Monod and François Jacob discover messenger RNA, a single-strand copy of DNA that can be used to produce proteins in cells. In 2020, messenger RNA becomes famous, because it is used to create certain coronavirus vaccines.

1977

British biochemist Frederick Sanger develops the first DNA sequencing technique, which can be used to read the genome. For this discovery, he receives his second Nobel Prize in Chemistry in 1980.

1978

The bacterium *Escherichia coli* (E. coli) is genetically modified to produce human insulin. In 1982, this artificial insulin becomes the first commercial application of genetic engineering.

1982

The first genetically-modified animal is created – a giant mouse to which the growth hormone gene from a rat had been transferred. The first transgenic (GMO) plant was produced a year later.

1983

American chemist Kary Mullis invents the polymerase chain reaction (PCR) technique and wins the Nobel Prize in 1993. This method can exponentially duplicate a DNA sequence in vitro. By solving the problem of low quantities of available DNA, PCR revolutionises molecular biology. Today, a variant of this method (RT-PCR) is used in coronavirus diagnostic tests.

1984

British researcher Alec Jeffreys develops a procedure that can identify an individual using the variations in their genome. In 1986, this genetic analysis is used to identify a murderer for the first time.

1991

US company Myriad Genetics is created. In 1996, it releases the first test that could indicate a predisposition to breast cancer, based on analysis of mutations in the BRCA1 gene.

2003

After 13 years of work, the full sequencing of the human genome is complete. This immense effort cost \$2.7 billion and involved more than 20 research centres. Today, the latest machines can complete the same operation in just a few hours, for less than \$700 (see p. 31).

2007

US company 23andMe becomes the first company in the world to market genetic testing to the general public, to enable them to trace their ancestors. The saliva test was named the "Innovation of the Year" by *Time Magazine* in 2008.

2012

Scientists Emmanuelle Charpentier (France) and Jennifer Doudna (US) develop CRISPR-Cas9, a genome-editing technique. This method could cure many diseases, since it corrects the genome more precisely than traditional gene therapies. For this discovery, the two researchers receive the Nobel Prize in Chemistry in 2020 (see p. 46).

2020

Developed in less than a year – a record – COVID-19 vaccines made from messenger RNA become available on the market. Messenger RNA technology is presented as a therapeutic revolution that could completely change many medical fields such as oncology.

RNA VACCINES: AN INCREDIBLE BREAKTHROUGH



The pandemic has forced vaccine research into a new era of messenger RNA therapies – a revolution that big pharma did not see coming, overtaken instead by innovative biotech companies.

BY BERTRAND BEAUTÉ

Unlike traditional vaccines, mRNA solutions must be stored at a very low temperature (-70 ° for BioNTech's vaccine, -20 ° for Moderna's). A logistical challenge that will be the business of refrigerated transport specialists, according to UBS. Here, the German company Va-Q-Tec which has developed refrigerated containers to transport BioNTech's vaccine.

BioNTech from Germany and Moderna from the US. Two biotech companies, virtually unknown to the general public a year ago, have now won the coronavirus vaccine race. Their success is thanks to messenger RNA (mRNA). By using this innovative technology that has been sitting (or maturing) for more than 30 years in laboratories, the two companies have revolutionised the vaccine sector (read an interview with Steve Pascolo on p. 42). "It's a bit embarrassing for big pharma," smiles Pierre Corby, a health analyst at Union Bancaire Privée (UBP). "They were beaten by two unknown start-ups." Comparatively, the vaccine produced by Sanofi (ranked number 3 in the world for vaccines) will not be ready until the end of 2021 – a year after Swissmedic approved the BioNTech vaccine! ▶

Of course, none of this would be possible without “Operation Warp Speed”. Launched in mid-May by Donald Trump to accelerate the development of coronavirus vaccines, this project played a major role in vaccine development. Between 2010 and 2020, it took an average of eight years to develop the 21 vaccines authorised by the FDA during that period, whereas for the COVID-19 vaccines, it only took one year, thanks to the \$12 billion invested as part of Warp Speed.

“Washington decided to support several vaccine technologies to maximise the chances for success,” said Martial Descoutures, a pharma/bio-tech analyst at Oddo BHF. “And mRNA technology was the winner.” This success is even more remarkable considering that, despite nearly three decades of research, messenger RNA had never previously been used to create a marketable vaccine. The technology was purely experimental.

“It’s truly impressive,” says Corby, health analyst at Union Bancaire Privée (UBP). “In January 2020, mRNA was still just a concept that not many believed in. Now, we have the first COVID-19 vaccines because of it. The pandemic was an incredible

catalyst for this technology. Without it, we would have had to wait until 2024 for BioNTech or Moderna products to be available.”

“It’s truly impressive, in January 2020, mRNA was still just a concept that not many believed in”

Pierre Corby, health analyst at Union Bancaire Privée (UBP)

MASS PRODUCTION CHALLENGES
Compared to traditional vaccines (see inset below), the primary advantage of messenger RNA is that it is a much simpler technology to use: “Producing an RNA vaccine is faster and less expensive than producing a standard vaccine,” said Corby. “It’s a wonderful technology that has become mature.”

In phase III trials, the RNA vaccines from BioNTech and Moderna achieved an impressive efficacy of nearly 95%, whereas the traditional vaccine developed by AstraZeneca/Oxford is only 70% effective. “I would be surprised if other COVID-19 vaccine candidates are able to reach that level of efficacy,” says Descoutures. But developing a vaccine is only the first step. It also needs to be produced on a large scale and meet pharmaceutical industry quality standards, which has never been done for RNA vaccines.

To achieve this, BioNTech, CureVac and Moderna – the three most advanced biotech companies using messenger RNA technology – had to partner with well-established players in the industry. Moderna is outsourcing 80% of its coronavirus vaccine production to the Swiss company Lonza, BioNTech has partnered with Pfizer, and CureVac (whose vaccine is not yet approved) is working with its compatriot Bayer.

The Pfizer/BioNTech partnership expects to produce 2 billion doses in 2021, while Moderna is aiming for 1 billion. This will certainly generate incredible revenue. According to figures leaked on the internet, the

RNA VACCINE: HOW DOES IT WORK?

The general principle of all prophylactic vaccines is to “train” the immune system to recognise a disease agent before the agent infects a person. If a vaccinated person becomes infected, their body can immediately react, preventing the disease taking hold. Traditionally, vaccines are made up of viruses that have been rendered inactive in the laboratory, or of a protein from the protective shell of the

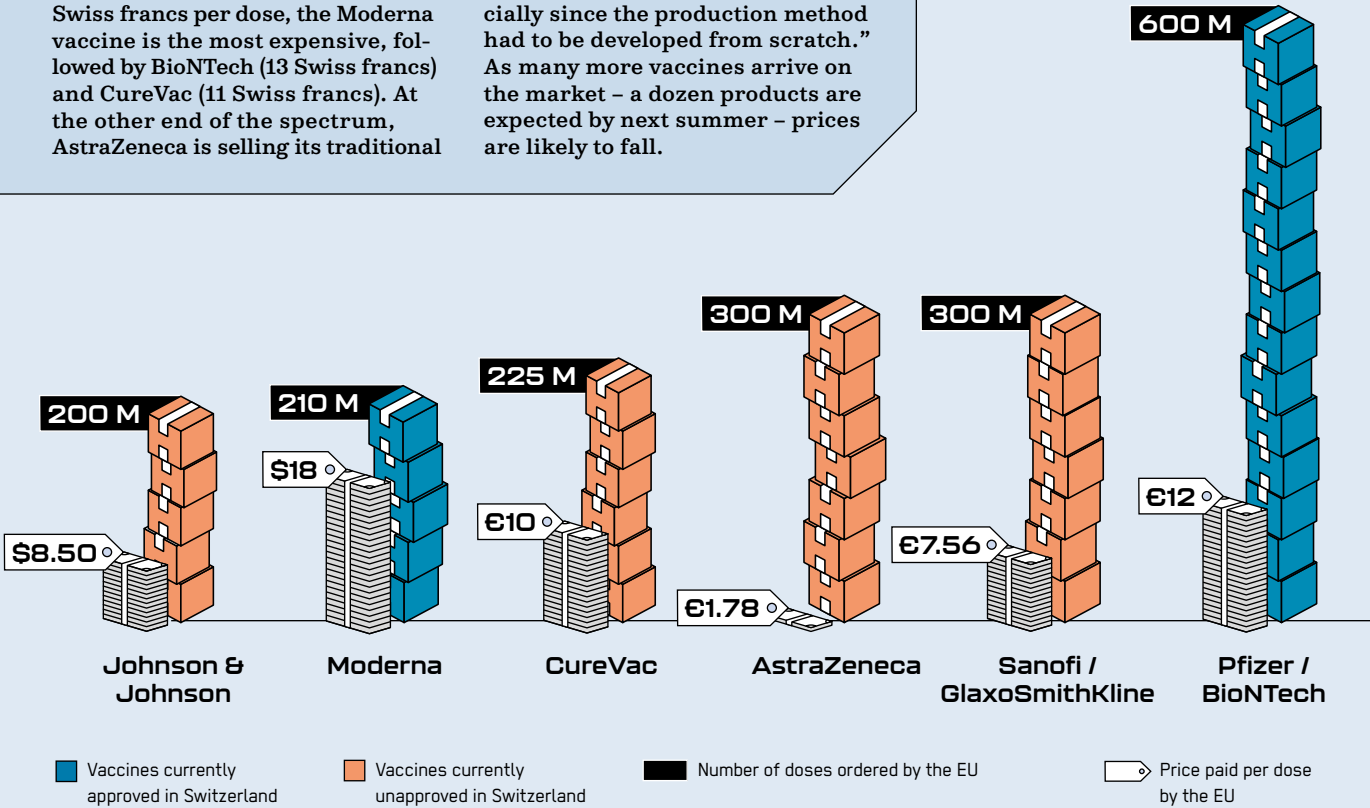
virus. The immune response induced by these vaccines is generally rather weak. Additives such as aluminium are added to increase the immune response. But mRNA vaccines cause a very strong immune response on their own and do not require additives. To produce mRNA vaccines, scientists create an RNA in the laboratory that is coded for one of

the virus proteins (the spike protein, for the coronavirus). This mRNA is encapsulated in lipids and injected into the body. It will then be processed just like any other mRNA that is present in human cells and turned into protein. Cells produce the viral protein, which will induce an immune response. Unlike traditional vaccine solutions, RNA vaccines are completely synthetic.

PRICE WAR

In mid-December, the Belgian State Secretary for the Budget, Eva De Bleeker, caused an uproar when she tweeted the prices paid by the European Union to pre-order COVID-19 vaccines. At nearly 16 Swiss francs per dose, the Moderna vaccine is the most expensive, followed by BioNTech (13 Swiss francs) and CureVac (11 Swiss francs). At the other end of the spectrum, AstraZeneca is selling its traditional

vaccine at only 1.9 Swiss francs per dose. This difference doesn’t shock Pierre Corby, analyst at UBP: “Innovation costs money. It’s to be expected that the messenger RNA vaccines are more expensive, especially since the production method had to be developed from scratch.” As many more vaccines arrive on the market – a dozen products are expected by next summer – prices are likely to fall.



European Union paid 12 Euros for the BioNTech vaccine and 18 Euros for the Moderna vaccine (see infographic above).

“These companies will see lots of revenue this year,” confirms Corby. But no one knows what will happen afterwards. Will the pandemic end? Will the coronavirus become endemic and, if so, will people have to have an injection every year, like the flu vaccine? There are still many unknowns at this time.”

While the share prices for BioNTech and Moderna sky-rocketed, by 105%

and 450% respectively in 2020, analysts are cautious about the future.

“Sales won’t be quite as strong in subsequent years,” warns Descoutures, “especially since the price of COVID-19 vaccines could fall in a year, when many other products come on the market and compete with BioNTech and Moderna.”

But Moderna, CureVac and BioNTech have other advantages. “Before the pandemic, these companies were working on other medicinal candidates,” said Corby. “Moderna has about 20 potential vaccines in deve-

lopment and BioNTech specialises in cancer treatments. Messenger RNA therapies have only just begun.”

Martial Descoutures agrees: “The success of messenger RNA vaccines makes the technology credible in the prophylactic vaccine sector. I expect that older vaccines will be reformulated with this technology. For other therapeutic applications, such as oncology, we must remain cautious. I think that messenger RNA will work in some cases, but not others. As with all treatments in development, there will be successes and failures.”

INTERVIEW

"MESSENGER RNA COULD BE USED TO TREAT ANY ILLNESS"

As Switzerland approves two COVID-19 vaccines that use messenger RNA, Steve Pascolo – a researcher at University Hospital Zurich, an industry pioneer and a busy entrepreneur – explains the potential for these new types of therapeutic solutions. Find out more in this interview.

BY BERTRAND BEAUTÉ

Steve Pascolo knows messenger RNA well. Long before 2020, long before the pandemic and long before the molecule became the most talked-about in the world, the University Hospital Zurich researcher was already working on the therapeutic potential of messenger ribonucleic acids (mRNA). In an interview with *Swissquote Magazine*, Pascolo explains how in the span of over 20 years, this molecule went from being abandoned by academic research to being a vaccine solution that could lead to a therapeutic revolution.

The first two approved vaccines for SARS-CoV-2 are mRNA vaccines. Does that surprise you?

No. The technology has been ready for a long time. But the coronavirus epidemic really sped things up. It created global demand and generated financing that confirmed the potential of mRNA. For the small community of researchers

who have been studying it for a long time, this does not come as a surprise. It just confirms what we've been saying for 20 years: in a pandemic, this technology allows us to create a vaccine in a very short amount of time. It's not a coincidence that the first two approved vaccines (from BioNTech and Moderna) use mRNA. It's because this technology is the best tool we have.

Why did it take so long to emerge?

In the early days of my research, back in 1998, no one cared about mRNA. No one believed in it! We received no public funding and, without money, we couldn't continue our research. Now, everyone is changing their tune and saying that this technology is amazing. But it's not new, it wasn't pulled out of a hat. We've been working in the shadows for 20 years.

Why was there such a lack of interest from the scientific community?

Unlike DNA, which is very stable, mRNA quickly degrades in the human body. For this reason, there was a bias against RNA. For a long time, most researchers believed that the molecule was too fragile and that it would be destroyed by the body before it could have any therapeutic or vaccinal effect. So they preferred to work on the potential of DNA instead. In my opinion, the fact that RNA degrades quickly has always been an advantage. I think that it is more secure, precisely due to the fact that it is biodegradable. That reduces the risk of complications. That said, in the vaccines currently on the market, the biotech companies had to encapsulate the mRNA in lipid nanoparticles in order to protect it and transport it into cells.

Will we start to see other mRNA vaccines?

We will likely see some older prophylactic vaccines be replaced with mRNA versions, because they are safer and much easier to produce. New vaccine products will be developed to fight viruses that we don't have solutions for yet, such as cytomegalovirus or Zika. Clinical mRNA vaccine studies are already underway.

What other illnesses could be treated with RNA?

In theory, there could be an mRNA solution for any medical condition. The potential of this technology seems infinite. For genetic diseases such as cystic fibrosis and Duchenne muscular dystrophy, mRNA could be used to create a therapeutic protein. It could also

"In the early days of my research, back in 1998, no one cared about mRNA. No one believed in it!"



PHILIPPE ROSSIER / BLICK / RINGIER

STEVE PASCOLO: AN MRNA PIONEER

After a PhD at the Pasteur Institute in Paris, Steve Pascolo joined the University of Tübingen in Germany in 1998. Along with several colleagues, he founded German biotech firm CureVac in 2000, where he held the role of Chief Scientific Officer (CSO). From 2003 to 2006, CureVac and the University of Tübingen clinic led the first clinical trials of mRNA-based cancer vaccines.

In 2006, Pascolo left CureVac and joined University Hospital Zurich, where he created the "therapeutic messenger RNA» platform in 2017. As part of the European MERIT programme, he collaborates with German company BioNTech to conduct clinical trials for breast cancer patients. He is also the founder and CEO of the start-ups Miescher Pharma and spRNA.

be used to treat Alzheimer's and Parkinson's disease. The German company Ethris, for example, is developing an mRNA nasal spray that can restore lung function to patients with respiratory illnesses. Moderna is particularly focused on cardiac pathologies; an mRNA injection into a patient's heart could produce proteins that repair blood vessels. And of course, there are high hopes for mRNA in the oncology field, with the development of individualised cancer-fighting vaccines.

How does that work?

Doctors take a biopsy of part of the tumour and then sequence the genome. They then produce mRNA

molecules that are coded for the identified mutations. This creates a vaccine unique to the patient and results in an immune response that is targeted to the tumour. The goal is both therapeutic (tumour regression) and prophylactic (avoiding relapses after an operation). The European MERIT project – in which I am participating with BioNTech – is also conducting clinical trials with breast cancer patients.

So far, cancer vaccines have not been very effective...

Cancer cells, as well as AIDS cells, are able to escape and hide in the body because they can mutate many times. So a vaccine created

from one specific tumour protein isn't going to work. You need a big immune response. In oncology, mRNA vaccines will be able to target not just a single protein, as in the case of coronavirus, but five to 15 proteins, and possibly even more. This type of vaccine is expected to be approved by 2023.

This is not the first time that people have used the word "revolution" when a new technology emerges. At the time, gene therapy provoked a similar response...

With gene therapy, everyone was calling it a revolution, even though the technology had never yielded results. But mRNA has proven results, as evidenced by the coronavirus. The revolution happened before people even knew about it.

Which companies are best positioned to benefit from mRNA?

CureVac, BioNTech and Moderna are all doing very good work, but I think that BioNTech, with whom I collaborate, has more guarantees because its portfolio of molecules in development is more diversified. CureVac, which was created in 2000 and is the industry pioneer, has always focused on mRNA vaccines. Moderna, which was created in 2010, originally targeted mRNA-based gene therapies and only started working on vaccines in 2014. Finally, BioNTech (founded in 2008) takes a horizontal approach, and is focused on cancer treatments in a broad sense. Besides mRNA technology, it is also developing other approaches, such as cellular therapy and immunotherapy. ▲

Winners of the genome revolution

Offering direct-to-consumer genetic testing, gene therapies, and even incredible IT storage solutions, the DNA business continues to grow. A myriad of companies are taking advantage of it. Here's an overview.

BY BERTRAND BEAUTÉ

ILLUMINA

A world leader in sequencing, Illumina supplies machines that can track coronavirus variants. Illumina sequencers are present in more than 10,000 laboratories in 115 countries.



FOUNDED
1998

HEADQUARTERS
SAN DIEGO (US)

EMPLOYEES
7,800

2020 REVENUE
\$3.236 BN

ILLMN

ILLUMINA THE FUTURE GOOGLE OF GENETICS

With a touchscreen on top of a black or white plastic box, Illumina devices look a bit like large printers. Upon first glance, it's hard to tell that these machines are the driver of the genetic revolution. But in fact, they produce more than 90% of sequencing data worldwide. In other words, they read the vast majority of DNA studied in the world, leaving only crumbs for Illumina's competitors (Roche, Thermo Fisher and BGI).

To protect its discoveries, Illumina filed more than 900 patents, monopolising the market

How did the Californian company become such a monopoly? To find the answer, we need to go back to the early 2000s. At the time, scientists

used the Sanger method to sequence DNA. This process, in which each letter of DNA (A, G, T, C) is read individually, was long and expensive. Illumina had another solution: bombarding fragments of DNA with lasers. Each of the four letters reflected back a different light, making it possible to use cameras and algorithms to read DNA more easily: in 2001, sequencing the entire human genome cost \$100 million, whereas now it costs just \$700. The price reduction is so remarkable that it is now referred to as "Flatley's Law" in honour of Jay Flatley, the head of Illumina from 1999 to 2016 (see infographic on p. 31).

To protect its discoveries, Illumina filed more than 900 patents, monopolising the market. And the company essentially built an empire, building more than 17,000 sequencers around the world. But with lower sequencing costs, replacing the machines and selling the related consumables is becoming a less lucrative business. So Illumina is increasingly focused on developing cloud solutions to analyse the data generated by its systems. The goal is to become the Google of genetic data. Most analysts recommend holding shares, which rose by 11.5% in 2020.

AND ALSO...

MODERNA

A MEDIA SENSATION

The US biotech made all the headlines in 2020 with its mRNA vaccine to fight Sars-CoV2, the second vaccine to be approved by Swissmedic. The company, which is expected to generate nearly \$13.2 billion in revenue in 2021 thanks to the vaccine, also has another 15 products in its development pipeline (see *Swissquote Magazine*, September 2020).

FOUNDED: 2010

HEADQUARTERS: CAMBRIDGE (US)

EMPLOYEES: 820

2019 REVENUE: \$60.2 M

MRNA

THERMO FISHER

THE LAB SUPPLIER

The US multinational Thermo Fisher Scientific supplies research material to laboratories, including sequencing devices. In August 2020, the company acquired Qiagen – a Dutch biotech known for its diagnostic kits and DNA and RNA purification products – for \$12 billion.

FOUNDED: 2006

HEADQUARTERS: WALTHAM (US)

EMPLOYEES: 75,000

2019 REVENUE: \$25.54 BN

TMO

CUREVAC

THE GERMAN PIONEER

The German biotech, which is developing a COVID-19 vaccine currently in phase III trials, is a pioneer in the mRNA field. Created in 2000, well before its competitors BioNTech (2008) and Moderna (2010), it has in its portfolio other prophylactic vaccines, particularly for yellow fever, as well as mRNA-based immunotherapies for several cancers.

FOUNDED: 2000

HEADQUARTERS: TÜBINGEN (DE)

EMPLOYEES: 450

2019 REVENUE: €17.4 M

CVAC

CRISPR

THE MOLECULAR SCISSORS

When Jennifer Doudna (American) and Emmanuelle Charpentier (French) were awarded the Nobel Prize for Chemistry in October 2020, a revolutionary discovery came to

light: the CRISPR-Cas9 system. Behind this rather unsophisticated name lies a tool that can cut and modify the DNA of any organism, including that of humans. "These

'genetic scissors' have only been around for eight years, but they already hold great promise for humanity, offering the hope of curing genetic diseases," explains Pernilla Wittung-Stafshede, a member of the Nobel Committee, at the announcement.

To develop these therapies of the future, Charpentier founded the Zug-based company Crispr Therapeutics in 2013, where she now acts as a scientific advisor. This biotech company is the most advanced in the therapeutic application of the CRISPR system: its drug CTX001, for haemoglobinopathies, is the first of its kind to have entered clinical trials, with two patients receiving treatment in early 2019. Preliminary results, published in December 2019, were promising.

"These 'genetic scissors' already hold great promise for humanity"

Pernilla Wittung-Stafshede,
member of the Nobel Committee

The company (one of whose main shareholders is pharma giant Bayer) also has three anti-cancer drugs in phase I clinical trials, as well as less advanced treatments for genetic diseases such as Duchenne muscular dystrophy. Most analysts recommend buying shares, which have already risen by more than 130% since the start of 2020.

Emmanuelle Charpentier, co-founder of Crispr Therapeutics, being awarded the Japan Prize in April 2017. She later received, in October 2020, the Nobel Prize in Chemistry with her colleague Jennifer Doudna.

TAKEHIKO SUZUKI / YOMIURI / THE YOMIURI SHIMBUN / AFP

FOUNDED
2013

HEADQUARTERS
ZUG

EMPLOYEES
300

2019 REVENUE
\$289.590 M

CRSP

TWIST

THE GOLDSMITH OF SYNTHETIC DNA

To promote the German series *Biohackers*, released in August 2020, Netflix stored the first episode on artificial DNA, synthesized by US company Twist Bioscience. What if we stored digital data in DNA, rather than in the cloud? The rather surprising idea is garnering quite an interest from digital giants. With its density and very long lifespan, DNA is an ideal material for storage. According to an article published in *Science Magazine* in 2017, a single gramme of synthetic DNA can store 215 petabytes of data – the equivalent of 100 million films! In 2018, researchers from ETHZ succeeded in storing the entire *Mezzanine* album by Massive Attack on a few strands of DNA. "This method allows us to archive music for hundreds of thousands of years," said Robert Grass, professor at ETHZ. Comparatively, music storage on a CD will only last for about 30 years.

A single gramme of synthetic DNA can store 215 petabytes of data - the equivalent of 100 million films

To explore this potential, in November 2020 software giant Microsoft and hard drive specialist Western Digital announced the creation of a "DNA Storage Alliance" with Illumina and Twist Bioscience. Within this alliance, Illumina will supply its

expertise in reading DNA, so that the stored data can be accessed (see also p. 45). But the biggest challenge is producing synthetic DNA to build a new type of hard drive. And that's where Twist Bioscience comes in. While the cost of producing synthetic DNA remains prohibitive (nearly \$3,500 per megabyte), Twist has developed a technology that produces DNA on silicon chips, which could drastically reduce the price.

The stakes are high. Beyond data storage, synthetic DNA is seen as the next big thing in genomics after sequencing, since it could have applications in a variety of fields such as biofuels, biotherapeutics and biomaterials. For example, the company Impossible Foods has already used synthetic DNA to produce a haemoglobin-equivalent that makes its artificial meat "bloody". Twist Bioscience is currently leading this growing market, but several private start-ups are hard at work, such as DNA Technologies, Eurofins Genomics and DNA Script. Most analysts recommend holding shares in Twist, which already increased by more than 540% since the start of 2020.

FOUNDED
2013

HEADQUARTERS
SAN FRANCISCO (US)

EMPLOYEES
400

2020 REVENUE
\$90.1 M

TWST

EXACT

THE SCREENING EXPERT

A specialist in genomic cancer screenings, Exact Sciences has grown considerably in recent years, acquiring Genomic Health in 2019 for \$2.8 billion and Thrive Earlier Detection in October 2020 for \$2.15 billion.

FOUNDED: 1995

HEADQUARTERS: MARLBOROUGH (US)

EMPLOYEES: 2,300

2019 REVENUE: \$1.32 BN

EXAS

GENOWAY

MUTANT MICE

A small Lyon-based company, genOway creates genetically modified lab mice using CRISPR-Cas9 technology. This is a booming sector for drug testing, so the company has a promising potential outlook (see *Swissquote Magazine*, September 2020).

FOUNDED: 1999

HEADQUARTERS: LYON (FR)

EMPLOYEES: 100

2020 REVENUE: €11 M

ALGEN

BGI

LOWER COSTS FROM CHINA

The news made headlines. In February 2020, the Beijing Genomics Institute, better known as BGI Group, announced that it could sequence the human genome for \$100, which is seven times less than with sequencing machines from the global industry leader Illumina.

FOUNDED: 1999

HEADQUARTERS: SHENZHEN (CN)

EMPLOYEES: 3,600

2019 REVENUE: \$434 M

300676

CELLECTIS

THE FRENCH START-UP

Collectis is developing UCART19, a promising cancer treatment based on genome editing that is currently in phase I clinical trials. The company has five other treatment candidates that are less advanced (see *Swissquote Magazine*, March 2019).

FOUNDED: 1999

HEADQUARTERS: PARIS (FR)

EMPLOYEES: 100

2019 REVENUE: \$15.19 M

CLLS

FOUNDED
1991

HEADQUARTERS
SALT LAKE CITY (US)

EMPLOYEES
2,600

2020 REVENUE
\$638.6 M

MYGN

LEON NEAL / GETTY IMAGES

By revealing in 2013 to have undergone a double mastectomy, actress Angelina Jolie publicised Myriad Genetics' genetic testing.



MYRIAD THE SHAMELESS AMERICAN

The story of Myriad Genetics is now case law. In 1996, the US company was the first to market a genetic diagnostic test that measured the predisposition for breast and ovarian cancer. To protect its invention, the company filed two patents on the BRCA1 and BRCA2 genes, which are closely associated with those cancers. This privatisation of DNA became the subject of a global

cer genetic testing. Since the ruling, many tests have been developed by competitors, including those outside the medical industry. Companies such as 23andMe offer this type of DNA testing directly to consumers without a medical prescription.

This is because the market has skyrocketed, thanks to Angelina Jolie. In 2013, when genetic testing was still largely unknown to the general public and even health professionals, the American actress wrote an article for the *New York Times* announcing that she had undergone a preventative double mastectomy at the age of 39 because she is a carrier of the BRCA1 mutation. Her article, titled "My Medical Choice", caused many people to take an interest in their genetic risk factors. The phenomenon was dubbed the "Angelina effect" and the portfolio of available genetic testing has expanded ever since. Myriad Genetics, which is only one of the hundreds of companies selling genetic testing, offers more than 15 DNA tests for diseases such as depression, melanoma and colorectal cancer. Most analysts recommend holding shares, which have gone up and down for several years.

Myriad Genetics offers more than 15 DNA tests for diseases such as depression

public debate, with a fundamental question: can human genes be patented? Myriad Genetics lost the battle definitively in 2013 when the US Supreme Court ruled that DNA could not be patented. The decision ended its monopoly on breast can-

INVITAE TELEMEDICINE IN THE GENOME AGE

Direct-to-consumer genetic testing is becoming more widespread. This is demonstrated by the success of unlisted company 23andMe, which offers members of the public the opportunity to order a saliva test online for \$199 to detect their genetic predisposition to a dozen or so diseases. But this type of service raises a few issues (see also p. 52): "When patients receive the results, they are not in a position to interpret them," stresses Professor Marc Abramowicz, head of the genetic medicine department of the Geneva University Hospitals group (HUG) and director of the Centre for Genetic Medicine. "This can cause a certain amount of distress, and even anxiety if the results are bad."

In response to this problem, American company Invitae, a specialist in genetic screening tests, has developed a more sophisticated approach, whereby customers can order genetic testing kits online for between \$250 and \$350. Unlike companies such as 23andMe, the test is approved by an "independent" expert who judges whether the customer really needs it. If the test is deemed pertinent, the kit is sent to the customer, who takes the saliva sample himself and sends it back to Invitae. The results are then made available online. The company strongly recommends that its customers have their results analysed by a doctor – an additional service that Invitae provides through its part-

nerships with telemedicine providers PWNHealth and Genome Medical.

Invitae's innovative approach takes advantage of two booming sectors: genetic testing and telemedicine. Most analysts recommend holding shares, which soared by more than 150% in 2020.

FOUNDED
2010

HEADQUARTERS
SAN FRANCISCO (US)

EMPLOYEES
800

2020 REVENUE
\$278 M

NVTA

CALYXT NEW GMOS

Using genome editing tools, this US company develops genetically-modified food products, such as a soybean oil that is low in bad fats. It has been on the market since 2019 and claims to be a healthier choice (see *Swissquote Magazine*, March 2019).

FOUNDED: 2010
HEADQUARTERS: MINNESOTA (US)
EMPLOYEES: 50
2019 REVENUE: \$7.3 M

CLXT

NATERA PRENATAL TESTING

Specialising in genetic testing, Natera launched the non-invasive prenatal test Panorama in 2013. The flagship product can detect genetic diseases in an embryo by testing a blood sample from the mother, avoiding a much more invasive amniocentesis.

FOUNDED: 2004
HEADQUARTERS: SAN CARLOS (US)
EMPLOYEES: 1,000
2019 REVENUE: \$302.3 M

NTRA

VERACYTE BAYER'S FRIEND

American company Veracyte is developing genome tests to avoid unnecessary surgery in the treatment of various cancers. In December 2020, German giant Bayer extended the scope of its collaboration with Veracyte to include the molecular diagnosis of thyroid cancer.

FOUNDED: 2008
HEADQUARTERS: SOUTH SAN FRANCISCO (US)
EMPLOYEES: APPROX. 270
2019 REVENUE: \$120.4 M

VCYT

BIONTECH

THE CANCER-TURNED-VACCINE SPECIALIST

During its IPO on the NASDAQ in 2019, the German biotech group was struggling to attract investors. It planned to sell 13.2 million shares in the IPO at a unit price of \$18-\$20, but the company had to scale down its plans, releasing only 10 million shares at \$15. At the time, BioNTech specialised in individualised cancer treatments with a pipeline of about 20 compounds. It did not yet have any products on the market and had never generated a profit.

Due to the coronavirus, BioNTech and its partner Pfizer are expected to share \$15 to \$20 billion in revenue in 2021

But that was then. In January 2020, the company's future changed radically when CEO Uğur Şahin,

who co-founded BioNTech with his wife Özlem Türeci, decided to pivot entirely and develop a COVID-19 vaccine using mRNA technology. After receiving €375 million from the German government and partnering with US giant Pfizer in March 2020, the small biotech made the right decision: in December, BNT162b2 was the first vaccine authorised in the United States, European Union and Switzerland. "Seeing people benefit from our work is very touching," said Türeci, in an interview with German magazine *Spiegel* in early January.

Due to the coronavirus, BioNTech and its partner Pfizer, which plan to produce two billion doses in 2021, are expected to share \$15 to \$20 billion in revenue in 2021. And after that? The German biotech will likely return to its original focus: "I think that we have a realistic opportunity to fundamentally change the way cancer is treated," said Şahin in *Spiegel*. And now that mRNA technology has proven itself effective against the coronavirus, BioNTech is no longer struggling to attract investors. In 2020, the company's share price increased 160% and analysts are now split on whether to purchase or hold shares.

BIONTECH



At the very beginning of the pandemic, the German laboratory BioNTech redirected its research towards a vaccine against COVID-19.

FOUNDED
2008

HEADQUARTERS
MAINZ (DE)

EMPLOYEES
APPROX. 1,500

2019 REVENUE
€108.6 M

BNTX

EDITAS

THE GENOME EDITOR

With around 10 drug candidates in its pipeline, Editas Medicine, which uses the CRISPR-Cas9 genome editing method, has a robust portfolio. That said, all its drugs are still in the early stages of development.

FOUNDED: 2013

HEADQUARTERS: CAMBRIDGE (US)

EMPLOYEES: 2,008

2019 REVENUE: \$20.5 M

EDIT

INTELLIA

NOVARTIS'S PARTNER

With partnerships with Novartis and Regeneron, Intellia Therapeutics is developing seven treatments using CRISPR-Cas9 technology, particularly for genetic diseases and certain types of cancers.

FOUNDED: 2014

HEADQUARTERS: CAMBRIDGE (US)

EMPLOYEES: 250-300

2019 REVENUE: \$43.1 M

NTLA

SANGAMO

THE PIONEER IN GENOME EDITING

A front runner in genome editing, American company Sangamo Therapeutics has some 15 drugs under development, its most advanced being SB-525 for haemophilia A, which is currently undergoing phase III clinical trials.

FOUNDED: 1995

HEADQUARTERS: RICHMOND (US)

EMPLOYEES: 350

2019 REVENUE: \$102.4 M

SGMO



DNA

MASS-MARKET TESTING GOES WILD

Genealogy, athletic performance, food intolerances... Recreational genetic testing kits sold online can now be used for quite eccentric purposes, even in Switzerland. But just because the kits are available doesn't mean they are risk-free.

BY BERTRAND BEAUTÉ

When Élise received the results of her genealogical testing, she was a bit surprised and a bit disappointed: "It found 25% Balkans origins, which I wasn't expecting at all," said the Zurich student. "The rest was pretty disappointing. The results aren't very precise. It didn't give me any real information." Like many people, Élise decided to order a genetic test online. Easy enough. Kits can be ordered online in just a few clicks, and some are even less than 100 Swiss francs. The test arrives a few weeks later in the mail. Just scrape the inside of your cheek with the large cotton swab provided, place it in a tube and send it back to the company, often located in the United States.

These direct-to-consumer tests can reveal how to improve athletic performance, where your ancestors came from, or even if you are genetically susceptible to certain diseases such as Alzheimer's. Companies like DNA Romance even offer their clients the opportunity to find soul mates based on so-called scientifically unproven and ethically questionable genetic complementarity. According

to the *MIT Technology Review*, 26 million people around the world purchased direct-to-consumer (DTC) DNA kits between 2013 and 2019. This number is expected to reach 100 million by late 2021, according to the review. According to Global

"If you're not paying a lot of money for the test, that means the company will absolutely sell your data. You are the product!"

Hervé Chneiweiss, president of the ethics committee at Inserm

Market Insights, the DTC test market, which exceeded \$1 billion in 2019, is expected to reach \$3.4 billion in 2028. Business is booming, and there are many private companies taking advantage of it, such as the American

groups 23andMe, Gene By Gene and AncestryDNA, Israeli company MyHeritage and UK group Living DNA, all of which are not currently public.

POORLY PROTECTED CLIENT DATA

In a cumulative report published on 24 November 2020, the foundation TA-Swiss, which assesses technological impacts, identified 14 companies that offer genetic testing to the general public and ship to Switzerland. There is such widespread availability that the Swiss government actually revised the Federal Act on Human Genetic Testing (HGTA) in order to explicitly expand it to include tests sold directly to consumers (see also p. 55).

The goal is to better protect data provided by Swiss customers. "People think these tests are fun and harmless," said Hervé Chneiweiss, president of the ethics committee at Inserm (French National Institute of Health and Medical Research). "But that is entirely untrue. Data protection stops at the European border. The goal of these companies, often American, is purely commercial. If you're not paying a lot of money for ▶

the test, that means the company will absolutely sell your data. You are the product!" In 2018 for example, 23andMe sold all of their customers' genetic data, 5 million profiles, to UK pharmaceutical lab GlaxoSmithKline for \$300 million. And that wasn't the first time. According to the magazine *Wired*, between 2015 and 2018, 23andMe shared data with at least six other companies.

And private companies aren't the only ones interested in genetic profiles. In February 2019, Family Tree DNA, one of the largest mass market genetic testing companies, admitted to working with the FBI. And in April 2018, the "Golden State Killer", a serial killer suspected of 12 murders between 1974 and 1986, was arrested because a member of his family had taken a recreational DNA test that was then shared on GEDMatch, an open genomic database.

"People don't realise that when they give their DNA to companies, they also compromise their close family, who did not consent," said Alicia Sanchez-Mazas, professor in the Anthropology unit of the Department of Genetics and Evolution at the University of Geneva (Unige). "People working in the genetics field don't take these kinds of tests because they know how sensitive DNA data is."

Hacking, of course, is another major problem. In 2018, the company MyHeritage announced that 92 of its 96 million user accounts had been hacked, casting doubt on its DNA data protection system. "I wasn't worried when I sent in a saliva sample," said Élise. "But I probably don't know everything they were going to do with my DNA."

QUESTIONABLE RESULTS

A fundamental question: are mass-market DNA kits reliable? "All of these tests work the same way. They analyse small differences in our genome, known as variants.

Consumers may believe that their entire genome is being sequenced, but in reality, the test searches only for a few known mutations," said Chneiweiss. "From a scientific standpoint, the method is a proven one. But studies have shown that the quality of DTC tests vary from one company to another. Moreover, the interpretation of the results should be reviewed with some scepticism."

"The psychological repercussions of these tests are problematic"

Bernard Baertschi, ethics and philosophy researcher at Unige

Genealogical tests promise to reveal your geographical origins. But according to Sanchez-Mazas, "it is not possible to determine where a person's ancestors lived based on their genetic profile." Why not? While genetic variants are more frequent in certain locations than in others, there are no variants that are specific to one region of the world or a given population. "The Italian gene doesn't exist," said Sanchez-Mazas. "The best we can do is estimate the probability that an individual comes from a given population, by comparing their genetic profile against an existing database." Since DNA companies don't all use the same database, the results of each test are different.

One thing to note is that several genealogy companies, such as MyHeritage, also offer their customers a chance to "discover new family ties" by comparing their DNA with

genetic data from other customers – a service that is much appreciated by people who don't know their parents, for example, and wish to learn more about their identity. But proceed with caution: "Discovering that you have an unknown uncle in the United States and finding out that the family history you've heard about your whole life isn't true could be traumatising," said Chneiweiss. "And these results will affect the entire family, even if others don't want to know."

In terms of health concerns, DNA tests have similar limitations: it is difficult to reach a definitive conclusion from a genetic test.

"Know your genes. Own your health" claims the slogan of 23andMe, whose \$199 Health and Ancestry test claims to detect a predisposition to a dozen or so diseases. But it's not quite as simple as it seems. "We're seeing an increasing number of people come to the hospital after taking a commercial test because they are concerned with the results," said Professor Marc Abramowicz, director of the Centre for Genetic Medicine at HUG. "The problem is that even though these tests are technically reliable, they don't mean anything from a medical perspective."

For Alzheimer's, for example, there is not a singular known gene responsible for the disease. The variant tested by 23andMe is simply found more frequently among patients with the disease, but it does not mean that a person with the variant will develop Alzheimer's. "The psychological repercussions of these tests are problematic," said Bernard Baertschi, an ethics and philosophy researcher at Unige. What are you going to do with the information that you have a 13% chance of developing Parkinson's disease? It just causes anxiety for no reason, especially since there is no cure for that disease. These tests are quite dangerous for hypochondriacs." ▲

"PEOPLE SHOULD THINK TWICE BEFORE DOING THESE TESTS"

David Raedler, a Lausanne lawyer specialising in data protection and the private sphere, shares his expertise on recreational genetic testing.

BY BERTRAND BEAUTÉ

The revision to the Swiss Federal Act on Human Genetic Testing (HGTA) is expected to enter into force in 2021 or 2022, once the ordinances that explain its application are adopted. Why was it necessary to revise the law?

Medical genetic testing without a medical prescription is illegal in Switzerland, and will remain so. However, recreational genetic tests (for genealogy, fitness, food) were in a legal grey area, because they weren't explicitly covered by the Federal Act on Human Genetic Testing (HGTA). The problem is that with all the tests available online, it became very easy for anyone to order and take a test sold by foreign companies. So the federal law, which was enacted in 2007, no longer satisfied current requirements. It was revised in 2018 to explicitly include direct-to-consumer genetic tests. This new revision is expected to enter into force in 2021 or 2022.

Concretely, what will change?

With the exception of medical tests, recreational DNA tests will become legal in Switzerland, but they must follow a strict framework. The new HGTA states that samples and genetic data cannot be used for any purposes other than the test ordered by the

customer, except if the customer freely and expressly consents to other uses after being sufficiently informed. So companies will no longer be able to sell genetic data without consent from their customers. This already existed in the 2007 HGTA, but it will be explicitly extended to direct-to-consumer tests.

"When they send their genetic data to the United States, it is subject only to American law"

The global leaders in the industry are American companies. Does this apply to them?

No. This does not affect foreign companies. But the idea behind this new law is that Swiss companies can now enter the market and offer consumers an alternative to foreign

tests, where their genetic data will be truly protected. We're trying to protect people from themselves, because when they send their genetic data to the United States, it is subject only to American law. So they completely lose control of their data.

On that note, what are the risks for Swiss consumers who send DNA samples abroad?

The goal of these companies is purely commercial. They don't hesitate to sell consumer data to other companies, which could be catastrophic for the individuals involved. Here's an example. In Switzerland, the Insurance Contract Act requires that insured consumers are transparent with the insurance company. In other words, if you take a genetic test that detects you have a predisposition to a disease, you are required to alert your insurance company, even if the test was ordered online from a foreign company. If you don't tell your insurance company, and it finds out when purchasing a set of data, your insurance contract can be terminated. So people really need to think before taking these tests. They create problems that consumers aren't giving enough consideration to. ▲

In October 2017, Modern Meadow exhibited a t-shirt made of biofabricated material from its Zoa range at MoMA.

GENETICS

SWISSQUOTE MARCH 2021

GENETICS

SWISSQUOTE MARCH 2021

THE ASTOUNDING POTENTIAL OF SYNTHETIC BIOLOGY

Artificial food, new materials, synthetic viruses... Lab-made DNA is opening the door to numerous applications. But the potential of this technology can be a cause for concern.

BY STANISLAS CAVALIER

Creating living things. With the progress made in DNA synthesis, the idea is no longer a total fantasy. In 2019, researchers from the University of Cambridge announced in the well-known journal *Nature* that they had created perfectly functional

Escherichia coli (E.coli) bacteria in the lab, complete with an entirely synthetic genome. This was not a new achievement. In 2010, researchers from the John Craig Venter Institute had created the first artificial genome. But in the space of nine years, the scale had com-

pletely changed. It took 15 years for Craig Venter and his team to write a DNA with one million letters (pair of nucleotides), but the Cambridge researchers created four million in just two years. What's more, Venter's organism was simply a copy, whereas the bacteria created by the Cambridge researchers was an "improved" version of natural *E. coli*, because the genome was compressed to eliminate redundancies.

But what is the purpose of this work? Beyond the purely scientific aspect, this type of research is not without its economic motives. In medicine, the use of synthetic DNA to repair or replace a defective gene finally seems within reach. And in industry, creating cells with a bespoke genome would make it possible to create made-to-order molecules for the chemical and pharmaceutical industries, as well as biofuels and other materials. Is this the market of the future? Actually, it already exists. The US start-up Memphis Meats uses synthetic DNA to produce meat. In a more advanced-use case, Ginkgo Bioworks – which boasts that it can "read and write cell programmes just like we programme computers" – produces natural flavourings using synthetic DNA made by Twist Bioscience (see also p. 47).

And they are not the only companies to believe in the potential of synthetic DNA: Bolt Threads, for example, uses it to produce silk. How? The company, based near San Francisco, creates small fragments of synthetic DNA in the lab that imitates the genes of spider silk proteins. These fragments of DNA are then mixed with yeasts and placed in tanks with water and sugar, similar to breweries, and the yeast produces spider silk. In 2017, Bolt Threads made headlines with their product, presenting a yellow-gold dress to the New York Museum of Modern Art (MoMA).

"We're entering a new era for materials," says Bolt Threads CEO

Dan Widmaier in *Fortune* magazine, citing the environmentally-friendly advantages of the textile compared to leather and petroleum-based polyester. The company, which is also working on a vegan leather, signed a partnership in late 2020 with the brands Adidas, Lululemon, Kering and Stella McCartney, which plan to use the vegan leather in their products from 2021. But Bolt Threads has competition. In September 2018, New York start-up Modern Meadow launched Zoa, its first collection of vegan leather products produced using synthetic DNA.

New York start-up Modern Meadow launched Zoa, its first collection of vegan leather products produced using synthetic DNA

But so far, synthetic biology has not been competitive enough against fast fashion brands such as Zara, Uniqlo and H&M.

To improve returns, the ideal scenario would be to produce entirely artificial organisms. All of these companies

currently insert small fragments of synthetic DNA into the genome of natural organisms (yeast or bacteria) to manipulate them. But if companies were able to produce 100% artificial organisms, it would be possible to optimise our future and the future of the planet, since these biological systems would only be used to produce materials that were useful for humans. The potential of these "useful" organisms seems limitless: modified jellyfish that find and destroy pollution-causing material, yeasts that produce "green" bioplastics and fuels, viruses programmed to kill cancers, new medicines, meat and artificial leather that save animals...

The University of Cambridge's 2019 work to produce an entirely artificial bacterium seems to head in this direction. But this type of organism created by humans does cause some concern. Risks include creating a pathogenic virus or the "improvement" of human beings favoured by transhumanists. Researchers caused a scandal in 2016, when the "Human Genome Project-Write" was unveiled in the journal *Science*. The project aimed to build a human genome entirely from synthetic DNA. It received a wave of criticism, particularly because of the potential to create children without biological parents. ▲

SYNTHETIC DNA IS VERY EXPENSIVE

US company and industry leader Twist Bioscience creates DNA fragments for \$0.07 per letter (pair of nucleotides). At that price, reproducing the 3.2 billion base pairs of the human genome would cost nearly \$225 million. But currently, the primary market for synthetic DNA is focused on very small fragments used in PCR tests to diagnose COVID-19. The price of synthetic DNA remains a barrier for many other applications. For use to store IT data (see also p. 47), the cost is 100 million times too high,

according to a report by the French Academy of Technologies published in October 2020. But prices are falling fast, by a factor of 1,000 every five years, driven downwards by a handful of innovative start-ups. In addition to Twist Bioscience, the Paris biotech DNA Script is highly regarded in this market, with its DNA printing project. In January 2021, it received \$23 million from Intelligence Advanced Research Projects Activity, a research agency affiliated with the US intelligence services.

The flamboyant comeback of Japanese equities

The Tokyo Stock Exchange is once again stirring the interest of foreign investors. It is the market in one of the best positions to benefit from a likely global recovery. And in the longer term, it will benefit from improved corporate governance.

BY ANGÉLIQUE MOUNIER-KUHN



Following many long years erring through purgatory, an air of revival is spreading through global portfolios. After the element of surprise had subsided last August, it was as if Warren Buffett's announcement that he had bought a 5% stake in several Japanese trading companies dispelled the persistent scepticism felt by international investors towards Tokyo-listed shares. The \$6 billion investment in the famous "sogo shoshas", exporting conglomerates that had fallen out of favour due to the diversity of their holdings, is the largest position held by Berkshire Hathaway, the American financier's investment company, outside the United States. In the press release about the deal, the maverick of stock market shake-ups said he was "delighted" to be involved in the future of Japan, emphasising the long-term horizon and passive nature of his investment.

Discredited by its chronic under-performance, a consequence of decades of stagnant GDP and companies' inefficient use of capital, the Japanese stock market has long been left out of global allocation models. Even so, the world's third largest economy is the first component of the MSCI ACWI (All Country World Index) ex USA Index with a weighting of 16%. "It's true that Japan is a sort of forgotten market. Many emerging stock exchanges are attracting more attention," says Hiromi Ishinara, head of the Equity Investment Department at Amundi Japan. Cédric Le Berre, investment specialist and fund selector at UBP, agrees, "The Japanese market is under-owned and misunderstood. Especially in recent years, it has been deserted by foreign investors who have turned to Chinese equities."

Between 2015 and 2019, foreign traders have shed the equivalent of \$134 billion in Tokyo-listed securities, annihilating the massive buying

trend that followed Prime Minister Shinzo Abe's return to power at the end of 2012. "Although the Japanese stock market looked cheap, it was unattractive, dominated by unpopular stocks, such as big banks, or stocks in the automotive industry, which had fallen behind in the transition towards electric vehicles by focusing on hybrids," says Cédric Le Berre.

But the wind is starting to change direction. Despite the COVID-19 cataclysm, the leading index in Tokyo has stood out for its good performance. In 2020, the Nikkei jumped 16% to return to its highest levels since the late 1980s, a performance in line with that of the S&P 500 in the United States, but significantly better than that of the SMI (up 0.95%) or the Euro Stoxx 50 (down 4%). Although the past year again ended with net foreign sales of Japanese securities, the upturn in purchases in the last quarter suggests a trend reversal that should be confirmed in 2021, according to the overwhelmingly positive consensus.

In a note published at the end of December, Jean-Baptiste Berthon, senior cross-asset strategist at Lyxor Asset Management, believes in this new-found confidence prevailing. He believes that "the improved global outlook, easing of trade tensions, resurgence in consumer demand, and a myriad of government measures to support markets" are cyclical factors that all point to Japanese equities in 2020.

The government of Yoshihide Suga, the Prime Minister who came to power in September 2020, replacing Shinzo Abe after serving as his right-hand man, even shows reserved optimism. In December, it raised its growth forecast from 3.6% to 4% for the fiscal year that will begin in April 2021, after a 5.2% contraction last year due to COVID-19. This decision is based, ▶

for one, on the expected impact of the last instalment of economic support measures approved in December, which brought the total fiscal response to the pandemic to nearly JPY 310 trillion (about \$3 trillion). It is one of the largest stimulus packages in the world.

“The road to global recovery is likely to remain a bumpy one. But between the vaccine, government stimulus packages, and liquidity injected by central banks, stocks are ticking all the boxes. Due to its cyclical nature, the Japanese market (ed. note: the industrial and consumer discretionary sectors weigh twice as much as in US indices) is the market in one of the best positions to seize on a global recovery,” says Hiromi Ishinara.

“In an IMD study, Japan ranks only 27th in global digital competitiveness”

David Souccar, portfolio manager at Vontobel Quality Growth Boutique

These mountains of cash have long been singled out as the result of the excessive prudence of Japanese companies and their inability to allocate their capital effectively. But in last year’s turbulent economic climate, they turned out to be a boon. “Economic conditions are favourable to consolidations,” the expert says. “Being flush with cash, companies are in a good position to finance potential acquisitions should opportunities arise.”

Those deep pockets mean that they can also afford to be more generous than their Western competitors. Launched in 2015, governance reform is a fundamental trend that is beginning to pay off and justifies the renewed interest in the Tokyo Stock Exchange. “Government and corporations have become truly aware that improving shareholder relations is a guaranteed way of stimulating the economy,” says David Souccar. Cédric Le Berre agrees with this analysis, “Japanese companies are learning how to treat their shareholders better. This is reflected in better dividends and more share buybacks.”

With each revision, the next of which will be presented in the spring, the new code introduces stricter rules that are gradually bringing corporate Japan in line with international standards on shareholder communication, unwinding of cross shareholdings, compensation committees and independence of board members. On this specific point, progress is clear. Ninety-five per cent of companies listed in the “first section” of the Tokyo Stock Exchange (segment covering the largest firms in terms of capitalisation) now have at least two independent members on their boards of directors, compared with just over 20% six years ago.

Overall, however, the gap between Japanese firms and international standards has not yet been bridged,

Hiromi Ishinara points out. “For the moment, the reforms have led to a broad dispersion between those diligently working to improve, which are more likely to be large capitalisations, versus small- and medium-sized companies, which tend to lag behind and whose new standards are supposed to encourage them to catch up.” Listed companies are not required to follow all the measures, but they must justify the slightest deviation. Meanwhile, the Tokyo Stock Exchange has itself begun a transformation intended to clarify and tighten listing criteria, to bring them in line with practices of foreign stock exchange operators.

Another phenomenon at work is the growing consideration given by institutional and individual investors

to environmental, social and governance (ESG) issues. “At Japanese companies, the movement has not yet taken hold as it has in our latitudes. They have been concerned about the environment for a long time, and their governance practices have been improving since 2015. But social issues remain virtually ignored,” says Cédric Le Berre of UBP. Hence the need, he feels, to take a selective approach to the Japanese market and set apart the most deserving companies from the less virtuous ones.

In terms of sectors, high-tech industries (robotics, miniaturisation) and domestic consumption, focusing on the new consumer habits of millennials, are expected to offer the best opportunities. As

are technology companies that will benefit from widespread adoption of teleworking and development of the digital economy. “Investment in some SMEs in all of these sectors has accelerated considerably in recent years, and they have become much more efficient. This factor remains underestimated by foreign observers,” says Cédric Le Berre. For example, one of the Suga government’s priorities in its latest stimulus package was digitalisation, along with carbon emissions reduction, an area where the country has fallen behind considerably. “Japanese firms have a long way to go to catch up to companies in other developed economies. It is striking that fax is still used more than email to share documents. In an IMD study, Japan ranks only 27th

Japan’s Prime Minister Yoshihide Suga speaks on the state of emergency on 8 January, amid the new strain of COVID-19. The government declared a second state of emergency targeting Tokyo, Kanagawa, Chiba and Saitama Prefecture on 7 January.

in global digital competitiveness,” says David Souccar of Vontobel. Meanwhile, Hiromi Ishinara recommends avoiding companies that are likely to be the hardest hit by digital disruption, such as banks.

“Japanese companies are learning how to treat their shareholders better”

Cédric Le Berre, investment specialist and fund selector at UBP

All other things being equal, 2021 could well be Japan’s big year on equity markets. Unless COVID-19 insists on stirring up trouble. The first onslaughts of the pandemic in the archipelago were kept under better control than in Europe or the United States. But the latest incursion of the coronavirus that began in the autumn seems to have taken the authorities by surprise. Now, doubts have arisen about whether the Olympic Games can take place after being postponed to July 2021, and Prime Minister Suga’s approval ratings in the polls have suffered. Mr Suga is running out of time to prove his merit: new general elections are due to be called between now and this autumn, and uncertainty about their outcome could be felt on the stock market. No one is sure how long the Bank of Japan (BOJ) will continue to act as a bulwark with its massive ETF purchases, one of the vectors of its highly accommodative monetary policy. This strategy is a guarantee of stability for some but is also controversial as it can distort prices of listed securities. According to NLI Research, the BOJ actually became the biggest owner of Japanese stocks last year, holding the equivalent of 7% of total market capitalisation and edging out ahead of the Government Pension Investment Fund (GPIF). ▲

SWISS START-UPS IN THIS EDITION

We are now sharing our selection of promising Swiss start-ups in each edition.

BY GRÉGOIRE NICOLET

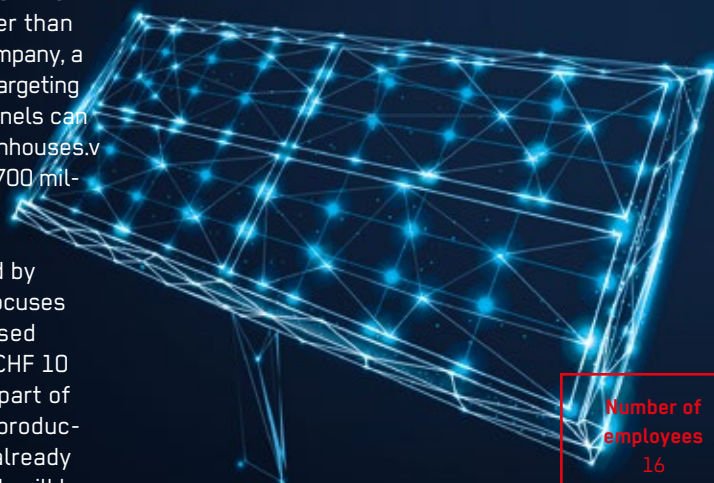


INSOLIGHT

SOLAR FOR AGRICULTURE

Solar energy has never been more affordable and Insolight is well-positioned to benefit from the drastic decrease in price. Its new solar panels offer a 29% efficiency rate, which is more than 10% higher than traditional industrial panels. The Vaud-based company, a start-up from the EPFL Innovation Park, is first targeting the agrivoltaic market where its translucent panels can be installed above fruit crops and even on greenhouses. This is a new, very promising market valued at 700 million Swiss francs.

Production of the panels is currently handled by Aargau-based company Högg, while Insolight focuses on R&D and design. The start-up already raised CHF 5 million in June 2020, in addition to the CHF 10 million received from the European Union as part of the Hiperion project, which aims to increase production of solar panels in Europe. Insolight has already launched an initial series of 1,000 panels, which will be installed for key clients. "We're aiming for mass production by 2023," says CEO and founder Laurent Coulot.



Number of
employees
16

Founded
2015

FARMY

FRESH PRODUCTS AND SOFTWARE ON THE MENU

Flying high on significantly increased demand during partial lockdowns, this Zurich-based start-up specialising in local delivery of fresh produce nearly tripled its revenue in 2020, from 9.5 million Swiss francs to 26 million francs. Beyond this staggering growth, the company isn't just focused on fruit and veg delivery: it has also become an IT services provider for the retail sales industry.

Farmy has developed its own IT infrastructure over the past seven years. The software successfully handled a 300% increase in orders during the first wave of the pandemic, which led the company to offer it to other businesses. The toolbox includes an online shop, a management system for orders, stock and deliveries, and an itinerary planning tool. Bio Suisse became its first client early this year and Farmy has claimed that demand for the software is already very high.

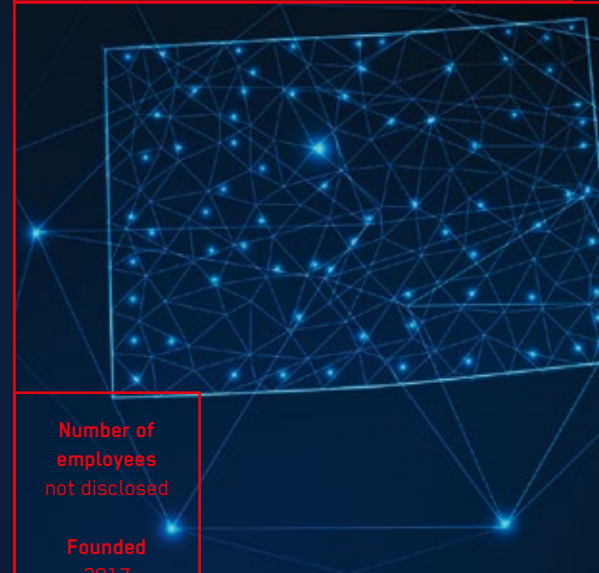


Number of
employees
220

Founded
2014

CUTISS

A GLIMMER OF HOPE FOR BURN VICTIMS

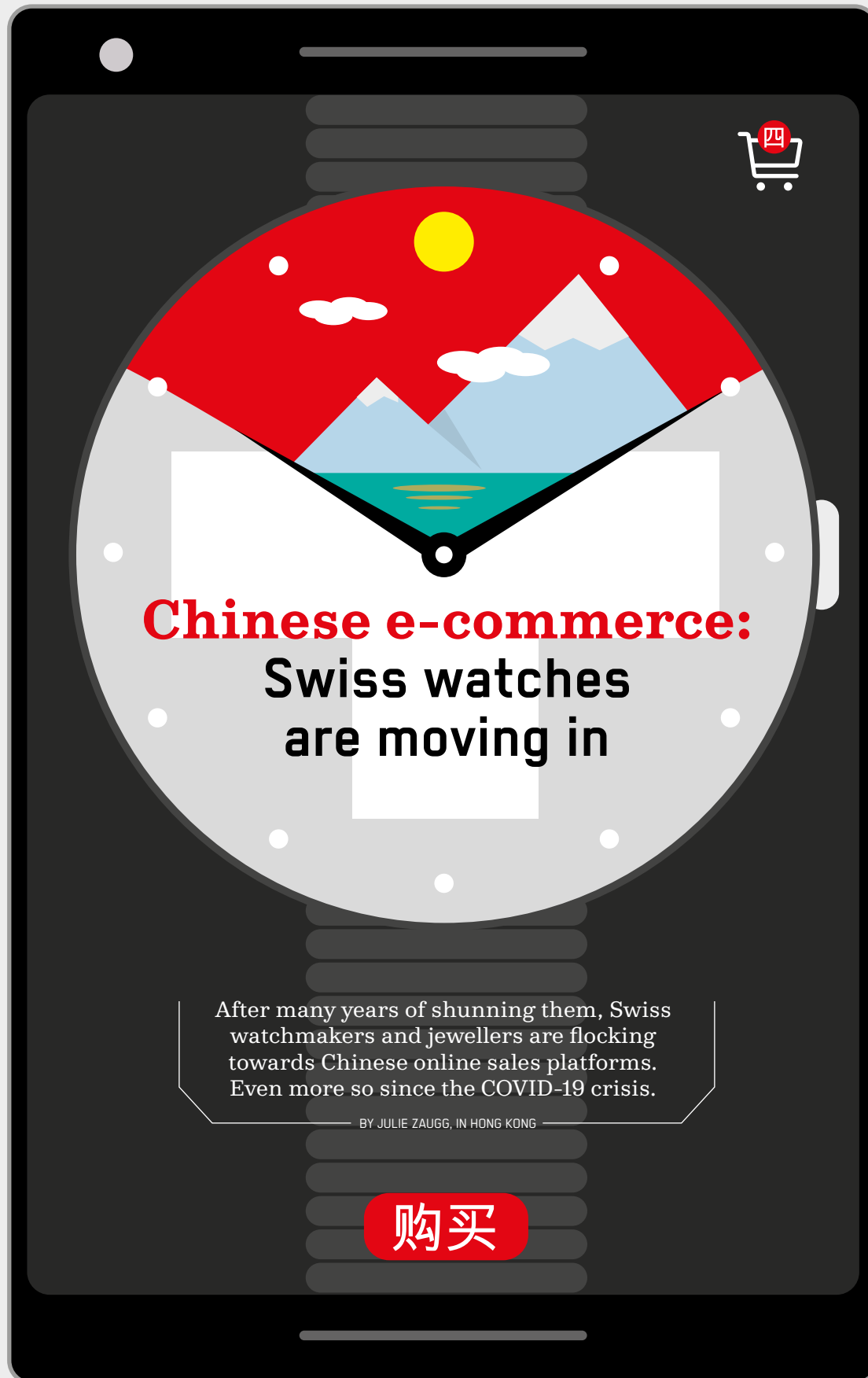


Number of
employees
not disclosed

Founded
2017

Created out of Wyss Zurich, a project accelerator from the University of Zurich and EPFZ, Cutiss was named the best Swiss start-up of 2020 by Venturelab. The company, co-founded by two women, Daniela Marina (CEO) and Fabienne Hartmann-Fritsch (CCO), aims to revolutionise skin grafts by growing human skin in laboratories. By taking a small skin sample from burn victims, Cutiss can artificially reproduce the skin to use for larger grafts.

But the company's biggest challenge is creating a machine that will standardise production of the synthetic skin, and Cutiss has not revealed information about the progress of its prototype. Along with 12 other Swiss companies, the Zurich start-up will participate in the 2021 edition of Euronext's TechShare programme, a European programme that prepares private companies for an IPO (see *Swissquote Magazine*, May 2020).



For the launch of its shop on the Chinese online retailer Tmall last August, Piaget pulled out all the stops. The Swiss watchmaker shot an interactive short film with star actor Liu Haoran, with a different ending for men and women. It also organised a livestream with Austin Li, an internet celebrity known for his hours-long videos during which he tries on – and sells – hundreds of lipsticks. The brand took advantage of the occasion to sell limited editions of its latest collection. “This campaign enabled us to attract 4.7 million internet users,” says Mathieu Delmas, managing director of Piaget China.

The Geneva-based company is one of the many Swiss watch and jewellery brands that have recently joined Chinese e-commerce platforms. In 2020, IWC Schaffhausen, Jaeger-LeCoultre, Vacheron Constantin and Montblanc all opened stores on Tmall.

This was not always the case. For a long time, luxury brands were hesitant to make the leap to Chinese e-commerce sites. “When I joined Alibaba in 2015, the majority of luxury brands were not on our platforms,” recalled Sébastien Badault, managing director of Alibaba France. The companies told him that they didn’t want their products being sold on the same site as saucepans and nappies, and didn’t want to lower their prices.

Watch brands were also afraid of jeopardising the relationships they had spent years building with their dealers. “By circumventing them to sell directly to consumers online, brands feared they would offend dealers,” says Fabrice Paget, founder of the Tokyo-based marketing company The Luxury Brand Agency. “But brands still need these stores for physical sales.”

On top of that was the concern that customers would not be willing to

spend several thousand francs for a timepiece or jewellery they had never seen with their own eyes. “Buying a luxury watch is an emotional experience, a special moment, and many customers prefer to have that in a physical store,” says Daniel Zipser, who covers the consumer sector for McKinsey from Shenzhen.

The Chinese made 70% of their luxury purchases at home last year, compared with 30% in 2019. And most of that shopping was online

With this feedback in mind, Tmall decided to create a dedicated section for premium brands, the Luxury Pavilion, in 2017. “Brands can open their own online shop, which allows

JD.com’s “luxury” platform offers personalised home delivery, complete with a valet in white gloves.



Cartier was the first Richemont brand to open its virtual store on Tmall. This Chinese online platform dedicated to luxury products has become a must for major retailers.



CARTIER

them to preserve their brand identity while also maintaining control over their pricing strategy,” says Sébastien Badault. Soon after, JD.com launched its own luxury goods platform named Toplife, which offers services such as delivery by a valet in livery and white gloves.

Over the past four years, Cartier, Breitling, Audemars Piguet, Carl F. Bucherer, Chopard, Zenith, Tag Heuer and Omega have all joined one of these two websites. In 2019, the Richemont group partnered with Alibaba to feature its multi-brand platform Net-à-Porter, followed by another agreement at the end of 2020 to team up and invest \$1.1 billion in Farfetch to develop the platform in China.

With the COVID-19 crisis, the move online has accelerated. “With stores closing, consumers have gone online,” says Luca Solca, analyst at the research firm Sanford C. Bernstein, which has specialised expertise in the luxury goods industry. “The

growth in online sales reported by luxury brands in 2020 alone would have taken five years under normal circumstances.”

The Chinese, who would normally clear out the luxury shops of Ginza, Interlaken and the Champs-Élysées, made 70% of their luxury purchases at home last year, compared with 30% in 2019. And most of that shopping was online. As a sign of this reversal, Swiss watch exports to China grew 17% between January and November 2020, but declined 23.5% worldwide, according to the Federation of the Swiss Watch Industry.

For watch and jewellery brands, a presence on Chinese e-commerce sites has many advantages. “They provide a way for us to reach our future customers, people who are 30 years old or younger and who are already used to making all their purchases online,” Mathieu Delmas explains. Unlike most, this category of the population is quite willing to spend big online. In August, Vacheron

Constantin sold 100 pieces from its Malte collection, each worth 166,000 yuan (22,780 Swiss francs).

Chinese e-commerce platforms also enable watch and jewellery houses to reach more customers. “China is a huge market, and they can’t cover all of it with a network of shops,” says Pablo Mauron, managing director China at the Swiss consulting firm Digital Luxury Group. Most luxury brands have locations in large cities such as Shanghai or Beijing.

Vacheron Constantin organised private videoconference sessions

That pushes up online sales. On Singles’ Day, China’s major shopping festival on November 11, Cartier sold more than 100 million yuan (13.7 million francs) worth of products on Tmall alone.

But these platforms are more than just a sales channel. “They tell the story of the company and its universe through all the creative content they host, such as livestreams, short videos and augmented reality,” says Mathieu Delmas. Some brands have taken original marketing strategies. In May, IWC Schaffhausen featured a 3D model of its Singapore store online. Tmall customers can walk around and chat with virtual assistants.

Roger Dubuis and Italian tyre manufacturer Pirelli joined forces to launch a sales campaign on WeChat, during which 88 limited edition timepieces were available for 8,888 minutes (8 is a lucky number in China). And Vacheron Constantin organised private videoconference sessions with a brand representative for customers interested in buying watches worth over 100,000 Swiss francs.

TAKING RISKS

Joining these e-commerce sites comes with its share of risk for Swiss manufacturers. “They don’t own their customer data, which remains the property of the Chinese platforms,” says Daniel Zipser of McKinsey. Forced to offer discounts during sales events such as Singles Day, they also lose control over their pricing strategy and risk compromising their brand image.

Another drawback is that myriad counterfeit products still circulate on Chinese e-commerce platforms. “In the past five years, we have set up a team that works with brands to identify counterfeits, with algorithms that use artificial intelligence to detect them automatically,” says Sébastien Badault from Alibaba. “When a suspicious product is spotted, it is removed from the

site within 24 hours,” he says. By going through a brand’s dedicated shop on the Luxury Pavilion or Toplife, customers are guaranteed to buy an original product.

But counterfeits are still out there, especially on the peer-to-peer platform Taobao or on WeChat, where transactions are more confidential. Sometimes the algorithms developed by these platforms generate ads for products sold by Taobao alongside Tmall ads, particularly on the Alipay payment app. Some brands have taken the initiative to reassure their customers. Breitling recently introduced a blockchain-based digital passport to verify the authenticity of its products. Consumers just scan it to access a certificate that proves the authenticity of the watch and identity of its owner. ▲

CHINA NEWS SERVICE / GETTY IMAGES



Jiang Fan, president of Taobao and Tmall, two internet platforms owned by Alibaba, celebrates record sales at an event in Hangzhou on 12 January.

ADVANCED TRADER

A MORE RELAXED FOREX EXPERIENCE

Swissquote has launched a new interface that is much easier to use to trade currencies, precious metals and CFDs. Anton Stavrov explains more about the new system.

swissquote.com/advanced-trader

ADVANTAGES OF THE NEW PLATFORM

Intuitive and customisable interface

Advanced charting tools from TradingView

Wide range of order types available

Swissquote's new web interface for Forex and CFDs is a real departure from traditional platforms. What motivated the change?

It came from a simple fact: traditional currency trading platforms are from a different era. They are relatively off-putting and difficult to configure. So we had the idea of creating a 100% web-based platform that would be lighter and more accessible. It was a natural evolution. With the advent of Generation Z, many clients no longer want to download and install software. It was time for a change.

What are the other advantages?

The interface is much more modern and easier to use. One of the main new developments is a partnership with the US platform TradingView, which is the benchmark in the industry, and we are offering its chart drawing tools. We also have more than 15 years of experience developing trading interfaces, with all the safety and security of a Swiss bank.

Will long-time traders dislike the interface?

We believe that the new tool is powerful enough that clients who use our advanced functions will be happy with it. It's a good balance: the interface is both friendly and powerful. The platform provides access to many types of orders and traditional technical analysis tools, including 27 different indicators (MACD, stochastic oscillator, RSI, etc.) and 17 overlays (Bollinger Bands, Ichimoku, parabolic SAR, etc.). Furthermore, everything is entirely customisable. The feedback we have received from the first users has been very positive.

How will the platform evolve?

The goal is to eventually implement all traditional functions, while continuing to innovate. We plan to improve the platform throughout the year, taking user feedback into account. Ideally we will have at least one update every two weeks. We are looking to have more meaningful interaction with clients.

At the same time, we will continue to offer a large panel of CFDs. Our current Forex offer is already quite extensive. It includes nearly 100 currency pairs, as well as options, futures, indices, commodities and government bonds. The next big step will be to expand our share-dealing services.

The Forex is a ruthless market. Many traders have given up...

Forex platforms do have a bad reputation, but that can't really continue in Switzerland, due to the Finma regulation. Our goal and primary focus is for our clients to have long-term success and continue to use our services over time. The interface is designed to assist non-professional users. Several types of orders, such as stop-loss, can be used to protect positions, along with maintenance margins and stop-out levels to avoid negative balances.



ANTON STAVROV
HEAD FOREX SOFTWARE ENGINEERING
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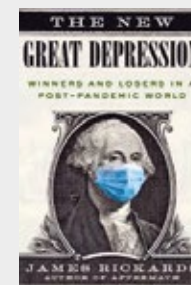


Other Press, 2020
CHF 40.-

THE MONEY PLOT A HISTORY OF CURRENCY'S POWER TO ENCHANT, CONTROL, AND MANIPULATE

By Frederick Kaufman

The Money Plot, by Frederick Kaufman, an essayist and regular contributor to the *New York Times*, offers a new look at the history of currency from its origins to today. The smart, refreshing work uses history, etymology, finance and sociology to help demystify the eternal fiction that is money, and the power of fascination and control that it has always held over humans



Penguin LCC US, 2020
CHF 37.-

THE NEW GREAT DEPRESSION WINNERS AND LOSERS IN A POST-PANDEMIC WORLD

By James Rickards

Well-known and controversial, American former investment banker James Rickards attacks the global crisis caused by the coronavirus pandemic and its impact on the world economy. While predicting an absolutely unprecedented crisis with disastrous consequences, the author provides avenues to consider for knowledgeable investors who wish to maintain their wealth during this time.



Google Play
Free,
in-app purchases

STADIA THE TRIPLE-A GAME ON A SMARTPHONE

Stadia, Google's cloud gaming platform, is finally available to Swiss Android users. The games are hosted in the cloud on Google servers and streamed live on users' machines. This means that users can play bandwidth-heavy games on more basic devices. The catalogue of available games is still limited, but is expected to expand quickly



Google Play,
Free

HEYNOTE DIGITAL STICKY NOTES

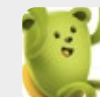
A useful little app, Heynote allows users to create original sticky notes and keep them on their smartphone background. This is particularly helpful for grocery lists or to-do lists. The very intuitive interface offers many themes and varieties, allowing users' imaginations to run wild.



Google Play,
App Store,
Free

HOZZ THE HOLY GRAIL OF HOME DECOR

The top app worldwide for interior decorating, Houzz can find, look up and even test in augmented reality products from a database of over 21 million photos. Users can also receive advice from other members of the community, including both professionals and regular app users.



App Store,
Free trial,
and monthly
subscription

WAKEOUT! - ACTIVE BREAKS MINI EXERCISES, ANYTIME, ANYWHERE

Named "the best iPhone app of 2020" by Apple, Wakeout! is a welcome app for fitness during the pandemic. Friendly and informative, the app suggests dozens of mini physical exercises that can be done as an active break, either at home or outside. The app provides a short demonstration video for each exercise.



AUTO

The free electron

The perfect embodiment of retrofitting, the electric version of the Fiat 500 is ready for the shift to green vehicles.

BY RAPHAËL LEUBA

FIAT 500E



ENGINE: ELECTRIC, TRACTION, 42 KWH LI-ION BATTERY

POWER: 7 KW (118 HP), 220 NM

ACCELERATION: 0 TO 100 KM/H IN 9 SEC

PRICE: STARTING AT CHF 29,990.-

In the 1997 science-fiction film *Gattaca*, Uma Thurman and Ethan Hawke fight the dangers of eugenics against a futuristic backdrop, while driving cars from the 1960s (Citroën DS, Studebaker Avanti, etc.) powered by a mysterious source of clean, silent energy. This conversion is now called retrofitting. In specialised workshops, mechanics can install a modern electric engine in cars from a previous era. Whether due to a lack of inspiration or simply opportunism, some car manufacturers have chosen to follow this trend. They are housing their latest electric platforms in silhouettes inspired by

a rich history. The Fiat 500e is a perfect example. It is difficult to hold it against the FCA Group (now Stellantis), as the shape of the Fiat – even in its new electric form – is undeniably appealing. People are drawn to the recessed headlights and split indicator lights. And the 500e isn't the only car of its kind – there's already a Mini Cooper SE, and Renault is launching an electric R5 by 2023.

Two levels of power

With the 500e model, the popular Cinquecento holds a “premium” commercial positioning both in terms of materials and price. The vegan leather seats are classy and the 10-inch screen equipped with the “Hey Fiat!” co-pilot are a nice touch, as are the clever storage and lack of central console. It is kitted out with quite a range of assisted driving technologies, even including a few options for autonomous driving. It offers markedly improved ride com-

fort, in terms of both the chassis and soundproofing (and for good reason).

In terms of power, the 500e is a step above the standard 500, which is fitted with a new 70 hp 3-cylinder mild hybrid petrol engine. But that still cannot match the 118 hp electric motor paired with the large battery, offering an acceleration of 100 km/h in 9 seconds with a range of 320 m in mixed use. The basic 95 hp electric model is slower, has a shorter range and is less expensive. But at CHF 26,990, it still costs CHF 10,000 more than the combustion model. While the 500 already exists in a saloon version and semi-cabriolet C, Fiat has created a third, unprecedented electric model dubbed “Trepuno” (3+1), with a small extra door tucked into the right side. This CHF 2,000 option, along with the successful electric conversion, is proof that Turin-based Fiat is ready to embrace change. ▀

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TRAVEL

A springtime breeze in Ticino

A weekend excursion of exotic walks and relaxing havens in the region of Locarno.

BY SALOMÉ KINER



SWITZERLAND



TICINO

LOCARNO

The “Ponte dei salti”, overlooking the Verzasca river, is a tourist hotspot in the region.

With a picturesque palette of landscapes that transforms around every turn and valley, Ticino is a region full of surprises. Walkers will love adventuring among the many scents and stones found along the trails. History buffs will be awed by the architectural heritage that accompanies them from one museum to the next. And gourmets will enjoy the blended intricacies of the local cuisine, seated in a cosy grotto.

While the very photogenic Verzasca Valley recently made the rounds on social media and attracted many tourists, Maggia is the slightly more hidden gem. Seven hundred kilometres of paths, ancestral stone, climbing, bike trails and rafting: eclectic and wild, bathed in the essence of chestnut trees, with staggering views of the surrounding mountains, this part of Ticino definitely lives up to its fairy-tale reputation. ▶

FROM MAGGIA TO MAGGIA VIA THE VALLE DEL SALTO

A circular, fully-marked route departs and arrives in the village of Maggia, so hikers can discover the wonders of the region with an easy hike (nearly 9 km for an average of 4 hours of walking).

At the start of the hamlet, a stone path bordered by vines and historic fountains leads to the first and marvellously small votive monument of the hike. Further along as the trail ascends, hikers can view the rooftops of the village of Maggia through the forest. Near the Santa Maria della Pioda chapel, a remarkable vestige of the Middle Ages, benches provide a meditative rest and hikers can enjoy luxurious views dotted with religious buildings.

Crossing the Riale del Salto river is the start of a relatively easy yet long ascent, with stairs and embedded stone slabs. It is part of the vast Vallemaggia Pietraviva project: this initiative – which aims to protect and highlight the architectural heritage of the Valley and its raw material, stone – has created more than 20 trails that can be used in all seasons in good weather. It's definitely worth the detour to Braiaa for another votive chapel; this one is decorated by Ticino painter Giovanni Antonio Vanoni.

The many rustici that can be seen perched along the way are a reminder of what daily life was like for residents of the Valley – farmers, butchers, shepherds and goatherds – who lived in the foothills of this mountain for many years.



The picturesque village of Brontallo, perched in the Maggia valley.

WHERE TO STAY

In Maggia* Casa Martinelli

A superb boutique hotel in a Ticino house that dates back to over three centuries ago, paired with an ultra-modern cubic addition designed by Luigi Snozzi, a well-known Swiss architect. The rooms are minimalistic and filled with light. Guests can fall asleep listening to the calming sounds of the Salto waterfall, and swimmers enjoy the fall's natural pool in summer months. Starting at 250 Swiss francs per night for two people in the low season.

*The village of Maggia is located approximately a 20-minute drive north of Locarno. There is a bus route from Locarno to Maggia that takes less than 30 minutes.

In Ascona Hotel Monte Verità

If you visit Monte Verità, you must spend the night at the hotel of the same name, which overlooks the tranquil waters of Lake Maggiore: a peaceful breakfast on the terrace gives you the best view of this Bauhaus architectural gem, which was built in 1927 and renovated in 2008.

Around 230 Swiss francs per night for two people with a view of the lake.

In Locarno Casa Borgo

Several hotels on the Ticino Riviera offer spa services, but none of them can say they offer B&B-style rooms quite like Casa Borgo, with its floral arrangements, stone staircases and shaded alcoves. From the hotel, it's a quick 20-minute walk to the Termali Salini & Spa Locarno thermal baths, where you can spend the day relaxing with a view of the lake.

Starting at 120 Swiss francs per night for two people in the low season.



The stone houses of the village of Maggia.

Once at the top of Mount Canaa (914 metres), the path descends towards the river. Following the (still!) marked trail, hikers will reach the embedded small valley of Ringio, which also is proof of the clever constructions that humans built to facilitate their activities.

While the very photogenic Verzasca Valley has attracted many tourists, Maggia is the slightly more hidden gem

Shortly after, Cassinella offers a stunning view of the abrupt slopes of the opposite valley. The old chestnut tree that towers over the village chapel emits a powerful essence that envelops hikers who are now purified from their walk (and from the saintly images found along the way). From there, the return to Maggia

follows the same path as the start of the hike.

THE MAGNETIC PULL OF MONTE VERITÀ

No visit to the region is complete without a trip to Monte Verità, on the outskirts of Ascona-Locarno. Similar to the Vallemaggia, this hill is well-known for its magical powers... So much so that in the early 20th century,

a handful of idealistic artists and intellectuals came to Monte Verità to experiment with living in harmony with nature. The German writer Hermann Hesse, American dancer Isadora Duncan and Russian anarchist Mikhail Bakunin were part of that group. Casa Anatta is a museum dedicated to that experiment. It is an easy, picturesque 20-minute walk from Ascona. ▲

WHERE TO EAT

Osteria Croce Federale

While it may look like a nondescript casual restaurant, locals say that Osteria Croce Federale serves the best risotto in the region. Located in Verscio, 6 km from Locarno, a trip to the restaurant also gives visitors the opportunity to spend the evening at Teatro Dimitri, founded in the 1970s by the Ascona clown and mime Dimitri and his wife Gunda. Today, students come from all over the world to train at this school.

Ristorante Cittadella

In Locarno, gourmets often visit Ristorante Cittadella, known for its seafood platters and Mediterranean dishes. The setting is lovely: located in a former cloister filled with archways and exposed beams, the terrace faces the Santa Maria Assunta church and guests can prolong their aperitif while seated among Ticino residents whose laughter is a sure sign of their Italian roots.

BOUTIQUE



ANTI-STRESS HEADPHONES

The Melomind looks like traditional headphones. The only difference is two electrodes that are placed behind the neck and sensors in the earpieces. The device, designed by start-up MyBrain Technologies, determines an electroencephalographic profile in 30 seconds via an app and then plays sounds that are said to boost the production of alpha waves, which are a sign of a calm mental state.

melomind.com
CHF 430.-



BACTERIA KILLER

The very latest from Swiss brand Laurastar, the Iggi portable vaporiser disinfects and steams objects and fabrics. It uses only water and no chemical products. Testing showed that the dry steam that is emitted at more than 100 degrees kills most bacteria, mites and other microbes. Compact and elegant, the device also won the Red Dot Design Award 2020 and the iF Design Award 2020.

laurastar.ch
CHF 199.-



CUSTOMISABLE PEN

Caran d'Ache has launched customisation options for its iconic 849. Almost every part is customisable, including the colour, clip and button style, ink and packaging. The everyday pen for fans of the Geneva-based manufacturer can be customised into 3,600 different combinations. It is also possible to engrave a name, word or emoji on the pen.

carandache.com
From CHF 49.-



BESPOKE SHOES

A new brand of men's shoes based in Romandy, Reed Blake takes 3D measurements of clients' feet using a dedicated app in order to recommend the correct shoe size. Designed in Switzerland and made in Europe using 99% biodegradable materials, the shoes are available in more than 60 models and delivered with an elegant cleaning and maintenance kit. We particularly like the Andrew Oxfords with a floral design on the tip and leather soles.

reed-blake.com
From CHF 380.-



POCKET COMPRESSOR

With a design resembling a padlock, the Xiaomi Mi Pump is a wireless electric air compressor that effortlessly inflates balls and wheels in just a few minutes. With its compact size (124 x 71 x 45.3 mm), the micro pump from the Chinese manufacturer can be easily transported and recharged using a universal USB port. With the digital screen, users can check and adjust tyre pressure.

mi.com
CHF 49.-

SMART TOOTHBRUSH

Early this year, Philips launched its new "smart" electric toothbrush, which uses sensors to analyse brushing habits (movements, amount of pressure, duration, frequency). This high-end model, named the Sonicare 9900 Prestige, connects to a smartphone via a dedicated app and provides various reports and recommendations.

philips.com
Available from April, price currently unknown



SMART ELECTRIC BICYCLE

Developed by a Marseilles-based start-up, the IWEETCH bike automatically adapts to the needs of the rider. With no speedometer or screen to monitor, this electric bicycle – with a futuristic design and light weight (18.5 kg) – analyses the rider's biking style and routes to optimise the electric assistance in real time.

iweech.com
From CHF 3,150.-

TRIED AND TESTED

REPAIRING A
SMARTPHONE
AT HOME

BY GÉRARD DUCLOS

Our columnist rolled up his sleeves and tried to repair his iPhone on his own. Here's his account of the disastrous attempt.

Everyone with a smartphone knows from experience that high-tech devices are notoriously fragile and require regular screen and battery replacements. Fortunately, there are specialised repair shops everywhere, in which artisans with magic fingers repair smartphones in a matter of minutes with impressive ease, all for a price of around a hundred Swiss francs.

"I could probably do that myself," you might think, after witnessing a quick repair. Save a few precious francs and learn a useful new skill... sounds ideal. A few Google searches later, I decided I was up for the challenge. In just a few clicks, you can order a complete repair kit online containing replacement parts, a screwdriver and special tools, and have it delivered to you. A kit to replace the screen of an iPhone 6 or 7 costs around 40 Swiss francs, and a battery replacement costs double that.

A few days later, I received my order and I started disassembling my iPhone 7 to replace the battery.

Armed with all the necessary parts as well as a video tutorial hosted on the kit manufacturer's website (in my case, the German brand Fixxoo), I confidently opened my device.

Armed with all the necessary parts as well as a video tutorial, I confidently opened my device

Curiously, I encountered more resistance than I expected. I pushed a bit harder and the screen popped off. I must have tried a bit too hard, in fact. When the screen detached, the extremely delicate wires that connect the screen to the device tore off, making the screen, which was new, completely unusable.

First lesson learned: watch the entire tutorial from beginning to end... It includes a thorough demonstration of each step. Another tip: definitely do not try to turn the screws with

anything other than the tool provided in the kit for that specific task. Apple devices, in particular, have screw threads, and from experience, using the wrong wrench could render the screws completely unusable.

Fortunately for the purposes of this test, we also planned to replace the screen and battery of an iPhone 6. This time, the operation went a little more smoothly: the device opened without any damage and I was able to successfully change the battery.

But things took a turn for the worse again when I tried to replace the screen. I needed to carefully execute numerous tricky steps, including gently manoeuvring the home button and many very thin wires. Inevitably, my impatience and proverbial clumsiness caused the entire operation to fail.

As a result, I now have an iPhone 7 that will probably never turn on again and an iPhone 6 with a brand-new screen and battery, but no home button. Conclusion: if you're all fingers and thumbs, best to leave it to the professionals. ▴

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ALPINE EAGLE XL CHRONO

The pure yet bold Alpine Eagle XL Chrono is a column-wheel chronograph equipped with a flyback function. Its 44 mm case houses the Chopard 03.05-C chronometer-certified automatic movement, for which three patents have been registered. This exceptional timepiece is forged in Lucent Steel A223, an exclusive ultra-resistant metal resulting from four years of R&D. Proudly developed and handcrafted by our artisans, it showcases the finest expertise and innovation cultivated within our Manufacture.

Chopard

THE ARTISAN OF EMOTIONS – SINCE 1860