

# SWISSQUOTE

FINANCE AND TECHNOLOGY UNPACKED

## CORONAVIRUS

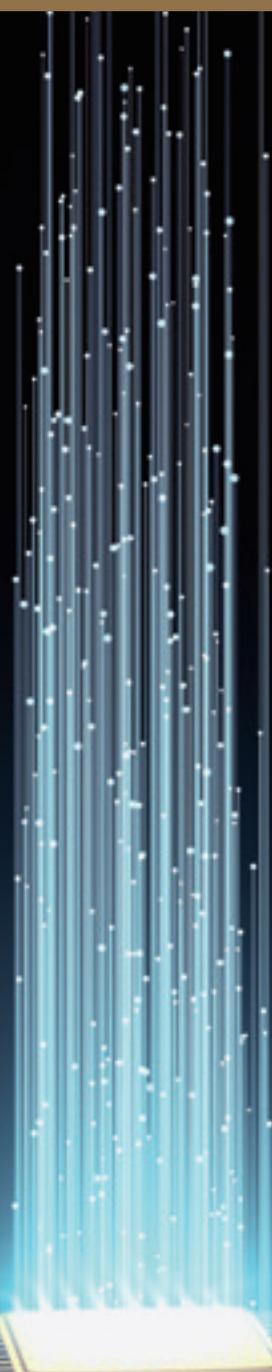
A wave of optimism hits the Swiss stock market

## PORTRAIT

Alcon dreams big

## E-COMMERCE

Etsy, the crafts master



## DOSSIER

# A TRILLION MICROCHIPS

The ultra-connected future has already begun

ISSN 2296-3278

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▶ INTEL ▶ TSMC ▶ NVIDIA ▶ ASML ▶ AMD ▶ COMET ▶ INFINEON ▶



COLLECTION  
*Fifty Fathoms*



©Photograph: Laurent Ballesta/Gombessa Project



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# The chip war is only just beginning



By Marc Bürki,  
CEO of Swissquote

p. 30

Donald Trump is not a geek, he's a real estate developer. However, the White House's current resident does understand the importance of semiconductors. Found inside smartphones, aeroplanes, data centres and even everyday smart objects, electronic chips are **everywhere**, and in the near future, with the emergence of artificial intelligence, these chips will make decisions for us, drive our cars, steer missiles, and more.

So it's not surprising that the United States is trying to maintain control over the development and manufacturing of these electronic components. While the current industry leaders are American companies, the trade war that the US president is currently waging against Chinese telecoms provider Huawei is largely designed to stop Beijing from acquiring these skills, because while China is indeed the world's factory, semiconductors are still its Achilles heel. According to a report from the Centre for Strategic and International Studies (CSIS) published in February 2019, China produces only 16% of the semiconductors it consumes, which is not enough to ensure its autonomy.

However, ironically, pressure from Washington may not have the intended effect. Rather than submit to the trade war, China is now **fast-tracking** its own development and investing heavily to do so. Its objective: to produce 40% of all semiconductors sold in the country in 2020, and 70% by 2025. The initial results of this policy are beginning to become clear. According to the firm IC Insights, HiSilicon, Huawei's driving force in the semiconductor industry, made a dramatic entrance into the global top 10 chip manufacturers in Q1 2020. Thus far, HiSilicon has only designed electronic components, with their production outsourced to Taiwanese company TSMC. However, the Chinese company is sending more and more of its manufacturing orders to its compatriot SMIC.

p. 62

And where is Europe in all this? With start-ups such as UK-based ARM, Dutch company ASML and Swiss group **Comet**, Europe is mastering crucial elements in the steps to manufacture electronic chips. However, it will need to do more to become a top player, like the United States is now, and presumably China in the future. Good reading!

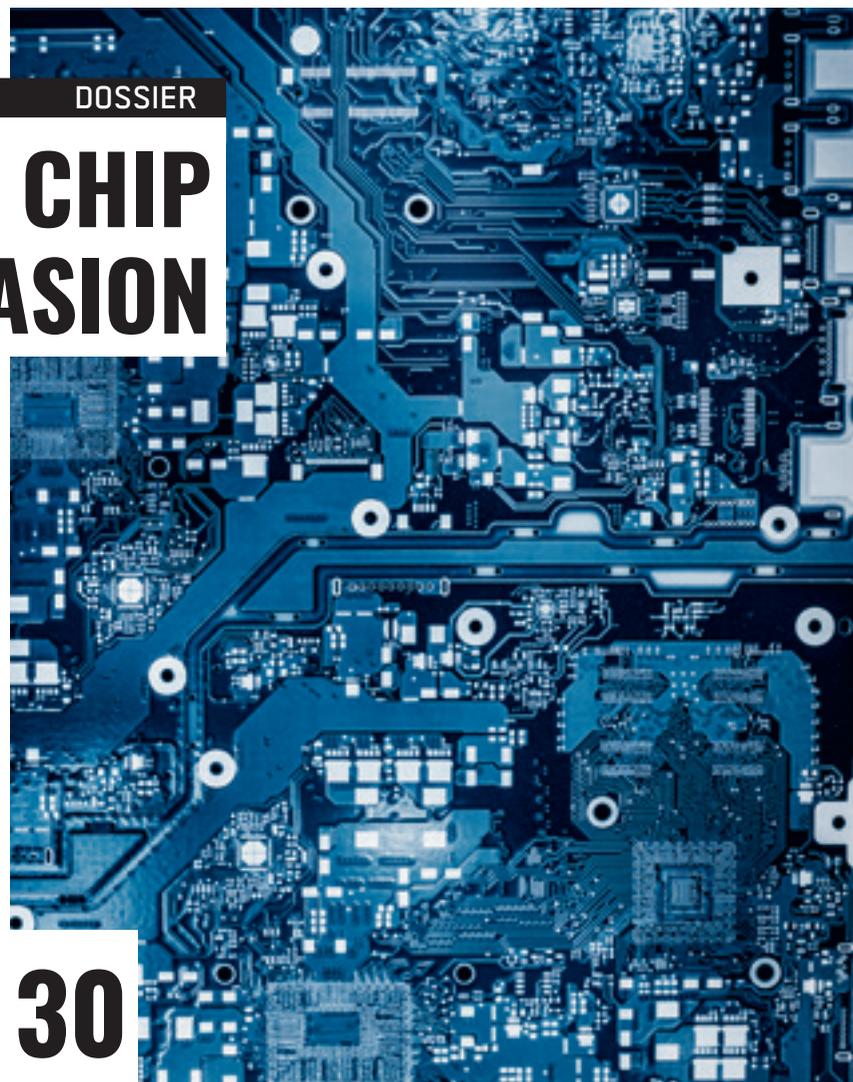
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## ALPINE EAGLE

With its pure and sophisticated lines, Alpine Eagle offers a contemporary reinterpretation of one of our iconic creations. Its 41 mm case houses an automatic, chronometer-certified movement, the Chopard 01.01-C. Forged in Lucent Steel A223, an exclusive ultra-resistant metal resulting from four years of research and development, this exceptional timepiece, proudly developed and handcrafted by our artisans, showcases the full range of watchmaking skills cultivated within our Manufacture.

*Chopard*

THE ARTISAN OF EMOTIONS – SINCE 1860



DOSSIER

# THE CHIP INVASION

CORONAVIRUS



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BUSINESS TRIP

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#### Erratum

An error was made in our last edition on page 25. The figure 3.6 is the number of hospital beds in acute care per 1,000 inhabitants in Switzerland and not the number of beds in intensive care. Our apologies for this unfortunate mistake.

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# SCANS

telecoms  
**LOON BALLOONS DEPLOYED IN KENYA**



LOON

The Loon project from X, the Alphabet subsidiary, aims to provide internet access to some of the world's most remote regions, via stratospheric balloons filled with helium. These balloons, which were launched from the United States, now make it possible for Kenyans to access 4G from Telkom Kenya in every region of the country. This is the first commercial deployment of Loon balloons, but

the Alphabet subsidiary was able to test their effectiveness in Peru and Puerto Rico, where internet users were provided free access if the traditional cellular data network was down. The COVID-19 pandemic spurred the Kenyan government to fast-track the project's approval. Mozambique has already followed suit, making a similar agreement with the operator Vodacom.

— G00G — TKG — V00



**“Currently, Switzerland needs open markets, not dangerous political experiments”**

**Jan Atteslander**, member of the board of directors at economiesuisse

streaming  
**PANDEMIC PUTS CINEMAS ON PAUSE**



Walt Dohrn, the director of *Trolls 2*, in good company, before COVID-19 spread around the world. Here in Berlin, on 17 February.

ISA FOLTIN/BETTY IMAGES

As cinemas worldwide were forced to close, production studios had to rethink their distribution channels. In the United States, several feature-length films, such as *Bloodshot* and *The Hunt*, went live on streaming platforms just a few days after their release, bypassing the 90-day period that is usually reserved for cinema-goers after the release date. *Troll 2: World Tour*, produced by Universal, was even available live on streaming platforms the very same day it was re-

leased for \$19.99 — a relatively high price for a VOD rental. It was a huge success, with Universal reporting that the film has already brought in more than \$100 million. CEO Jeff Shell later announced in the *Wall Street Journal* that his studio would continue to release films simultaneously in both formats, even after the health crisis ends. But Universal quickly had to retract its statement, as cinemas threatened to boycott the group's studio productions. — CMCSA

pharma  
**ROCHE STRENGTHENS ITS POSITION IN GENETIC SEQUENCING**

Roche acquired US-based genetics sequencing specialist Stratos Genomics in May for an undisclosed sum. In 2014, the Basel pharma giant had already injected \$15 million into the Seattle-based company, whose board of directors includes Heiner Dreismann, former director of the Diagnostics division at Roche. This acquisition gives Roche

access to the procedures developed by Stratos. The objective is to bring DNA sequencing to market, making diagnoses faster and cheaper, at a cost of around 200 Swiss francs per person, according to experts from ZKB. As a comparison, the first commercial DNA sequencing cost \$3 million per patient.

— ROG

## RANKING

**TOP 5 SUPPORTED COMPLETED CAMPAIGNS ON KICKSTARTER**  
(total funds pledged in dollars)

1. PEBBLE TIME SMARTWATCH (2015)  
20.34 M
2. COOLEST COOLER PORTABLE REFRIGERATOR (2014)  
13.29 M
3. FROSTHAVEN BOARD GAME (2020)  
12.97 M
4. PEBBLE 2, TIME 2 SMARTWATCH (2016)  
12.78 M
5. KINGDOM DEATH: MONSTER 1.5 BOARD GAME (2017)  
12.39 M

Source: Kickstarter

**TOP 5 SMARTPHONE COMPANIES**  
(amount of phones sold globally in Q1 2020)

1. SAMSUNG  
58.3 M
2. HUAWEI  
49.0 M
3. APPLE  
36.7 M
4. XIAOMI  
29.5 M
5. VIVO  
24.8 M

Source: IDC

**THE WORLD'S TOP 5 HIGHEST PAID DOTA 2 (E-SPORT) PLAYERS**  
(in millions of dollars as of 8 May 2020)

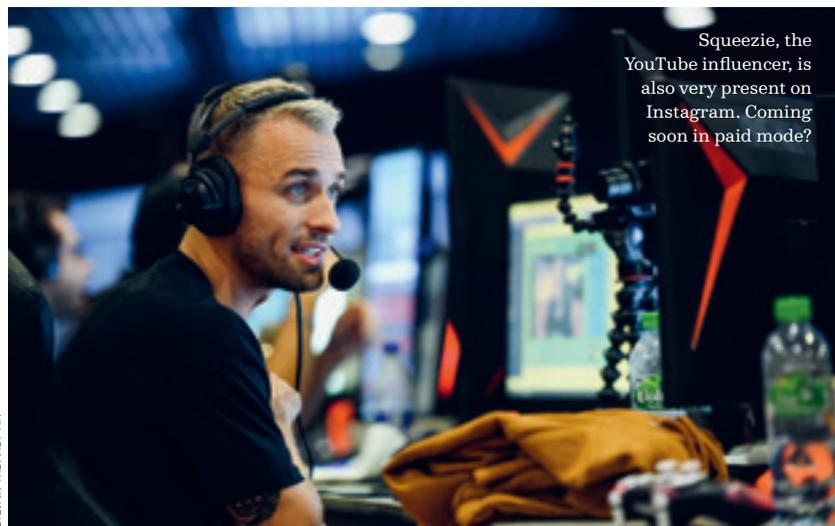
1. NOTAIL (JOHAN SUNDSTEIN)  
6.9 M
2. JERAX (JESSE VAINIKKA)  
6.47 M
3. ANA (ANATHAN PHAM)  
6 M
4. CEB (SÉBASTIEN DEBS)  
5.5 M
5. TOPSON (TOPIAS ZAAVITSAINEN)  
5.4 M

Source: Statista

24

The number of countries in which 5G is now available.

*social media*  
**INSTAGRAM TREATS ITS INFLUENCERS**



Squeezeie, the YouTube influencer, is also very present on Instagram. Coming soon in paid mode?

SILVAIN THOMAS / AFP

The social network Instagram, owned by Facebook, will now provide its members with the possibility of monetizing their live video services. This new functionality in the test phase, called "Badges", allows spectators to financially support the content creator of their choice, by paying a flat rate of \$0.99, \$1.99 or \$4.99. Depending on the amount invested, one, two or three hearts will appear

next to their names in the comments, improving their visibility. For their part, content creators will have the list of all badge holders for their account. Instagram currently has no commission on transactions, with creators pocketing all monies paid. Live video is a booming format on Instagram, with live viewing having jumped 70% between February and March. FB

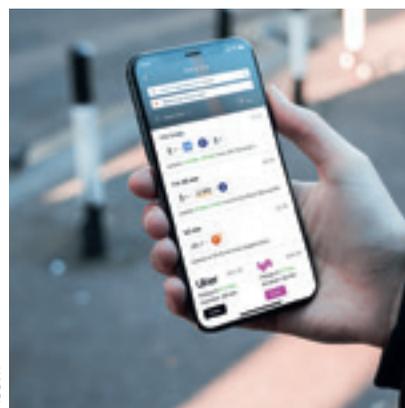


**10.3%**

For the first time, organic food products exceeded a 10% market share in Switzerland in 2019.

MOOVIT

*geolocation*  
**INTEL ON THE RIGHT TRACK**



\$900 million – that's how much Intel will spend to acquire a 200-person start-up that was worth \$131 million in February 2018. Israeli start-up Moovit saw its user base skyrocket over the last two years, now reaching nearly 800 million. The app, which helps users travel through a city in the most efficient way possible using all types of transport, is available in 3,200 cities in 103 countries. Intel plans to integrate Moovit into Mobileye, another Israeli start-up acquired in 2017 that develops anti-collision and advanced driving assistance systems. INTC



**“Customers want Replay and going against their wishes will not work”**

**Urs Schaeppi,**  
 CEO of Swisscom, regarding TV companies' desire to remove the Replay functionality

*cryptocurrencies*

**E-EURO: BANQUE DE FRANCE SETS THE BALL ROLLING**



MANUEL COHEN / MANUEL COHEN VIA AFP

The Banque de France announced on May 20 on Twitter that it had "successfully tested the use of a blockchain to experiment with the use of a central bank digital currency", adding that other tests will be carried out in the weeks to come. The test took place in partnership with the Société Générale bank. In practice, the latter issued 40 million euros in financial securities in the form of security tokens, which were settled on the blockchain of the Banque de France's digital euro.



**1.8 M**

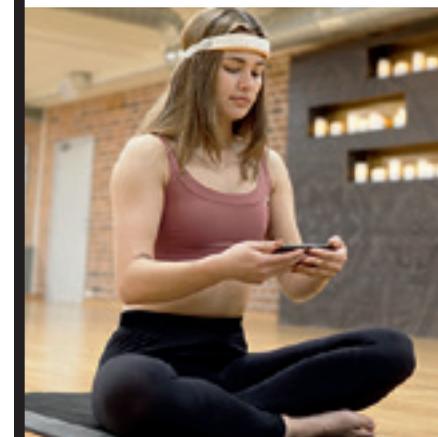
The number of guns sold in the United States in April, an increase of 71% compared to 2019. In March, 2.6 million guns were sold, up 85% compared to the previous year.



**“My grandchildren are demanding more environmentalism at Nestlé”**

**Paul Bulcke,**  
 CEO of Nestlé, in an interview with RTS

**KICKSTARTER**



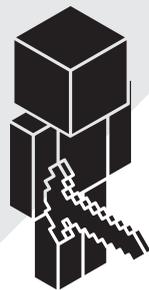
MENDI

**MENDI: REAL BRAIN TRAINER TRAINING YOUR BRAIN**

Projects that exceed \$2 million on the crowdfunding platform are rare – but Swedish start-up Mendi achieved this milestone with the new brain training method it has developed, whose design was financed by the European Union, among others. Previously, this type of training was reserved for those who could spend \$15,000 for a few sessions in specialist clinics – but Mendi offers its system for \$500. The device is a band equipped with sensors that measure the cerebral activity of the pre-frontal cortex. It also includes a mobile application that translates your brain activity into a score. Users can play a game on their mobile devices to consciously control this score, and in time, control the activity of the pre-frontal cortex in order to strengthen this area. Benefits include improved concentration and greater capacity for memorisation, as well as the ability to fall asleep faster or reduce the amount of sleep needed.

FUNDS RAISED  
 \$2,144,360

AVAILABLE  
 SEPTEMBER  
 2020



## \$150 M

The total amount raised in gaming platform Roblox's latest fundraiser. Thanks to its flagship game *Minecraft*, the company is now valued at €4 billion, according to the *Wall Street Journal*.

automotive

### AUTONOMOUS VEHICLES AT A STANDSTILL



The Bosch IoT concept shuttle at the 2019 Shanghai Motor Show.

GLENN CHAPMAN / AFP

Tech companies promised that functional autonomous vehicles would be on the roads by 2020, but perfecting the technology is taking longer than expected and the pandemic has made the task even more difficult. Social distancing has prevented tests from being carried out, as test drives often require two people in the vehicle to prevent accidents. Faced with astronomical operating costs and no revenue, start-ups are conducting mass layoffs (Zoox, Lyft, Ike, Kodiak Robotics), being acquired (Drive.ai by Apple) or closing down (Starsky Robotics). At Waymo, an Alphabet subsidiary, development has

been delayed by several months. The California company was nonetheless able to raise \$750 million in early May, which is in addition to the \$2.25 billion raised in March. Large manufacturers aren't faring any better: Ford announced that its autonomous vehicle would now be delayed from 2021 to 2022, and PSA has long abandoned the sector. Only Cruise, supported by GM and Honda, recently presented a functional model, dubbed Cruise Origin, which is currently limited to travelling only in relatively enclosed environments.

— F — UG — GM — 7267 — 6006

gaming

### ANIMAL CROSSING AND NINTENDO: LOCKDOWN'S WINNERS



DR

With children (and adults!) at home, the timing of the release of *Animal Crossing: New Horizons* couldn't have been more perfect for Nintendo. The latest version of the popular simulation series was an immediate success. It was the most-sold game in March across all platforms, becoming the third-best launch in Nintendo's history. Only *Super Smash Bros. Ultimate* (2018) and *Super Smash Bros. Brawl* (2008) sold higher in their

first month on the market. In the midst of lockdown, the social component of the game seems to have played a crucial role in its success. Sales of the Switch console also boomed during this time. In March 2020, sales doubled compared to March 2019 — the highest Q1 sales of a Nintendo console since 2010. The Japanese company increased production of the Switch by 10% to keep up with demand. — 7974



**“I look at [TikTok] as so fundamentally parasitic, that it's always listening. The fingerprinting technology they use is truly terrifying, and I could not bring myself to install an app like that on my phone”**

Steve Huffman, CEO of Reddit, at the Social 2030 conference in late February

#### THE FLOP

### The Smart City of Toronto is no more

Sidewalk Labs, an Alphabet subsidiary, hoped to create an ultra-modern living space in Toronto, built on a 5-hectare abandoned port area. An ambitious smart city project was first proposed in 2017. It included numerous innovations such as cycle tracks that were heated in the winter and spaces that could be transformed based on the day of the week. Robots were also supposed to deliver

packages and collect rubbish. But local opposition became increasingly vocal over the last two years, notably due to a lack of transparency from Google regarding the use of the data it was collecting. Along with the company's recent austerity cuts as a result of the pandemic, this opposition was the last straw for the Google smart city project.

— 6006

media

### TAMEDIA FORCES AN UPDATE

The internet platforms of the *Tribune de Genève* and *24 heures* newspapers underwent a drastic update. The *Tribune de Genève* page is cleaner after a reduction in the number of sections available, while the new *24 heures* site highlights news in the canton of Vaud. This update comes at a time when the entire press industry is experiencing a significant drop in advertising revenue due to the coronavirus pandemic, despite a big uptick in readers. — TXGN

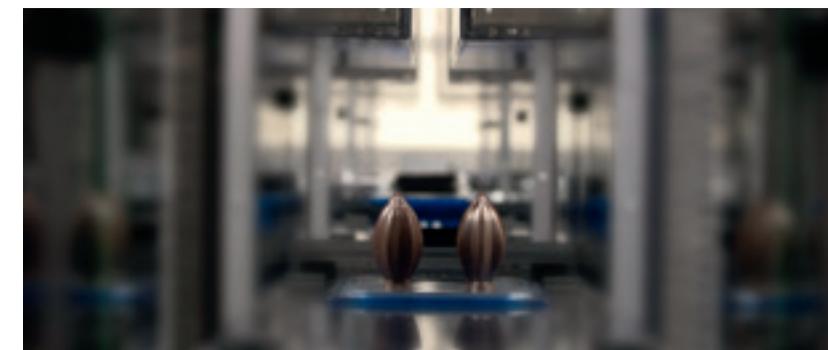


## -98.9%

The incredible decline in the number of local passengers at Zurich airport in April 2020, down to 20,866 travellers, compared to 1,951,979 a year earlier.

food

### 3D-PRINTED CHOCOLATE: REALITY MEETS FICTION



THE BARRY CALLEBAUT GROUP

In episode 136 of the successful series *Elementary*, Sherlock Holmes 3D-printed a chocolate rabbit with the help of a Zurich scientist and his chocolatier brother in Brooklyn. Two years after the episode was released, the Zurich group Barry Callebaut has opened the world's

first chocolate 3D printing studio. The company is operating this new technology via its food decoration brand Mona Lisa. The Mona Lisa 3D Studio allows chefs to design their own bespoke confections and produce them quickly on a large scale at an affordable price. — BARN

SCANS



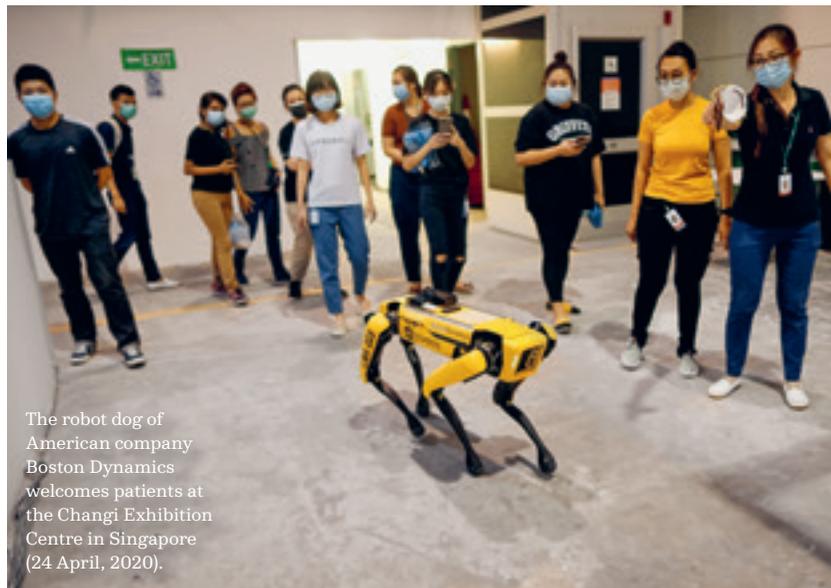
**“We pay up to \$100,000 a minute for our premium long-form movies and chapters”**

**Meg Whitman,**

CEO of streaming application Quibi, which launched in early April. The budget is comparable to that of large productions from Netflix, Amazon, HBO Max and Disney+.

robotics

**NEW MISSIONS FOR SPOT THE ROBOT DOG**



The robot dog of American company Boston Dynamics welcomes patients at the Changi Exhibition Centre in Singapore (24 April, 2020).

EDGAR SU / REUTERS

There has been a lot of talk about robots in recent months following their contribution to caring for sick coronavirus patients, including in China, Lombardy and Thailand. Sensing an opportunity, Boston Dynamics, a subsidiary of the Softbank group, adapted its robot dog Spot into a mobile videoconferencing system. Equipped with an iPad, Spot allows healthcare workers to commu-

nicate remotely with patients waiting in line and triage accordingly, without the risk of contamination from direct contact. Spot's four articulated legs allow it to reach many places where other robots cannot go. The city of Singapore also found another use for Spot: encouraging social distancing by patrolling parks with an audio message directed at citizens.

— V 9984



“BEAUTY LIES IN THE DETAILS OF THE GRANDEST STRUCTURES, AND THE FINEST.”

ORA ITO, CREATOR OF SHAPES, WEARS THE VACHERON CONSTANTIN PATRIMONY.

**VACHERON CONSTANTIN** | ONE OF NOT MANY.  
GENÈVE



**\$19.8 BN**

The amount raised in 2019 globally by agri-food start-ups, an increase of 250% in five years, according to the firm AgFunder.

IPO

**A CHINESE CLOUD LEADER GOES PUBLIC ON THE NASDAQ**

While the COVID-19 pandemic paralysed most IPOs, Kingsoft Cloud, a Chinese company that specialises in cloud computing, was able to raise more than \$500 million during its IPO in the United States in early May. Founded in 2012, Kingsoft Cloud was originally a subsidiary of Chinese software giant Kingsoft Corp., but in its IPO documentation paperwork,

the company indicated that it is now independent. Alongside Alibaba and Tencent, Kingsoft Cloud is one of the cloud leaders in China. But while its sales continue to grow (from \$174.5 million in 2017 to \$557 million in 2019), so do the company's losses (from \$100.5 million in 2017 to \$156 million in 2019).

— V KC

# TRENDS



the figure

RYAN ROSLANSKY

## Networking at the head of LinkedIn

Position  
CEO

Age  
42

Nationality  
American

After more than 11 years as CEO of LinkedIn, Jeff Weiner has stepped down. He was replaced on 1 June by Ryan Roslansky, who previously held the roles of senior vice president and product director. The announcement was posted on LinkedIn, of course. Jeff Weiner mentioned that Roslansky was the first person he recruited in 2009 after being named CEO in December 2008. The two met while working at Yahoo!. During their collaboration at LinkedIn, the number of members worldwide increased from 33 million to 675 million, with revenue rising from \$78 million in 2008 to \$7.5 billion today. It is the biggest change in the social network's executive team since it was acquired by Microsoft in 2016 for \$26.2 billion. Weiner isn't leaving the company entirely; he will remain the executive chairman of LinkedIn's board of directors.



the country

CHILE

## A top-ranked country on the brink of chaos

In 2010, Chile joined the very exclusive club of countries that belong to the OECD, the same year that it was ranked the most competitive country in Latin America by the WEF Global Competitiveness Report. But in the last 10 years, inequality has grown and Chile has become the most unequal country in the OECD. In October 2019, an increase in the price of a subway ticket in the capital city was the last straw and the country saw an unprecedented wave of protests. The government even had to mobilise the army to stop looting.

Population  
18,729,160  
(2018)

GDP per capita  
\$15,923 (2018)

Growth  
+1 (est. 2019)

Main economic sectors  
mining  
(copper, carbon and nitrate),  
food products,  
chemicals, wood  
and agriculture  
(peaches, wine  
and fruits)

The protests were expected to start again in March after the austral summer holidays, but as holidaymakers returned home, the first cases of coronavirus appeared. As a result, the government declared lockdown and postponed until October a referendum on the creation of a new

constitution to replace the one from Augusto Pinochet's military dictatorship. While the pandemic ended the protests, Chileans remain angry at the right-wing government led by Sebastian Piñera.



the innovation

SMARTGLASSES LIGHT DRIVE

Manufacturer  
Bosch

Available from  
2021

Price  
Not disclosed

## Stylish smart glasses

Bosch has developed a small optical device named "Smartglasses Light Drive" that can transform any pair of traditional glasses into smart glasses. Keeping the user's hands free and leaving the field of vision unaffected, Smartglasses Light Drive can display a route, receive calls and notifications, and consult information such as a grocery list, recipe or even assembly

instructions. The advantage of this new technology is that it maintains the wearer's privacy, as the information projected onto the lenses is not visible to other people. In fact, the image is not projected onto the lenses themselves, but directly onto the surface of the retina.

As a result, the German company claims that the image will always

remain clear, regardless of whether it is being viewed in full sun or at night. Current smart glasses are often seen as unattractive by potential consumers, but with this miniature projection system, designers can offer more stylish smart models suitable for daily wear.

ARTUR VERKHIVESTKIY / DEPOSITPHOTOS.COM; BOSCH SENSORTEC

# ANALYSIS

SPECIALISTS' VIEWPOINT

FOCUS

## A bad trip in the country of green gold

The Canadian cannabis industry is under pressure, due to chronic overproduction and resistance from the black market.

BY ANGÉLIQUE MOUNIER-KUHN AND BERTRAND BEAUTÉ

Just a flash in the pan? At the start of the COVID-19 crisis, legal cannabis sales saw an unprecedented boom in Canada as consumers swarmed shops to stock up before quarantine. Over Q3 which ended on 31 March, Aurora Cannabis – one of the most prominent companies in the green gold market – sold 12,729 kilos of cannabis, a 39% increase compared to the same quarter the previous year. But the coronavirus effect quickly dissipated, and the sweet scents of cannabis faded away. According to Michael Singer, the interim CEO of Aurora Cannabis, April sales have returned to their pre-pandemic level and companies in the industry have plunged back into the bleak climate that the industry faced previously.

In autumn 2018, the legalisation of recreational marijuana in Canada piqued incredible interest from investors. Dubbed the “green rush”, the hype caused share prices of Canadian producers to skyrocket (read our May 2018 edition). Ontario-based Canopy Growth saw its share price go from CAN\$3 in 2016 to more than CAN\$60 in September

2018. The other major players in the industry, such as Aurora Cannabis, Aphria and Hexo, also benefited from this enthusiasm. But since then, the companies that invested in the buzz are now tumbling on the Toronto stock market.

On average, the primary companies in the industry saw their market capitalisation fall nearly 70% in 2019, despite the fact that the year was quite successful for Canadian stocks (+19% for the S&P/TSX Composite, the main index of the Canadian stock market). And because of the pandemic that has upended the world since the start of 2020, the market will not be restarted in a sustainable way: after reaching its lowest point in mid-March at under CAN\$15, Canopy shares are now around CAN\$25, slightly higher than at the end of 2019.

“The problem is that too many companies entered this young market and were valued based on their production capacities,” said Nikolaas Faes, an analyst at Bryan, Garnier & Co. “In recent years, more than 200 production licences were

granted by the Canadian government. Together, these companies have a total production capacity of 2,300 tonnes, whereas global demand is probably around 700 to 750 tonnes per year, of which 227 is for legal consumption. Therefore, demand is nearly four times less than production capacity.”

This is because, despite legalisation, the number of total users has not grown: according to Statistics Canada, 1.8 million Canadians, or nearly 6% of the population, consume cannabis every day, which is the same amount as before the market opened. Furthermore, the black market is still functioning much better than expected. According to Statistics Canada, 42% of consumers purchased marijuana from illegal suppliers in Q2 2019.

As a result, prices went down and stocks took the hit. Furthermore, exports will not be able to absorb overproduction. Even though medicinal marijuana is now legal in 33 US states and 11 authorise recreational marijuana, cannabis remains illegal at a federal level in the United States,

and is therefore illegal to import. Europe is a modest prospect, even though the medicinal market lead by Germany and Italy is expected to grow. Legal consumption would increase for the time being to a dozen tonnes, according to Faes, which is certainly not enough to help Canadian producers get rid of their unsold stock.

Aurora Cannabis announced a shocking cost-savings plan in early February. The plan included: 500 employees (nearly 15% of the workforce) terminated, debt restructuring, suspended investments, and the retirement of its founder and CEO Terry Booth. The aggressive development strategy of this integrated company (including production, marketing and transformation), was backed by a series of expensive acquisitions. But it is struggling to fulfil its promises: in the quarter that closed at the end of December 2019, Aurora Cannabis generated a net loss of CAN\$1.3 billion.

**To a lesser extent, this situation is similar to the burst of the internet bubble**

“The rationalisation programme shouldn’t be a surprise to anyone; even the most optimistic investors knew that it was inevitable,” said analysts from the Canadian Imperial Bank of Commerce (CIBC) in a recent note. What’s more surprising, according to the analysts, is that the downturn hit almost everyone equally. Whether full of cash or drowning in debt, profitable or not, engaged in solid partnerships or all alone, cannabis stocks have all seen a somewhat uniform devaluation.” To a lesser extent, this situation is similar to the burst of the Internet



A HEXO greenhouse in Canada. The company was formerly known as Hydropothecary.

HARRISON KOYMAN

bubble that put a brutal end to the overvalued IPOs in the tech industry in 2000.

However, the cannabis industry remains promising. “There will be more losses and bankruptcies,” predicted Faes. “Just because a bubble burst on the stock market, it doesn’t mean that the black market has disappeared. Gradually, the legal market will overtake the black market.” According to a report from firm BDS Analytics, published in late April, the global cannabis market is expected to reach \$47 billion in 2025, which is an annual growth of 21% compared to 2019. “Growth outlooks for long-term sales in the global legal cannabis markets remain exceptional,” said Roy Bingham, co-founder and CEO of BDS Analytics. “The cannabis industry could soon reach a decisive moment where US states, faced with an imminent global recession, will consider legalising cannabis as a potentially lucrative new source of tax revenue.”

The Swiss National Bank (SNB) seems to agree. According to information in Swiss daily *Le Temps*, the Swiss bank took advantage of the coronavirus crisis to double its shares of Aurora Cannabis. In late March, its portfolio held 4.2 million shares in the Canadian company, compared to 2.4 million previously. For companies in the industry, the green light at the end of the tunnel could come from institutional investors. Indeed, while individuals have been closely following the cannabis industry since the very beginning, asset managers waited for quite some time due to “too-limited performance history, too-high valuation levels, or internal restrictions,” said the CIBC. The fact that a certain number of players have reached operational profitability (EBITDA) and are generating positive cash flows, probably starting in 2021, will “force” institutional investors to reconsider the industry. For analysts from the Canadian bank, the countdown for the rebound has begun. ▀

# Alcon has its eye on the future

Separated from Novartis last year, the Geneva-based group stands out in the promising ophthalmology market. We take a closer look.

BY JULIE ZAUGG

IN FIGURES

**5 BN**

The number of people who could be myopic by 2050, which is half of the projected global population, according to experts

**22,142**

Number of employees

**\$7.36 BN**

Total sales made by Alcon in 2019, up 5%

**1945**

Year the company was founded in Forth Worth, Texas

The divorce took place on 9 April 2019. Alcon was independent once again, after more than 40 years under Swiss giants Nestlé and Novartis. Originally from Texas, the small company specialising in sterile ophthalmic products has taken an unusual path. It was first acquired by Nestlé in 1977 and, under the food giant, quickly became one of the main players in the eye care market. “Nestlé invested a lot of money in Alcon, but also gave it enough autonomy to develop its own products and strategies,” says Sibylle Bischofberger, an analyst at Zurich Cantonal Bank.

In 2008, the Vevey-based group decided to sell off Alcon in increments to Novartis, and the acquisition was complete in late 2010. But working within the Basel-based group proved to be less comfortable. “Novartis focused all its energy on its pharmaceutical division and ignored its other segments, such as ophthalmology and generics,” says Bischofberger. “As a result, Alcon suffered from years of under-investment in its research and development department, as well as in its sales force and factories, which caused a loss of market share.” In the second half of 2015 and into 2016, Alcon even slipped into the red.

The poor performance convinced Novartis to give Alcon its freedom back as part of a split transaction that led to Alcon being listed on the Swiss exchange and NYSE in April 2019. The company used the transaction to move its headquarters to Geneva. It is now valued at 24.7 billion Swiss francs.

**“It dominates the ophthalmic surgery sector, with a market share of 40%-45%”**

Daniel Buchta, analyst at Vontobel

Freed from the yoke of the Basel-based group, Alcon can now “focus on its growth strategy and devote more energy to launching each new product,” says Scott Bardo, an analyst at Berenberg. Alcon, which has 22,142 employees and is present in more than 180 countries, will become “quicker and more agile”, said ▶

Sergio Duplan, head of Alcon's North American market, in September 2019. One example of this is Pataday, a brand of eye drops that was brought to market just 17 days after it was approved by the US health authorities, just in time for the start of the hay fever season. "We are now in charge of our own destiny," said Alcon CEO David Endicott in the US financial press.

**Leader in its market**

Alcon seems to be well-positioned to tackle the challenges it faces. "It dominates the ophthalmic surgery sector, with a market share of 40%-45%, far ahead of the global number two, Johnson & Johnson, which only has an 11%-13% market share," says Daniel Buchta, an analyst at Vontobel.

Alcon has a particularly strong presence in various surgery segments, such as procedures to treat cataracts, retinal detachment and macular degeneration. Alcon also has its own brand of surgical devices, implants and disposable surgical products, which are well-known and appreciated by surgeons. This gives the brand a competitive advantage over other companies in the industry, it says.

One of Alcon's flagship products is a state-of-the-art implant named PanOptix. This artificial lens is designed for patients suffering from cataracts and is a significant advance on existing technology, as Damien Gatinel, a cataracts expert at Fondation Adolphe de Rothschild Hospital in Paris, explains: "Until now, this type of lens allowed patients to only see close up (30-45 cm) and far away (more than 1 m). The Alcon implant is different in that it is a trifocal lens, so patients can also have an intermediate field of vision, around 60-80 cm, which is the field of vision we use when looking at a computer screen." PanOptix has been available on the European market since 2015 and is just starting to break into the US market. "This is the only product of this type on the US market," says Bardo.

**High-end positioning**

Alcon is also strongly positioned in the contact lens market, ranked number two globally. In particular it dominates the high-end lens segment, thanks to its water gradient range named Dailies Total 1. But this positioning is also Alcon's main weakness. Its competitors Johnson & Johnson, CooperVision and Bausch & Lomb all have cheaper products that work better for the mass market. "To address this vulnerability, Alcon recently launched a cheaper water gradient lens called Precision 1, which should help the company regain market share," says Daniel Buchta of Vontobel.

**"As the population gets older, demand for cataract surgeries will increase significantly"**

Sibylle Bischofberger, analyst at Zurich Cantonal Bank

Another issue is its heavy dependence on reusable lenses, which need to be changed once a week or once a month. "This type of lens is declining compared to daily lenses, which require less maintenance," says Buchta. And if the reusable market shrinks, it would hurt sales of contact lens cleaning solution. "Here again, Alcon is very exposed," adds Buchta.

Nevertheless, Alcon's medium-term outlooks are favourable. "As the population gets older, demand for cataract surgeries will increase significantly in the coming years, particularly in Europe and the United States," says Sibylle Bischofberger. The prevalence of myopia among young people will also increase, as they spend more and more time looking at screens. "In China, 90% of this segment of the population is already affected," she said. This is great news for contact lens sellers such as Alcon.

**ANALYST ADVICE**

**"A SOLID INVESTMENT IN THE MEDIUM TERM"**

In 2019, Alcon saw its sales increase 5% to reach \$7.36 billion. The ophthalmic surgery sector did particularly well, growing by 7% to reach \$4.2 billion. The implants sector saw even higher growth at 9%. "Implants have the most significant growth potential for Alcon, due in particular to the performance of the PanOptix implant in the US market," says Scott Bardo, an analyst at Berenberg. Alcon's margins are also expected to improve.

In 2019, its margins were at 17.2%, but the company hopes to reach 20%-25% by 2023. Bardo believes that the Swiss company, whose shares he recommends purchasing, is a good medium-term investment due to its dominant market position in the eye health market and the strength of its brand, which is synonymous with quality. But Alcon needs to continue to innovate in order not to lose any ground to its rivals such as Carl Zeiss, Abbott and Bausch Health in the surgical sector and Johnson & Johnson and CooperVision for contact lenses.

Furthermore, there is also increased demand from developing countries, in which cataract surgeries and the use of contact lenses have just started to take root, particularly among the new middle classes. Alcon already generates 25% of its revenue from emerging markets and records double-digit annual growth in such countries, particularly in China, Brazil and Russia. ▲ ~ ALC

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# Business trips in jeopardy

Already under fire as a result of corporate sustainability policies, certain types of business trips will not survive the coronavirus crisis.

BY ANGÉLIQUE MOUNIER-KUHN

**B**usiness trips have long been associated with the idea of escape, a chance to get away from the daily grind, pressure from management and family obligations, and an opportunity to enjoy crisp white sheets at an expensive hotel after a business class flight. But the reality of business trips isn't what it once was. Called upon by shareholders and clients to reduce their environmental footprint, an increasing number of companies have revised their travel policies in recent years to adapt to the climate crisis.

Now, the COVID-19 pandemic could be a fatal blow to business trips and other roadshows. Following the emergence of the virus in Asia and its spread around the world, business

travel quickly disappeared: "Business travel has become the latest casualty of the coronavirus pandemic, coming to a halt across the globe," lamented the Global Travel Business Association (GTBA) in early April. According to this international lobbying group, companies worldwide suspended all business trips and international borders were closed, which resulted in a loss of \$122.5 billion per month for the industry. Revenue for the travel sector was estimated at \$1,330 billion in 2017.

"Once this pandemic is successfully combated, business travel can return to being a positive economic driver of the global economy," said the GTBA in a press release. Wishful thinking? "The one-meeting trip will

disappear," said Paul Hudson, CEO of Sanofi and former CEO of Novartis, in the *Wall Street Journal* on 3 April. "That's incredibly important for our commitment to the environment and to respect people's time away from families. We'll be more demanding of the digital space."

"The crisis resulted in a major acceleration of companies using digital tools. That will certainly have long-term effects," says Jonathan Normand, executive director at B Lab Switzerland, which runs a certification process to recognise businesses that meet the highest standards of social and environmental performance. "Any company that hadn't yet experimented with long-distance collaboration was forced to change. In addition to teleconferencing, companies

discovered very effective online collaboration tools, such as Miro and Jumbo, which give employees new ways to collaborate with their ecosystem," adds Normand. Two years ago, Normand himself decided that he would systematically refuse all requests to attend international conferences: "I always suggest that conference organisers find people locally who can say the same thing I would."

According to the expert on innovation in society and governance, rethinking the added value of business travel – one of the main sources of a company's carbon emissions – and choosing digital alternatives instead is just "common sense". Especially since the current economic slump means that companies are reviewing their bottom line: as they look to cut costs, travel is often a very significant expense in the tertiary sector.

## RETHINKING PRACTICES

But this advocacy for remote work has its opponents, particularly in the finance industry. "Business trips are an integral part of a Wealth Management career: our entire business is based on trust, and meeting with clients in person is necessary," says Bernard Schuster, head of group communications at Union Bancaire Privée (UBP). Forced to cancel all international travel and require almost all of its employees to work from

home in March, the investment bank had to start teleworking overnight. Even after just a few weeks, the experience has already caused many to rethink how business will be conducted after the crisis. "We need to prioritise travel that has the purpose of growing business or making decisions. Physical presence is important during project launch meetings, but once the roadmap, roles and responsibilities are clear, it's very easy to work remotely," said Schuster.

**"Any company that hadn't yet experimented with long-distance collaboration was forced to change"**

Jonathan Normand, executive director at B Lab Switzerland

As an example of this evolution in progress, UBP organised its first virtual team-building session in April with its teams in Asia: "We were supposed to do a flashmob. I was standing up, clapping my hands with colleagues in Hong Kong and Singapore. It was a lot of fun and it really helped us establish a team dynamic, even though everyone was in their own homes," says Schuster.

## ACADEMICS ON THE FRONT LINE

At the University of Geneva, this period served as a life-size test. With colloquiums, conferences and invitations, the academic world traditionally involves a lot of air travel. Announced last year, the new air travel policy at UNIGE was expected to enter into force at the start of the next academic year. The policy includes a 50% reduction in CO<sub>2</sub> emissions from air travel by 2030 (compared to 2019) through increased use of train travel and videoconferencing. The global pandemic accelerated the process. "We skipped right over several steps," says Fabrice Calame, head of sustainable development goals at the UNIGE Rectorate. This was particularly true for the training step, since everyone had to dive right in, as well as the communication step, which was designed to convince people who were less enthusiastic about the merits of the new policy. Thus far, feedback on the technological infrastructure the university has invested in has been positive overall. "But it remains to be seen whether this period is enough to establish what will be a fundamental cultural shift," says Calame. UNIGE staff take nearly 4,000 aeroplane trips per year. ▽



# A wave of optimism hits the Swiss stock market

The SMI regained its lustre after a rough ride in March. But the Swiss stock market's flagship index hides a wide range of realities.

BY BERTRAND BEAUTÉ

**T**he Swiss Market Index – which represents the top 20 companies in Switzerland by market capitalisation – picked up again after taking a steep nosedive in March. In early June it had already passed the 10,000-point threshold, slipping only 6% year-to-date. By contrast, losses amounted to 19% for Italy's FTSE MIB index, 18.5% for the French CAC 40 and 9% for the German DAX over the same period. “The Swiss market outperforms all the main markets,” emphasises Eleanor Taylor Jolidon, co-head Swiss and global equity portfolio management at Union Bancaire Privée (UBP). In her view, this is because “alongside US firms, Swiss companies are the biggest value creators in the world. It's a tough situation for companies that need strong economic growth to perform. But that's not the case for the majority of Swiss companies, so I expect that the Swiss market will continue to outperform.”

In these difficult times, Swiss companies benefit from a number of advantages to overcome the crisis. “They are very international compa-

nies. When the economic backdrop is poor in some countries, it's better in others. Being active in a multitude of markets enables companies to buffer the impact of the crisis,” explains Jérôme Schupp, financial analyst at Prime Partners. “What's more, Swiss companies are generally very well-positioned – either the number one or a top-ranking player in their market, which makes them indispensable.”

## The SMI is also distorting market perspective

Nevertheless, it's not going to be all roses from here on out. “We jumped from extreme pessimism to a bit too much optimism,” Schupp adds. “The markets view the pandemic as a temporary crisis that will subsequently give way to a strong recovery. But we're only at the beginning of the difficult times.” Jolidon agrees: “The global economy

is extremely fragile. A lot of people have lost their jobs – nearly 40 million in the US – and I'm not sure that they'll return to work any time soon. There is currently a great deal of optimism on the markets, but I anticipate corrections with rather painful surprises, followed by more positive moments.”

The current optimism is partly due to the publication of Q1 2020 earnings, which turned out to be better than expected (see the infographic on p. 27). “The markets are very excited,” Jolidon continues. “People saw the Q1 earnings and thought, ‘that's not so bad after all.’ But the most important figures are those to come, not those already published. Q1 earnings don't reflect the scope of the crisis because Europe and the US were unaffected by the pandemic for the first three months of the year. We won't see the real impact of the crisis until Q2 earnings come out.”

In a way, the SMI is also distorting market perspective. “The disproportionate weight of Roche, Novartis and Nestlé – the top three SMI stocks, which have also been more resilient to the crisis than the market and

have positive outlooks – means this index is not representative of the Swiss stock market,” asserts Jérôme Schupp. “If you look at the other SMI companies and more broadly all companies listed in Switzerland, it's a different story.” Duty-free airport retailer Dufry, for example, has been hit hard by the coronavirus

pandemic, watching its revenue virtually disappear (-94% in April). On the other end of the spectrum, Logitech has benefited from the lockdown, boosting sales for webcam and video conferencing equipment by 32% and 60% respectively.

For Eleanor Taylor Jolidon, that's

why the current crisis calls for highly active management. “Don't think in terms of indices like the SMI or even in terms of sectors,” she emphasises. “There are winners and losers as a result of the crisis across every segment. Investors need to focus on companies that create value.”

Construction sites have been hit hard by the coronavirus crisis. Here, in Bern, two workers keep their distance (20 March).



KEYSTONE

## MANUFACTURING TAKES A BEATING

ABB...Geberit...LafargeHolcim...Sika

Manufacturing is paying a steep price over coronavirus. “In the second quarter, we expect ABB's operations to be significantly challenged by a sharp drop in demand due to lockdowns in many parts of the world,” warned Björn Rosengren, CEO of ABB, during the presentation of the company's Q1 earnings on 28 April. This industrial robot specialist isn't the only one in hot water. Building materials leader LafargeHolcim has had to shut down construction sites, while sanitary products specialist Geberit and adhesive and sealant manufacturer Sika have also closed operations.

Outside of the SMI, “some Swiss manufacturers have the misfortune of

being heavily geared towards the automotive sector,” says Eleanor Taylor Jolidon, co-head Swiss and global equity portfolio management at UBP. “The crisis may last quite a while for them because I doubt that people's first impulse after lockdown ends will be to buy a car.” The pandemic will likely have a long-term impact on companies that are highly dependent on automakers, such as Tornos and Autoneum. According to a press release by Swissmem on 26 May, “incoming orders for Switzerland's mechanical and electrical engineering industries (MEM industries) may bottom out”. Nearly three-quarters of MEM companies (72%) expect losses or insufficient margins in 2020. Not only that, but considering the time it

will take for their clients to start investing again, a reprieve isn't likely to be on the cards before summer 2021.

“Swiss manufacturers will survive because they are managed well. But they won't come out unscathed and there will be lay-offs in the machine-tool industry,” forecasts Jérôme Schupp, financial analyst at Prime Partners. At the other end of the spectrum, however, some companies should weather the storm quite well. Such is the case for VAT Group, INFICON and the Comet Group, three subcontractors in the semiconductors sector – a market that marches to its own cyclical tune and seems fairly immune to the crisis (see our report on p. 30).

## PHARMA AND AGRIFOOD ENJOY FAIRLY CLEAR SKIES

Nestlé...Novartis...Roche...Alcon...Lonza...Givaudan

Unsurprisingly, the pharmaceutical industry performs rather well in a health crisis. "But not all performances are created equal," says Eleanor Taylor Jolidon, co-head Swiss and global equity portfolio management at Union Bancaire Privée (UBP). "Roche is in a better position than Novartis, for example." One reason for this is that Roche's diagnostics expertise is critical in the fight against COVID-19. It can also rely on Actemra – a drug in its portfolio used by patients suffering from serious pulmonary complications. Novartis, on the other hand, owns very few molecules that are effective against coronavirus, except for the highly controversial hydroxychloroquine, of which the Basel-based group is one of the manufacturers.

Beyond these two companies, Lonza partnered up with US biotech firm Moderna Therapeutics at the end of May to help develop a vaccine against COVID-19. If they succeed, the Swiss drug manufacturer – whose Q1 revenue gained over 7.4% compared to 2019 – could become a major player in the production of the long-awaited vaccine. Givaudan is also doing relatively well. The Geneva-based aroma and perfume specialist saw its (luxury) perfume division impacted and switched gears, altering its production capacity to manufacture sanitising gel. As for agrifood giant Nestlé, the company benefited in Q1 from stockpiling purchases by customers on lockdown.



The Basel group Roche has developed a diagnostic test for COVID-19 called "v-Tac".

Badrul Chukrut/ZUMA Press/Newscom

## SERVICES SUFFER

Adecco...SGS

It's common knowledge that during a crisis, temporary workers are the first to find themselves in line for unemployment. And temporary-staffing giant Adecco is right with them. In Q1, the Zurich-based company recorded losses of €348 million versus profit of €133 million last year. "With April revenues down around 40% year-on-year, we expect Q2 to be a challenging quarter," admitted Adecco CEO Alain Dehaza in a press release.

For Geneva-based certification group SGS, the situation is more difficult to gauge. On the one hand, the company wasn't the least bit spared by the recession, but on the other, it is launching profitable new services like on-site verification testing for disinfection and face-mask compliance certification.

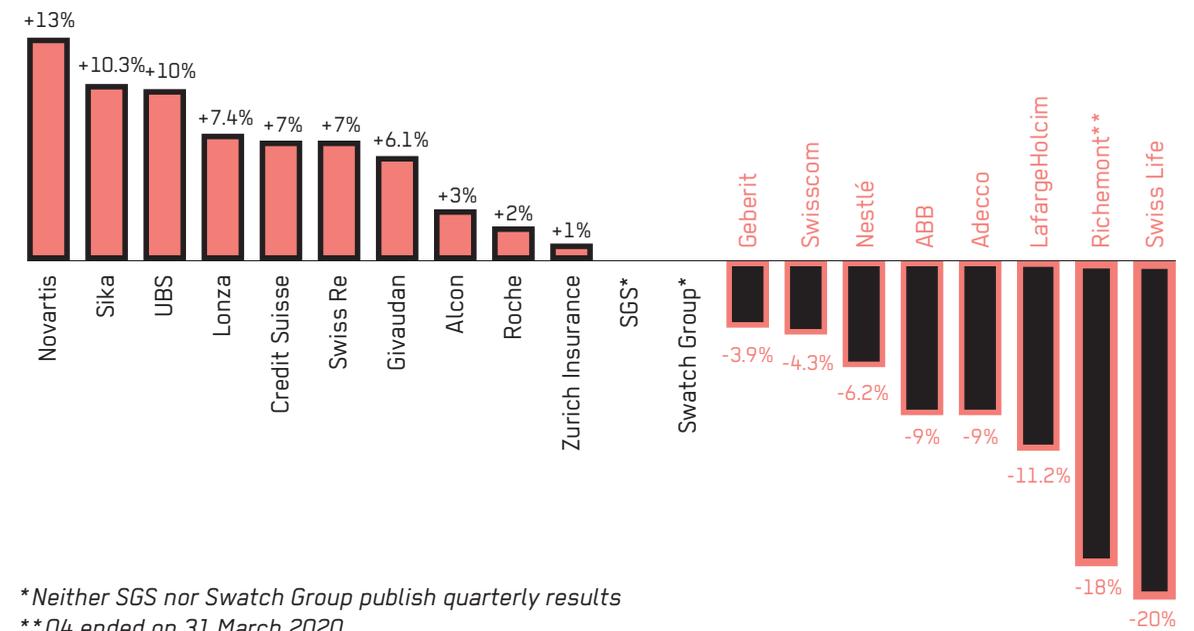
## LUXURY BRANDS SCRAMBLE FOR CUSTOMERS

Swatch Group...Richemont

The watchmaking industry is likely in the biggest crisis it has ever experienced. Swiss watch sales have come to a screeching halt due to the closure of shops and factories in response to lockdown measures as well as the lack of tourism. In the eyes of Prime Partners financial analyst Jérôme Schupp, "Swatch and Richemont will continue to have a rough ride at least until the end of the year. Since tourism generates a substantial portion of their revenue, they still have a long way to go on the road to recovery."

## STRONG Q1 EARNINGS

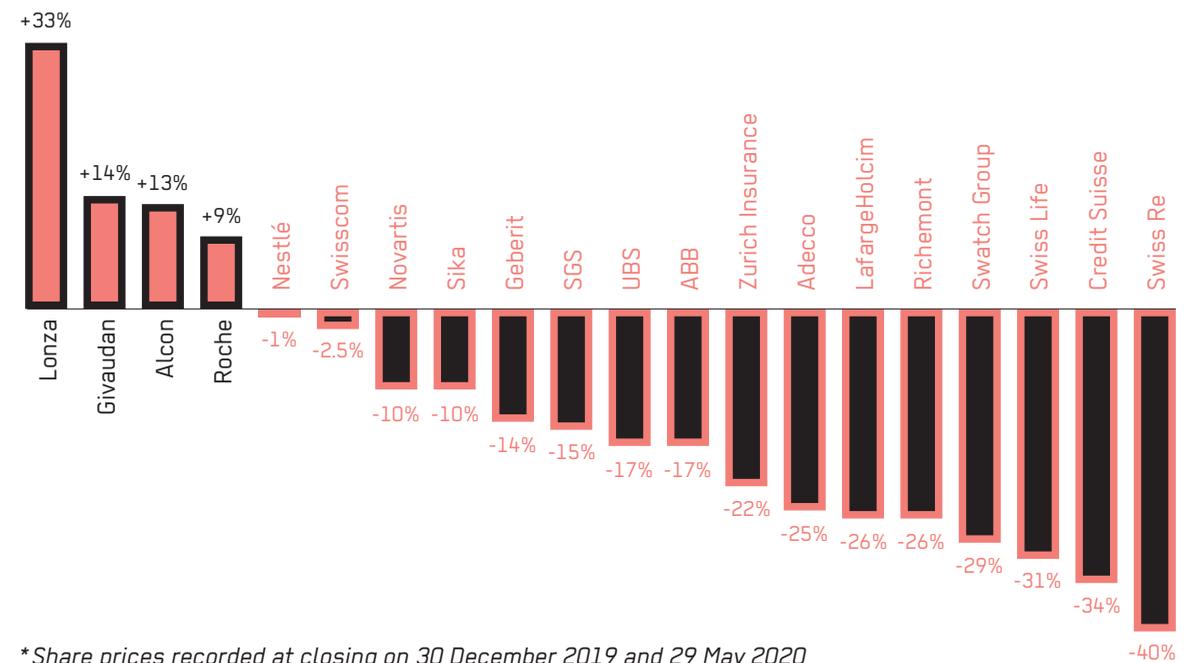
The pandemic had little impact on revenue for SMI companies in Q1 2020  
Change versus Q1 2019



\*Neither SGS nor Swatch Group publish quarterly results  
\*\*Q4 ended on 31 March 2020

## TURBULENCE ON THE STOCK MARKET

Change in share price of SMI companies from 1 January to 1 June\*



\*Share prices recorded at closing on 30 December 2019 and 29 May 2020

## BANKS AND INSURANCE COMPANIES REMAIN CAUTIOUS

*Credit Suisse...UBS...Swiss Life...Swiss Re...Zurich Insurance*

The industry has had dazzling results. UBS and Credit Suisse saw profits skyrocket in Q1 versus 2019, up 40% and 75% respectively. Both banks benefited from increased customer activity in wealth management and investment banking at the beginning of the year. But the circumstances still call for caution. "During recessions, payment defaults soar. That's what happened in 2008," recalls Jérôme Schupp, financial analyst at Prime

Partners. "Moreover, interest rates will stay low, which will be a wet blanket for bank margins."

And for their part, insurers will be strapped with payouts linked to the pandemic. In Q1, Swiss Re reported net losses of \$225 million compared with \$429 million in profits the previous year. The two extremes illustrate the scope of the impact of coronavirus on the reinsurance com-

pany's business. And it would seem that the worst is yet to come. The postponement of the Tokyo 2020 Olympics could cost Swiss Re \$250 million. In a press release published on 14 May, Zurich Insurance announced it had already paid out \$280 million in P&C claims related to the pandemic. The bill could reach a total of \$750 million over 2020 as a whole, an estimate that remains very uncertain, according to the group.

## DIGITAL WINS BIG

*Swisscom*

For Swisscom, the only telecoms company listed on the SMI, the pandemic has been smooth sailing. "But Swisscom's growth is incidental," says Jérôme Schupp, financial analyst at Prime Partners. "Lockdown measures obviously led to heightened demand

for digital services, particularly owing to the massive increase in telework, but the telecoms market is saturated in Switzerland and Swisscom's growth potential is therefore limited." That's why it's better to examine cases outside of the SMI, such as Logitech,

which is benefiting greatly from the pandemic. The IT accessories company posted revenue of \$709.2 million in Q1, up 14% year-on-year. Profits shot up five-fold. Software companies such as Crealogix and Temenos may also get a boost from the crisis.

Urs Schaeppi, CEO of Swisscom, at the presentation of the 2019 results on 6 February in Zurich.

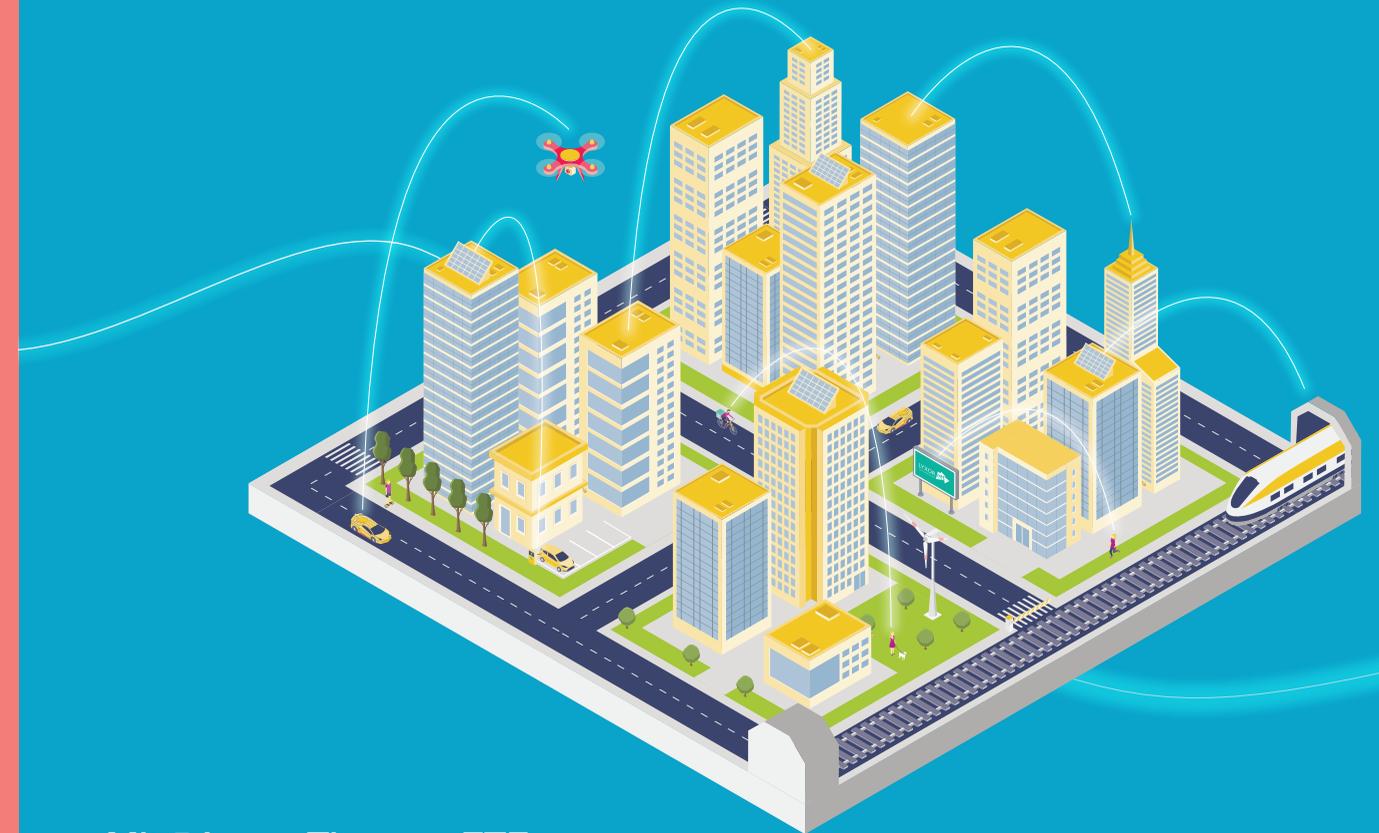


# swisscom

KEYSTONE

# Glaskugel war gestern

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DOSSIER

# THE CHIP INVASION

As more and more objects become equipped with electronic chips, the industry looks to a promising future, in spite of the coronavirus.

BY BERTRAND BEAUTÉ AND LUDOVIC CHAPPEX

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**T**hey are everywhere: in our homes, our cars, at work and even soon under our skin. What are “they”, you ask? Electronic chips, of course. First invented in the 1950s, they have gradually taken over the planet and have now become omnipresent in all of the devices we use every day. Since 2017, more than 1,000 billion chips are produced each year in fabrication plants – gigantic factories that make semiconductors for all the tech companies, such as Apple, Huawei, Nvidia and Qualcomm. And the takeover has just begun: “The fundamental trend for the next 10 years is more and more semiconductors,” said Hugo Paternoster, an industry expert at AlphaValue. “Volumes will increase as smart objects, including cars, become more available to a wider range of consumers.” ▶

Dossier prepared by:  
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While waiting for this prosperous future, the semiconductor market is experiencing a difficult period. Before the coronavirus crisis even began, the market had experienced a disappointing 2019, with a drop in sales of 12.8% over one year, to \$409 billion. A loss of this magnitude hasn't been recorded in 10 years. "The macroeconomic situation was complicated in 2019, with slowed growth in China, the US-China trade war and sluggish smartphone sales," said Frederic Yoboué, industry analyst for the Bryan, Garnier & Co. investment bank. "Prices dropped even more significantly given that chip manufacturers invested very heavily in 2017, when the price of semiconductors skyrocketed. When demand flipped in late 2018, manufacturers had far too many chips in stock and surplus production capacities, which led to a very sharp price drop."

For everyone in the industry, 2020 was supposed to be a year of recovery. In December 2019, World Semiconductor Trade Statistics (WSTS) predicted 5.9% growth for this year and 6.3% in 2021. But COVID-19 now overshadows these rosy outlooks. In a study published in April, consulting firm McKinsey now estimates that demand for semiconductors will drop by between 5% and 15% in 2020, compared to the previous year. Of the companies that will be af-

ected the most, those that design chips for smartphones (Qualcomm, MediaTek) and cars (Infineon, NXP, STMicroelectronics) will certainly bear the brunt of the brutal drop in production and consumption. On 29 April, US company Qualcomm announced a 21% fall in demand during Q1 for its chips, which are used in most smartphones. It is predicting a 30% decline for the next three months. The same applies to NXP, which generates nearly 50% of its revenue from the automobile sector. In Q1, the Dutch company recorded a fall of 12% compared to the previous quarter. Here again, the company is expecting the worst, predicting a drop of between 14% and 23% of its revenue in Q2 compared to 2019.

**"We just experienced two years' worth of digital transformation in two months"**

Satya Nadella, CEO of Microsoft

"The coronavirus has impacted the entire value chain: production, with the closure of several factories, but

also consumption," said Frédéric Yoboué, analyst at Bryan, Garnier & Co. "During a health crisis, people are less inclined to buy gadgets."

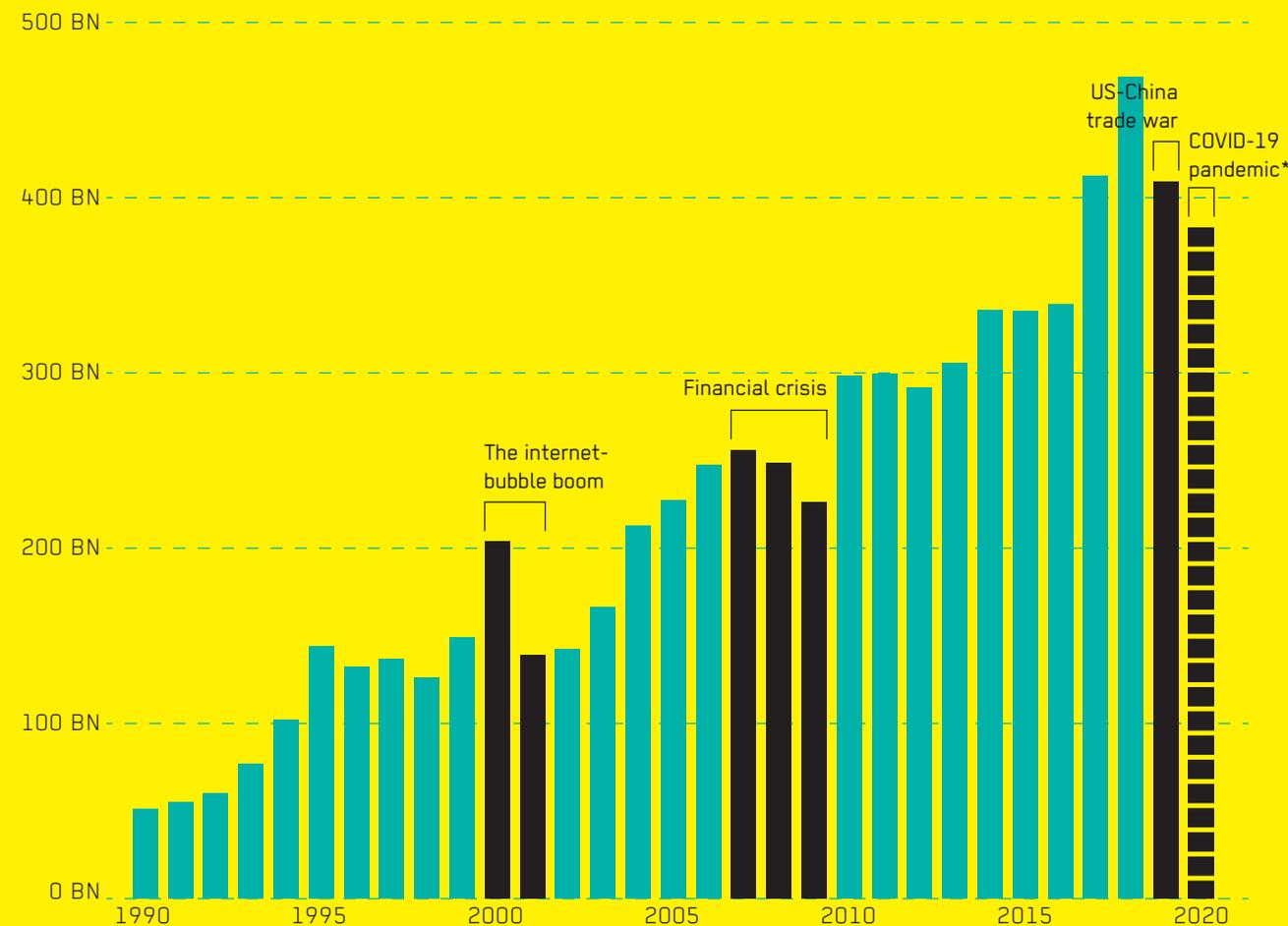
**THE CLOUD BLESSED BY THE PANDEMIC**

However, not all companies are affected by the virus in the same way. Far from it, in fact. Some companies even seem to be benefiting from the crisis, such as those that equip cloud computing giants. "With the boom in homeworking, streaming platforms, e-commerce sites and all the dematerialised services, companies in the cloud computing space need to increase the capacities of their data centres," said Julien Leegenhoek, tech stock analyst at Union Bancaire Privée.

On 20 March, e-commerce giant Alibaba announced that it would be investing \$28 billion in its cloud infrastructure over the next three years. The Chinese group justified its decision with the boom in homeworking since the start of the COVID-19 pandemic, which has led to a sharp increase in demand for dematerialised services. This is a godsend for memory manufacturers, such as Korean companies SK Hynix and Samsung Electronics, as well as server chip manufacturers (Intel, AMD). SK Hynix, for example, announced a 6% increase in revenue in Q1, reaching €5.4 billion. >

**NON-STOP SALES GROWTH**

Democratisation of technological objects has led to a continuous increase in the semiconductor industry's revenue – a sector that is going from strength to strength.



\* An optimistic semiconductor revenue forecast, with fourth quarter global economic recovery.

Sources: World Semiconductor Trade Statistics/Statista

**From Faraday to Moore**

**1833**

Michael Faraday makes a surprising discovery for the time period: the capacity of certain metals to conduct a current increases when the temperature rises. These materials aren't really insulators, but neither are they really conductors, so they are named "semiconductors".

**1947**

American researchers from Bell Labs invent the transistor, a semiconductor system made up of three electrodes that can control an electric current.

**1958**

American Jack Kilby connects several transistors together, creating an integrated circuit, otherwise known as the first electronic chip.

**1965**

Engineer Gordon E. Moore, who would co-found Intel in 1968, says in *Electronics* magazine that "the complexity for minimum component costs has increased at a rate of roughly a factor of two per year". This empirical prediction is known as "Moore's Law".

**1969**

Several companies, like Four-Phase Systems, begin working on prototype microprocessors: silicon chips filled with transistors capable of executing a computer program.

**1971**

Intel markets the first microprocessor: "Intel 4004" with 2,300 transistors and engraving finesse of 10,000 nanometres (nm). As semiconductor companies multiply in Santa Clara Valley – Intel's location – journalist Don Hoefler nicknames the region "Silicon Valley".

Other cloud giants (such as Amazon Web Services, Google and Microsoft) are in the same situation as Alibaba. "We just experienced two years' worth of digital transformation in two months," said Satya Nadella, CEO of Microsoft, on 29 April. In Q1, Microsoft's "intelligent cloud" activity, which includes its Azure platform for businesses, increased by 27% over one year, reaching \$12.3 billion.

#### 5G AND AUTONOMOUS VEHICLES

In the longer term, when the economy picks up again semiconductor sales are expected to generally recover. "The roll-out of 5G will drive the industry upwards," said Yoboué. "Consumers will want to buy mobiles that are compatible with this new mobile network, which is ideal for semiconductor companies which make nearly 30% of their revenue from mobile phone brands." This is especially true as 5G smartphones will require chips with higher added value and are therefore more expensive.

The other domain that is quite appealing to the semiconductor industry is cars, which in recent years have become quite reliant on electronic chips. Everything uses microprocessors now: from connecting the screens inside the vehicle to optimising battery consumption. "In 2019, the car market decreased by 5% and we're not expecting a recovery in the short term. That said, vehicles contain

an ever-increasing number of electronic chips," said Hugo Paternoster. In 2018, the average value of chips used inside a car was \$370 in a combustion model, compared to \$820 for its 100% electric counterpart.

### "Artificial intelligence opens a new market for chips that aren't GPUs or CPUs"

Ondrej Burkacky, a semiconductor specialist at McKinsey

"Cars will go electric, and eventually autonomous, which is undoubtedly excellent news for the semiconductor industry," said Julien Leegenhoek, tech equity analyst at Union Bancaire Privée. "Even if it seems far away, this future will indeed happen: cars will become electric and autonomous." Experts are already predicting that the average value of chips used in autonomous vehicles will be nearly \$2,000 per vehicle.

#### ARTIFICIAL INTELLIGENCE: THE HOLY GRAIL

In order for vehicles to become autonomous, they need to increase their technological capacity with artificial intelligence (AI) – a sector that is a real gold mine for the semi-

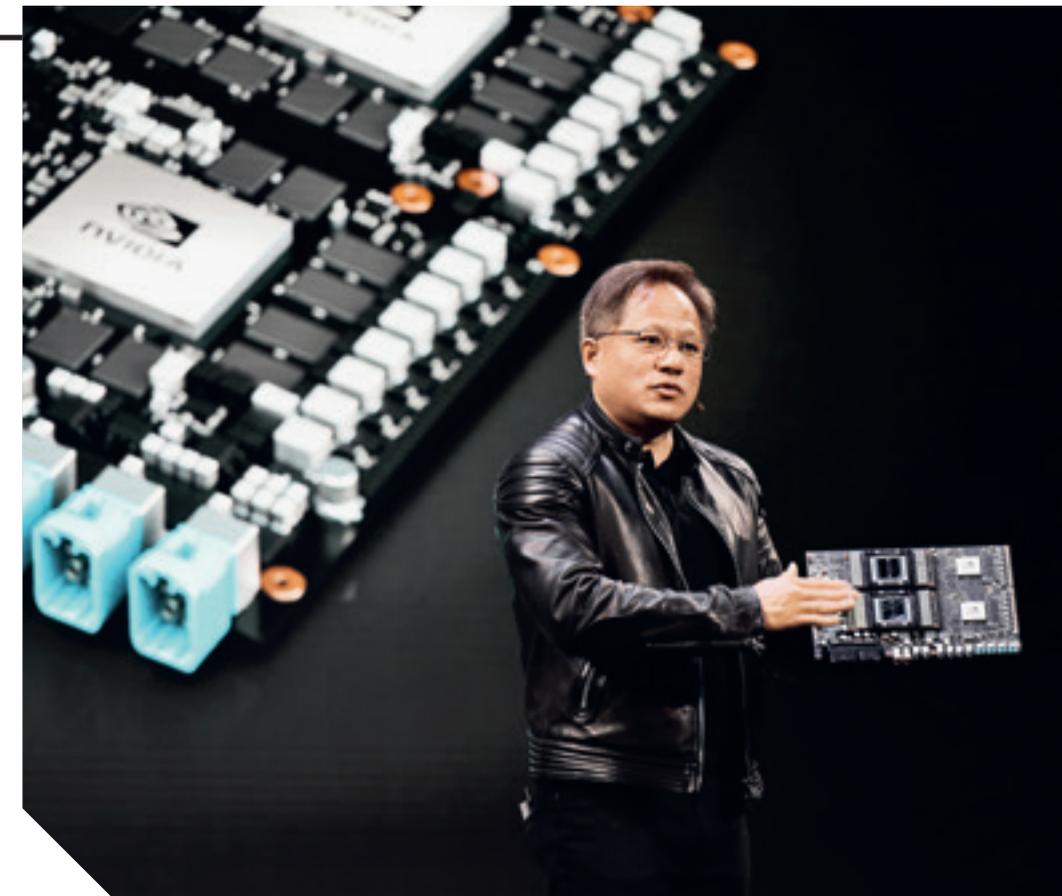
conductor industry. According to IHS Markit, the prospects of electronic chips in artificial intelligence applications across all fields (information technology, health, cars, telecoms, industry, etc.) will likely triple in size over six years to reach \$128.9 billion in 2025, compared to \$42.8 billion in 2019.

US company Nvidia, which specialises in graphic processing units (GPUs), seems to be the best positioned to take advantage of this growing market, almost by chance. In fact, the company hadn't particularly focused on AI. But in 2009, researchers at Stanford University had the idea to use GPUs for machine learning – a part of AI – rather than Intel processors (central processing units or CPUs). The result was quite successful.

Since then, the GPUs from Nvidia and its competitor AMD have been leaders in AI – an industry in which processors must handle large quantities of data. Moreover, Nvidia no longer calls its GPUs "Graphic Processing Units", but rather "General Processing Units". This marketing tactic indicates that its GPUs can now do everything and will eventually replace CPUs definitively.

Except that things aren't quite so simple. Initially developed to display video games, GPUs are imperfect champions of artificial intelligence, and many players are

Jensen Huang, CEO of Nvidia, presents the Volta graphics processor at the CIS in Las Vegas 2018. The Santa Clara company is at the forefront of the GPU market.



MANDEL NGAN / AFP

trying to develop new chip architecture specifically designed to meet the needs of AI. "Artificial intelligence opens a new market for chips that aren't GPUs or CPUs," said Ondrej Burkacky, a semiconductor specialist at McKinsey. "These are bespoke chips produced for this usage by companies like Google." The Mountain View company has launched TPUs (tensor

processing units) designed specifically for AI technology. And it is not the only one. Amazon and Facebook are also working on microprocessors dedicated specifically to machine learning, as are many start-ups. All hope to dethrone the traditional players.

To not get left behind, the traditional companies are willing to wield their

chequebooks: in March 2019, Nvidia spent \$6.9 billion to acquire Israeli start-up Mellanox Technologies. Intel, the leader in microprocessors, acquired Israeli start-up Habana Labs for \$2 billion in December 2019. Habana Labs is barely three years old, but is already well positioned in the promising market of electronic chips optimised for artificial intelligence. ▽

1974

Frenchman Roland Moreno invents the "smart card" – an integrated circuit capable of memorising information embedded in a plastic rectangle. This invention will find numerous applications, the best known of which are bank cards and SIM cards.

1975

Gordon Moore makes his law more precise: the number of transistors in the microprocessors is what doubles every two years. Between 1971 and 2001, this prediction was surprisingly accurate, as the density of transistors doubled every 1.96 years.

1992

The big players agree to advance at the same rate, founding the International Technology Roadmap for Semiconductors (ITRS). It publishes an industry biennial roadmap with one goal: stay in the framework of Moore's Law. Processor power becomes the computing progress marker.

2005

As Moore's Law celebrates its 40th anniversary and microprocessors can be finely engraved to just 65 nm, Gordon Moore admits that "it won't last forever".

2016

The semiconductor industry no longer uses Moore's Law. The new ITRS roadmap, dubbed "More than Moore", advises adapting chip capacities to their usage, rather than blindly doubling their power every two years.

2020

Taiwanese foundry TSMC expects to start production on 5 nm chips, which could contain up to 30 billion transistors.

# NO FACTORIES, BUT PLENTY OF IDEAS

With the notable exception of Intel, the big electronic chip companies don't have production facilities. This "fabless" business model allows them to focus solely on R&D.

BY BERTRAND BEAUTÉ

In 2015, history was made in the semiconductor world: IBM sold all its microchip production sites to US company GlobalFoundries. It was the end of an era. Created in 1911, Big Blue was an iconic player in the industry. But after being shaken up by newcomers, the venerable US company had to change its strategy, selling off a struggling business that recorded a \$700 million loss in 2013.

However, IBM hasn't left semiconductors completely behind. The giant continues to develop its own chips, particularly its Power processors that are used in its high-performance servers and supercomputers. But it no longer produces them. That task is now delegated to GlobalFoundries. By abandoning its production facilities to focus on research and development, Big Blue is simply adopting a method that has become the norm in the semiconductor industry: the fabless (no factory) model, which has been successful for other companies such as Apple, Qualcomm and Nvidia.

"Most companies around the world known for their microchips, with the notable exception of Intel, are fabless," points out Frédéric Yoboué, a semiconductor analyst at Bryan, Garnier & Co. "These companies delegate production to foundries and concentrate on the design and architecture of the chips themselves. This separation of tasks is due to the exorbitant cost of production factories for microchips. In addition, given the recurrence of investments, enormous volumes are needed to make them profitable." For example, the Taiwanese foundry TSMC, which alone produces more than half of all chips in the world, spent \$17 billion on its latest production facility.

Free from these gigantic investments, chip designers can concentrate solely on research and development, while simultaneously benefiting from the best production technologies. AMD is an excellent example of this strategy. In the early 2010s, the US graphics card specialist was struggling after several

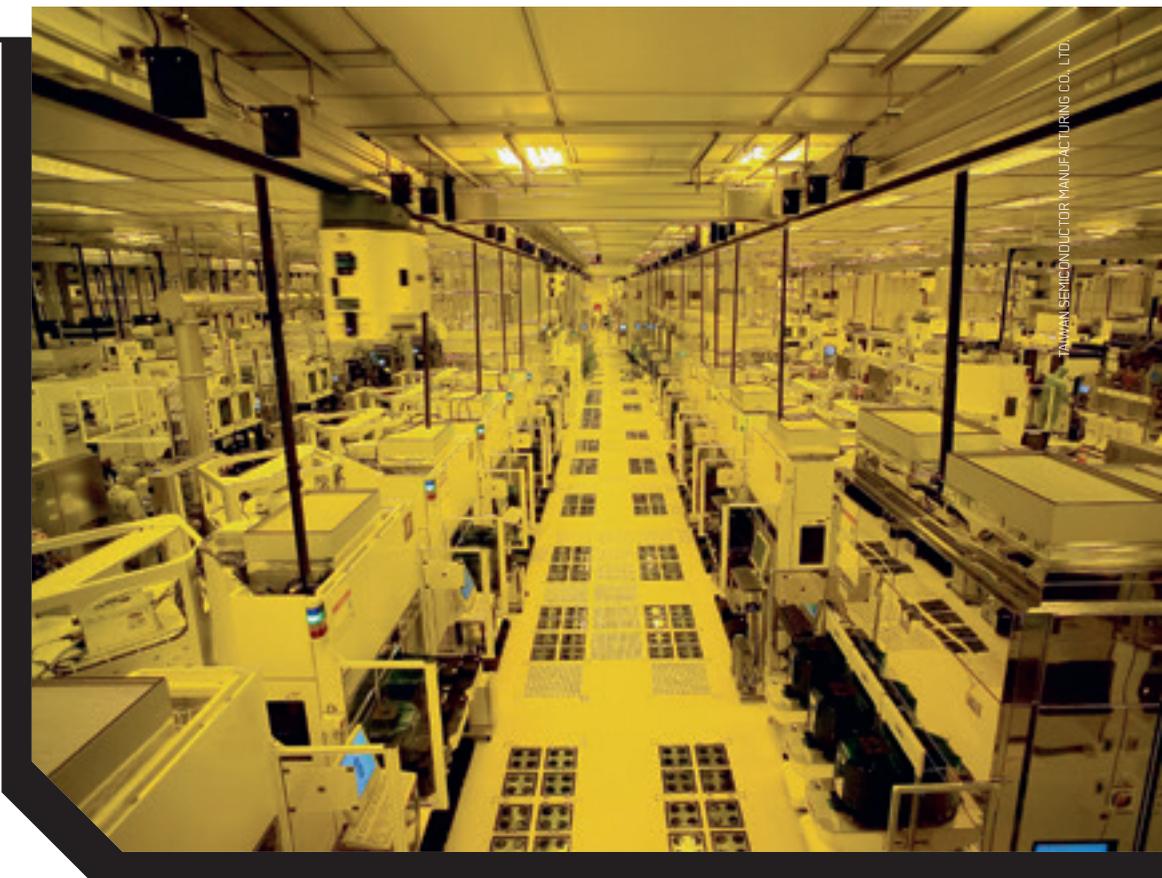
years in the red. AMD decided to sell off its production facilities, which would become GlobalFoundries, and go fabless. Since then, AMD has been winning market share in the domain of PC and server microprocessors, thanks to TSMC's production technologies, which are considered the best in the world.

**"ARM is one of the best companies I know of"**

Julien Leegenhoek, tech stock analyst at Union Bancaire Privée (UBP)

At the same time, its main competitor in this industry, Intel, which produces all its chips internally, is struggling to overcome challenges at its production facilities. While TSMC will launch mass production of 5 nm chips in April 2020, Intel will

A TSMC factory. The Taiwanese giant manufactures chips for several fabless companies like Apple, AMD and Nvidia.



only be able to produce its first 7 nm products in 2021. At a conference in March, George Davis, CFO of Intel, admitted that his company was two years behind the competition.

Another advantage of the fabless model is that new players – i.e. start-ups that don't have the funds to build factories – can emerge and disrupt the semiconductor market. UK start-up ARM did exactly that. "ARM is one of the best companies I know of," said Julien Leegenhoek, tech stock analyst at Union Bancaire Privée (UBP). "In just a few years, it has become the R&D office for the entire semiconductor industry." ARM was founded in Cambridge in 1983 when the UK manufacturer Acorn was designing ARM1, a simple, inexpensive processor for computers designed to be used in British schools.

Since the company was unable to finance factories, it sold the result of its R&D under licence. In the 1990s, the ARM architecture was particularly interesting to Texas Instruments, which at the time was designing chips for Nokia mobile phones. This partnership was the start of something good.

In the years that followed, the UK company filed many patents and claimed intellectual property on all processors designed for the telephone market. Its strength lies in the way it designs chips, which makes them less expensive and less energy-hungry. The competition, however, which is led by Intel, is still focused exclusively on power. In practice, ARM clients, which now include Apple, Samsung, Huawei and Qualcomm, pay for the rights to use ARM architectures. These companies pay ARM

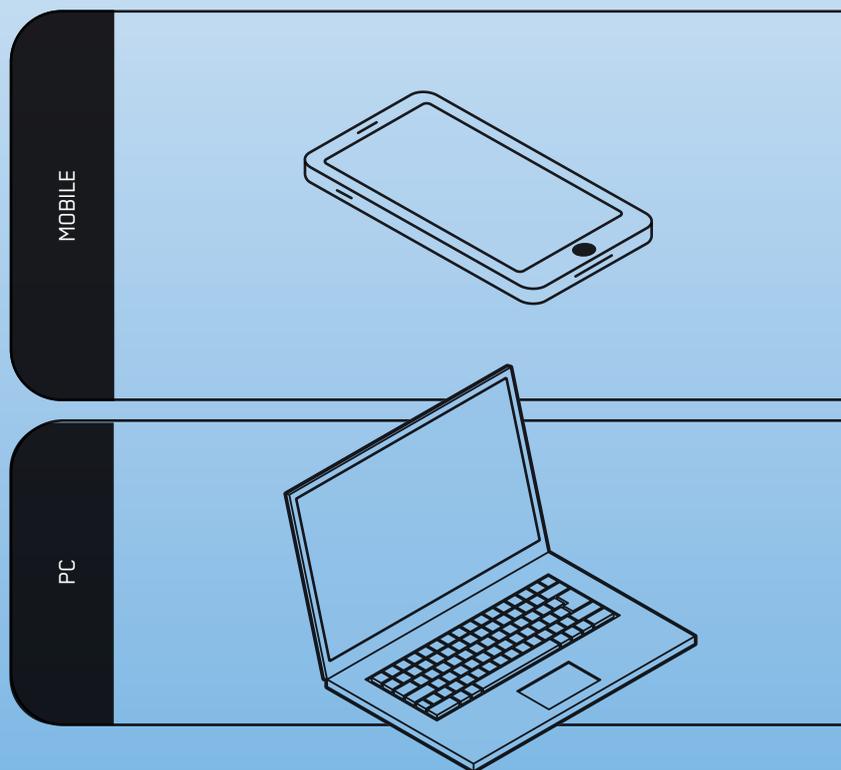
anywhere from \$200,000 to tens of millions of dollars (based on various criteria such as licence duration or exclusivity clauses), as well as royalties on each chip sold. The architecture is then "customisable" at will by the purchasers, that can apply their own innovations, such as the A13 chip – designed by Apple on ARM architecture – which is used in the iPhone 11 (see infographic on p. 38).

"More than 80% of smartphones sold worldwide currently run on ARM architecture," said Leegenhoek. This piqued the interest of Softbank, which acquired the company in 2016 for \$31 billion. Since the acquisition, ARM is trying to diversify by developing chips for connected devices as well as artificial intelligence servers. And it's doing it all without factories. ▲

# HOW ARE CHIPS MADE?

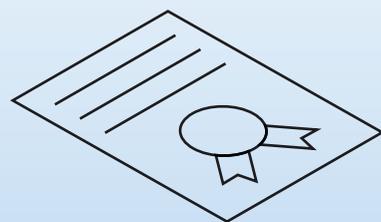
Many companies are involved in manufacturing processors. Here, a case study with Apple's A13 Bionic chip, used in the iPhone 11.

## THE VALUE CHAIN OF OTHER PROCESSORS



### ARCHITECTURE

The architecture of the chip is designed and patented by British company ARM.



### THE DIFFERENT TYPES OF COMPANIES INVOLVED

#### Foundries

They manufacture chips for a variety of clients. The main foundries are TSMC, UMC (both in Taiwan) and GlobalFoundries (in the US).

#### Fabless companies

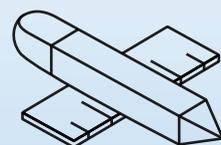
These companies don't have factories and focus on designing chips. Production is delegated to foundries. Some fabless companies include Nvidia, Apple and AMD.

#### Integrated manufacturers

They control the entire production chain, right down to the final products. The main integrated manufacturer of processors is US company Intel.

### DESIGN

Apple designs the chip. That includes defining the instructions that the chip will be able to execute and specifying the systems on the chip (SoC).



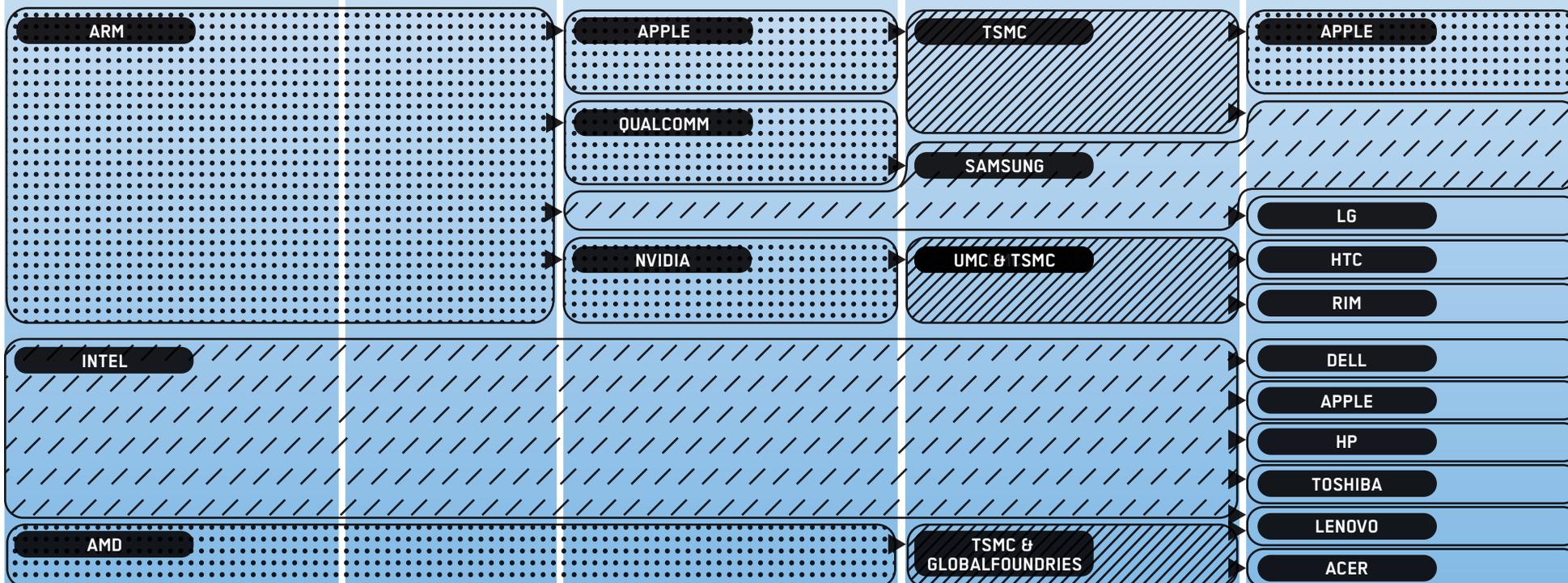
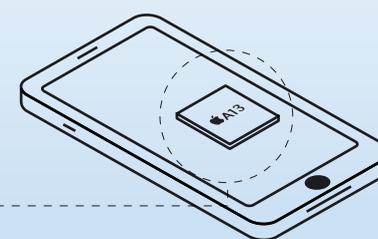
### MANUFACTURING

The Taiwanese foundry TSMC produces the A13 Bionic chip.



### REACHING THE CONSUMER

The chip is sent to China where iPhones are assembled, and the mobile phones are then sold around the world.





INTERVIEW

## “TRUST IS AS IMPORTANT AS TECHNOLOGY”

Heinz Kundert, CEO of Swiss company Comet Group, takes us behind the scenes in his industry.

BY LUDOVIC CHAPPEX  
PHOTOGRAPHS: THIERRY PAREL

### INTERIM DELUXE

In June 2019, René Lenggenhager stepped down from his position as CEO of Comet Group for personal reasons, and was quickly replaced by Heinz Kundert, chairman of the board of directors. It would be difficult to find a more experienced person to fill the role of interim CEO of the Fribourg group. Not many people around the world truly know the semiconductor industry from the inside out.

Swiss native Heinz Kundert, aged 68, spent 10 years as vice president of the international semiconductor association (SEMI International), based in the United States, but he has also successfully led many groups in the industry, including Swiss companies Unaxis (now named OC Oerlikon) and more recently VAT Group, a Swiss family business that he guided to become a stock market suc-

cess story from 2015 to 2018. He remains on the board of directors of VAT Group.

With his extensive practical experience, this mechanical engineer has understandably won over analysts, who commend his pragmatism and track record at the head of VAT. During his time as interim CEO of Comet over the past year, he has led quite significant strategic reorganisations, as he has aimed to refocus the company towards its key areas of business, primarily semiconductors. The ebeam division (non-contact sterilisation systems), which had been in the red since the beginning, was let go. Kundert will cede his interim CEO position on 1 October of this year, at the latest, to British-American Kevin Crofton, while remaining chairman of Comet's board of directors.

**T**he semiconductor industry can be divided into four categories: companies that design chips, companies that make chips, companies that make the machines that make chips, and smaller companies that supply the critical parts for these machines. Comet Group falls under the latter group, an ultra-specialised sector worth an estimated \$12 billion. The head of the Swiss group (read the company feature on p. 42) since June 2019, Heinz Kundert granted us an interview. He explained the developments of an industry in which his company plays a decisive role.

**In the next five years, what will be the most promising avenues for the semiconductor industry?**

The biggest trend is the expansion of data centres, which store and process a huge amount of data in the cloud, and which can be accessed in a few milliseconds. We can add to the list the Internet of Things, 5G, automotive electrification and ▶

## COMET GROUP: THE ESSENTIAL SUBCONTRACTOR

Fribourg-based company Comet is known for its x-ray systems, usually used by automobile and aeronautics groups to test materials, as well as in airports for inspection purposes. But the public knows less about the Swiss firm's products designed for semiconductor manufacturers. This division, named Plasma Control Technologies, actually makes up most of Comet's revenue. And the trend is likely to continue, with Comet estimating that this industry will represent 70% of its revenue by 2025.

Alongside products with obscure names such as RF generators and vacuum capacitors, Comet components are an essential part of the silicon chips found in our computers and smartphones. In practice, Comet supplies these components to a handful of companies (Lam Research, Applied Materials).

These companies then build the machines that the primary manufacturers (Intel, Samsung, GlobalFoundries and TSMC) use to create their chips. Comet is therefore one of the first steps in the subcontracting chain that supplies the very concentrated semiconductor industry (see the portrait gallery in this dossier on p. 44 to 52).

And the Swiss company excels in more than just its specialised field, says Robin Seydoux, analyst at Research Partners: "Comet controls a significant share of the market for vacuum capacitors and x-ray tubes, and demand for

its products continues to grow. It's going to launch a new radiofrequency generator that could result in Japanese giant Tokyo Electron becoming one of its clients, alongside American groups Lam Research and Applied Materials (ed. note: these three companies alone account for approximately 80% of the market share in this industry)."

This optimistic outlook is shared by Michael Foeth, analyst at Vontobel: "Comet is clearly the global leader in its field. The products it offers to its clients are ever more complementary and integrated, and the new feedback loop measuring systems make Comet products even more attractive."

Boasting a very full order book despite the uncertainties of COVID-19, Comet can capitalise on the industry's upwards trend over the medium to long term, according to analysts. A good example is the foundry TSMC, which will invest more than \$10 billion into its factories in 2020. Alongside the semiconductor industry, the Fribourg company is also banking on its x-ray division, a speciality of which includes reliability testing of parts and materials.

Comet has production sites in Europe, China, the United States and, as of this year, Malaysia. It generated a profit of 12 million Swiss francs during the 2019 financial year, and its EBITDA margin reached 10.8%. Most analysts recommend purchasing shares.

FOUNDED  
1948

HEADQUARTERS  
FLAMATT (CH)

EMPLOYEES  
1,330

2019 REVENUE  
CHF 371.6 M

COTN

artificial intelligence (AI). Furthermore, some configurations become crucial, such as latency for the automotive sector due to safety requirements.

### In what way will these changes affect Comet?

In terms of manufacturing chips, there is no major technological leap in sight, but rather constant improvements. Regardless of whether a chip is used for artificial intelligence or storage, the manufacturing process is the same, and always requires silicon. There are a few alternative materials, but in practice, these materials are difficult to work with on an industrial scale.

### So we won't see a disruptive manufacturing technology in the near future?

That's a question that industry specialists often ask us. Professors at Stanford University, who are at the cutting edge of chip design, particularly in terms of cost reduction and energy consumption, are intensively considering new processes. We have multiple options on the table, but all of them are based on the same manufacturing methods that we use now.

### If you don't change the manufacturing process, will you still be adhering to Moore's Law according to which the number of transistors doubles every 18 months?

This law will continue to apply but in additional new formats, such as multichip-modules.



### Why is going from the prototype stage to large-scale commercialisation so complex?

It's a long process. In our case, it takes seven years before a new product goes into production, and that is the result of a close collaboration between companies. It is not possible to simply offer our clients new technology that has not been jointly developed with them.

### What are the most striking innovations when it comes to production?

Currently, NAND 3D technology, which stacks transistors to increase their storage capacity, is very popular. This technology was invented by Toshiba in 1986 but has only been used commercially since 2015. So you see it took

nearly 30 years for this technology to become a real market. Our products are used to manufacture this type of chip. Another trend in the industry is miniaturising production tools. It's a way for us to improve profitability: doing better with less parts results in more compact machines. At Lam Research, which is one of our clients, the newest generation of machines is 50% smaller than the previous generation.

### In recent months, you've simplified the organisation and objectives of your company considerably, particularly by divesting of your ebeam division (non-contact sterilisation of surfaces). Why is that?

The ebeam division was the result of

a joint development with a client (ed. note: Tetra Pak) that began in 2005. It is a very expensive technology that is difficult to build, and 15 years later, we still hadn't achieved mass production. This activity was never profitable for us. It's a business that is feasible for a very large company, such as Tetra Pak, but not for Comet. In our industry, the most successful companies are focused on their speciality. This is something that I was able to see as the vice president of the global semiconductor association. Diversified companies are falling behind, and getting weighed down because companies need to invest so much money and intelligence to be successful that spreading out across business lines just isn't possible. ▽

# CHIP GIANTS

The semiconductor market is primarily dominated by US companies such as Intel, AMD and Nvidia. But lesser-known players from Europe and Asia want to shake up the established order. We feature some of the best.

BY BERTRAND BEAUTÉ AND JULIE ZAUGG

FOUNDED  
1993

HEADQUARTERS  
SANTA CLARA (US)

EMPLOYEES  
13,000

2019 REVENUE  
\$10.92 BN

NVDA

## Nvidia, video game champion

After reaching a record high of \$315 in February, the share price of graphics chip specialist Nvidia dropped to under \$200 in mid-March as a result of the coronavirus crisis. Unfortunately for investors looking for a good deal, shares have already returned to the top, trading at around \$350 at the beginning of June, which is higher than before the pandemic. The US company seems rather well immunised against the coronavirus.

Nvidia generates more than 50% of its revenue from the video game market, an industry that's booming during quarantine. In early April, for example, Nintendo asked its subcontractors to increase the production

volume for its Switch products by 20% to meet the growing demand. The GPUs inside these Switch consoles are none other than Nvidia chips.

**Nvidia generates more than 50% of its revenue from the video game market, an industry that's booming during quarantine**

Beyond the video game market, Nvidia is diversifying even further



NVIDIA

and pursuing various markets such as data centres, supercomputers, autonomous vehicles and artificial intelligence. In December, the company unveiled its new Drive AGX Orin chip designed for autonomous vehicles. A few months earlier, the US company acquired Israeli start-up Mellanox, which specialises in multi-core chips, AI and data centres, for \$6.9 billion.

As a fabless company, Nvidia has TSMC make most of its chips and as a result benefits from the Taiwanese manufacturer's technological advance (see also p. 50). The two companies are currently developing 5 nm GPUs, according to Taiwanese daily *DigiTimes*. This is a natural evolution, since the Nvidia 7 nm graphics cards will be released in 2020.

## AND ALSO...

### SILTRONIC, THE WAFER EXPERT

To manufacture electronic chips, a key ingredient is a raw material: silicon wafers. This industry is dominated by a handful of suppliers: Shin-Etsu and Sumco from Japan, Siltronic from Germany, GlobalWafers from Taiwan, and SK Siltron from South Korea. These five companies control more than 90% of the global market, estimated at \$11.2 billion in 2019. Siltronic, which has a 15% global market share, supplies TSMC and Intel.

FOUNDED: 1968

HEADQUARTERS: MUNICH (DE)

EMPLOYEES: 3,700

2019 REVENUE: € 1.3 BN

WAF

### NXP, THE AUTO PRO

Number two globally in the automotive chip market, Dutch company NXP generates 47% of its sales in this industry, and the remaining 21% in telecoms infrastructure, 18% in industrials and 13% in mobile telephones. In April 2019, the company purchased shares of French start-up Kalray, which develops smart processors for data centres and autonomous vehicles (see also p. 58).

FOUNDED: 2006

HEADQUARTERS: EINDHOVEN (NL)

EMPLOYEES: 31,000

2019 REVENUE: € 8.88 BN

NXPI

### SAMSUNG, THE MEMORY KING

The conglomerate Samsung is a major player in the semiconductor industry. As the second-largest chip buyer globally in 2019 behind Apple, as well as the second-largest producer after Intel, the Korean company primarily produces memory chips, which make up more than 80% of its revenue in the semiconductor industry.

FOUNDED: 1938

HEADQUARTERS: SEOUL (KR)

EMPLOYEES: 310,000

2019 REVENUE: \$190 BN

005930

## Intel, the upset king

And the king reclaims its crown. US giant Intel, which reigned over the chip market from 1992 to 2016, returned to its number one spot atop the semiconductor market in 2019 ahead of Samsung. However, all is not well. In a letter dated 31 March addressed to employees, Intel CEO Bob Swan expressed his disappointment: "We need to ensure that we exceed our customers' expectations and deliver what they need when they need it. Sometimes we failed to do that last year, and that was unacceptable."

**It seems as though Intel has lost ground in the PC and server processor sector, the very industry for which it is renowned**

With \$72 billion in revenue in 2019, up 1.7% over one year, Intel is still doing well. But it seems that the US champion is becoming increasingly outdated. In July 2019, the company definitively left the smartphone market. Despite the billions invested over 15 years, Intel never succeeded in breaking into the industry. It's

a stinging loss at a time where mobile phones are cutting into sales numbers for computer manufacturers, which are Intel's main clients.

But more importantly, it seems as though Intel has lost ground in the PC and server processor sector, the very industry for which it is renowned. While Intel began producing 10 nm semiconductors in March, manufacturers Samsung and TSMC (which produce chips for Intel's competitors AMD, Nvidia and Qualcomm) began producing 5 nm chips in 2020. Intel will not be able to reach a similar performance until 2022 or 2023.

Even Apple, Intel's long-time client, has turned away. According to

Bloomberg reports published on 23 April, Apple will no longer use Intel CPUs in its computers starting in 2021. Rumour has it that Apple will now use AMD processors or its own chips developed using ARM architecture and manufactured by TSMC.

As a result, according to Bob Swan, the PC-focused company must begin an urgent transformation to become more diversified. In 2019, the company generated 52% of its revenue from PCs and 33% from data centres, but only 6% came from memories, 5% from the Internet of Things and 1% from the automotive sector.



Bob Swan, CEO of Intel, during a results presentation on 23 April.

FOUNDED  
1968

HEADQUARTERS  
SANTA CLARA (US)

EMPLOYEES  
110,000

2019 REVENUE  
\$72 BN

INTC

NEWSCOM

## AMD, the feared challenger

Revenge. Historically battered by Intel for microprocessors and by Nvidia for graphics processors, AMD finally turned a profit in 2017 after six consecutive years in the red. Since then, everything has been going smoothly for the US company, whose clients include all the big names in the electronics industry (Amazon, Google, Microsoft), as well as the general public with its graphics cards (GPU) and processors (CPU) for PCs. AMD also equips the next generation of consoles, including the Sony PlayStation 5 and Microsoft's Xbox Series X, which is expected to be on the market by the end-of-year holidays. Its Radeon graphics cards are also used in Apple's Mac Pro computers.

**While Intel manufactures its own products, AMD is happy to simply develop its products as a fabless company**

AMD remains in good shape because the California firm is gaining more and more market share from its rivals as a result of its more powerful products (see

the November 2019 edition of *Swissquote Magazine*). In August 2019 for example, AMD launched the second generation of its Epyc processors for data centres, which are based on 7 nm process technology, whereas competing products from Intel will only move to 10 nm chips in 2020. As a result, AMD was able to sell its Epyc processors to the Microsoft and Amazon Web Services data centres.

To deliver such performance, AMD relies heavily on its partnership with TSMC. While Intel manufactures its own products, AMD is happy to simply develop its products as a fabless company. Production is handled by two manufacturers: US company GlobalFoundries for chips exceeding 7 nm and Taiwanese group TSMC for more powerful products. As a very important client for TSMC, AMD has access to the manufacturer's latest innovations. The California company is expected to be one of the first in the world to benefit from the 5 nm etching in 2021, right after Apple and its A14 Bionic chip that will be used in the iPhone 12 model expected in late 2020.

FOUNDED  
1969

HEADQUARTERS  
SANTA CLARA (US)

EMPLOYEES  
11,000

2019 REVENUE  
\$6.73 BN

AMD

## QUALCOMM, THE 5G LEADER

Already top of the 4G cellular modems sector with a market share of nearly 50%, Qualcomm is a global leader when it comes to 5G chips as well (see also the July 2019 edition of *Swissquote Magazine*). But the drop in smartphone sales as a result of the pandemic could impact the company's bottom line.

FOUNDED: 1985

HEADQUARTERS: SAN DIEGO (US)

EMPLOYEES: 37,000

2019 REVENUE: \$24.3 BN

QCOM

## SK HYNIX, NUMBER TWO IN THE MEMORY MARKET

Despite the pandemic, Korean memory card manufacturer SK Hynix remains positive. The company closed Q1 2020 with \$6.2 billion in revenue, up 4%. These positive figures are due to increased sales of DRAM memories and Nand flash used in data servers, which made up for the sluggish smartphone market.

FOUNDED: 1983

HEADQUARTERS: ICHEON (KR)

EMPLOYEES: 22,000

2019 REVENUE: \$22.48 BN

SKHNY

## TOKYO ELECTRON, FLYING SOLO

The world's third-biggest manufacturer, Japanese group Tokyo Electron hoped to merge with the number-one in the industry – US-based Applied Materials – to create a global giant. But the deal went under in 2015 after US authorities declined the merger. Since then, Tokyo Electron has been on its own. But it's still doing quite well: from 2016 to 2019, revenue increased nearly 100%, going from less than \$6 billion to \$11.5 billion. The company supplies chip manufacturing machines to Samsung, Intel and SK Hynix.

FOUNDED: 1963

HEADQUARTERS: TOKYO (JP)

EMPLOYEES: 13,000

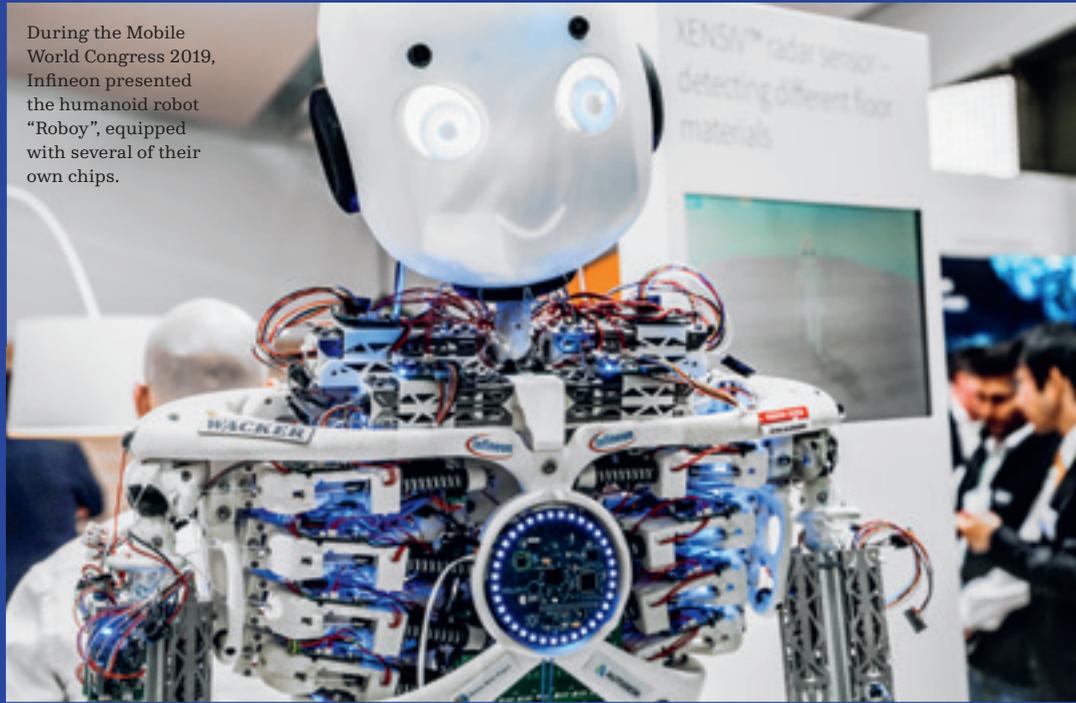
2019 REVENUE: \$11.5 BN

TEL

FOUNDED  
1999HEADQUARTERS  
NEUBIBERG (DE)EMPLOYEES  
41,0002019 REVENUE  
€ 8 BN

IFX

During the Mobile World Congress 2019, Infineon presented the humanoid robot "Roboy", equipped with several of their own chips.



INFINEON

## Infineon, the automotive specialist

Infineon chose a bad time to make the largest acquisition in its history. On 16 April, the German manufacturer (which etches its own chips) announced in the middle of a pandemic that it would acquire US-based Cypress for €9 billion. With this transaction, the Munich industrial company (the result of Siemens selling off its microprocessor business in 1999), has become the largest supplier of automotive chips in the world, ahead of Dutch group NXP and Japanese company Renesas, according to IHS Markit.

energy consumption of industrial machines and cars. For instance, the company supplies chips that control the battery of the Tesla Model 3. While Cypress is known for its Wi-Fi and Bluetooth components that are used in Nintendo's Switch console, as well as infotainment systems in models from Audi, BMW, Mercedes-Benz, Porsche and Tesla.

"Infineon is well-positioned to benefit from the promising automotive sector, which is progressively interested in electronic chips as a result of the increased automation of vehicles and electric motors," said Hugo Paternoster, an analyst specialising in semiconductors at AlphaValue. But the current context is hurting the German company, as the car industry is among the major victims of the COVID-19 crisis. Ratings agency Moody's predicts that this market will decline in 2020 by 21% in Europe, 15% in the United States and 10% in China. This will seriously impact Infineon's profits, as the company made nearly 45% of its revenue from the automotive industry before the merger.

### For instance, the company supplies chips that control the battery of the Tesla Model 3

On paper, the portfolios of the two companies seem very complementary in terms of the automotive sector: Infineon is an expert in powerful electronic components, which regulate the

FOUNDED  
1987HEADQUARTERS  
PLAN-LES-QUATES (CH)EMPLOYEES  
46,0002019 REVENUE  
\$9.56 BN

STM

## STMicro, European patriot

Created from the 1987 merger of Italian group SGS and French company Thomson Semiconducteurs, STMicroelectronics opened its headquarters in Plan-les-Quates, Switzerland, but under Dutch law. A truly European venture. Jean-Marc Chéry defends the company's European roots: "Europe must not lose the chip battle," said the STMicro CEO in 2018 in an interview with French daily newspaper *Le Figaro*. "Keeping this industry and its expertise on our soil is very important."

Ranked the European leader of the semiconductor industry in 2019, STMicroelectronics, which develops and manufactures its own chips, has a few tricks up its sleeve to compete with the US and Asia. The

company has a diversified portfolio with business activity in the automotive sector, smartphones and industry. Its biggest client is none other than Apple, whose iPhones are equipped with several key components from STMicro.

**"Europe must not lose the chip battle. Keeping this industry and its expertise on our soil is very important"**

Jean-Marc Chéry, CEO of STMicro

In the automotive sector, the European company is focused on

producing silicon carbide chips. Compared to traditional silicon which most electronic chips are made from, silicon carbide is used to make components that allow the battery to last longer. These silicon carbide parts can prolong the range of electric and hybrid vehicles. One of the first clients using this technology is US car manufacturer Tesla. Quite a big name.

Alas, the coronavirus crisis has significantly affected the smartphone and automotive industries. In Q1 2020, STMicro generated \$2.23 billion in revenue, which is below its predictions of around \$2.36 billion, and the company is predicting that Q2 will be even worse.

### GIGADEVICE, THE CHINESE FIREBRAND

The Beijing-based firm has entered into a partnership with start-up ChangXin Memory Technologies to produce DRAM memory cards that are used to store data. By late 2020, the two partners plan to produce 40,000 cards per month, which is 3% of the global total. This should cut into sales of South Korean companies Samsung and SK Hynix, as well as US group Micron.

FOUNDED: 2005  
HEADQUARTERS: BEIJING (CN)  
EMPLOYEES: 500  
2019 REVENUE: CHF 452 M  
603986

### MICRON, THE DRAM EXPERT

US company Micron Technology specialises in memory chips, of which it is the third-largest global producer. Specialised in dynamic random-access memory (DRAM) chips often used in PCs and servers, the company could increase its sales during the pandemic. Indeed, analysts expect that cloud players will increase their storage capacities and PC sales will take off again with more people working from home.

FOUNDED: 1978  
HEADQUARTERS: BOISE (US)  
EMPLOYEES: 35,000  
2019 REVENUE: \$23.41 BN  
MU

### AMEC, THE CHINESE EQUIPMENT SUPPLIER

Advanced Micro-Fabrication Equipment (AMEC) is one of the only Chinese manufacturers able to build machines that are used by foundries to produce chips. Sold in the rest of Asia and Europe, these machines can be used to produce the newest generation of chips.

FOUNDED: 2004  
HEADQUARTERS: SHANGHAI (CN)  
EMPLOYEES: 700  
2019 REVENUE: CHF 275 M  
688012

## TSMC, the unknown giant

Despite a global slowdown due to the coronavirus, Taiwanese giant TSMC is still generating staggering profits, almost as though there was no crisis. On 16 April, the company announced that its Q1 2020 revenue was up 42%, reaching \$10.3 billion, and profits increased 90%, compared to the same period last year. While the name TSMC (Taiwan Semiconductor Manufacturing Company) isn't very well-known, its products are nevertheless used in most electronic devices, including tablets, smartphones and cars. In fact, TSMC is the largest semiconductor manufacturer in the world: more than 50% of all electronic chips produced in the world come from TSMC factories.

But proceed with caution: TSMC doesn't sell anything to the general public and doesn't invent anything. As a manufacturer, it is happy to produce chips for other companies, most often fabless companies that don't have their own factories, such as Apple, AMD, Huawei, Broadcom, Qualcomm and Nvidia.

TSMC widely dominates its industry because its fabrication plants are so productive. The Taiwanese company currently produces 7 nm chips and will soon move to a 5 nm version. Comparatively, Intel's US factories can only produce 10 nm chips and GlobalFoundries is only able to produce 12 nm models. Thanks

to its smaller chips – which as a result use less energy and are more powerful – TSMC is far ahead of its competitors. Globally, only Samsung Electronics can keep up with TSMC, but the Korean company specialises in memory chips, whereas TSMC produces more complex products such as graphics processors (GPU) and central processing units (CPU).

**TSMC currently produces 7 nm chips and will soon move to a 5 nm version. Comparatively, Intel's US factories can only produce 10nm chips.**

For Q2 2020, TSMC expects revenue between \$10.1 and \$10.4 billion, compared to \$10.31 billion in Q1 2019. Of course, the smartphone industry, which makes up 50% of its revenue, will decrease in 2020. But this fall will likely be compensated by the deployment of 5G networks, which include many electronic components, as well as by the growth in the cloud computing industry.

A researcher at TSMC, a flagship company of Taiwan. It manufactures 50% of the chips produced globally, including the iPhone processors.



TAIWAN SEMICONDUCTOR MANUFACTURING CO., LTD.

FOUNDED  
1987

HEADQUARTERS  
TAIWAN (TW)

EMPLOYEES  
48,000

2019 REVENUE  
\$35.6 BN

— TSM

## BROADCOM, THE TEMPTATION OF SOFTWARE

Well-known in the semiconductor market, Broadcom (of which 85% of its chips are produced by Taiwanese giant TSMC), is becoming increasingly interested in software. In August 2019, the US company announced that it acquired Symantec, which sells the famous anti-virus software Norton, for \$10.7 billion. One year earlier, Broadcom also acquired CA Technologies, a US business software company, for \$18.9 billion.

FOUNDED: 1961

HEADQUARTERS: SAN JOSE (US)

EMPLOYEES: 19,000

2019 REVENUE: \$22.60 BN

— AVGO

## APPLE, THE KINGMAKER

As the largest global purchaser of chips in 2019 ahead of Samsung, with \$36.1 billion in purchases according to figures from Gartner, Apple has a life-or-death impact on some of its suppliers. And that's not ideal for these suppliers: Apple doesn't hide its ambitions to increasingly internalise the design of its electronic components. Several of its suppliers, including Intel, Qualcomm, Skyworks and STMicroelectronics, have reason to be concerned.

FOUNDED: 1976

HEADQUARTERS: CUPERTINO (US)

EMPLOYEES: 137,000

2019 REVENUE: \$260.17 BN

— AAPL

## TEXAS INSTRUMENTS, FROM CALCULATORS TO SMARTPHONES

Known to the general public for its school calculators (sharing the global market with Casio), US group Texas Instruments is the seventh-largest global producer of electronic chips. The company produces semiconductors for all industries, including the automotive, industrial and smartphone industries.

FOUNDED: 1930

HEADQUARTERS: DALLAS (US)

EMPLOYEES: 30,000

2019 REVENUE: \$14.38 BN

— TXN

## ASML, the Dutch gem

Size is important. To increase the number of components on each processor and therefore increase power, the semiconductor industry has begun miniaturising. In this race, Dutch company ASML, which for years has produced machines used by all the manufacturers (Intel, Samsung, TSMC), has just taken a huge leap forward by developing a lithography process that uses extreme ultraviolet rays (EUV).

**“ASML is quite simply the most important company in the world and no one knows about it”**

Julien Leegenhoek, tech stock analyst at Union Bancaire Privée

In other words, the semiconductor industry is using rays of light to etch circuits that are printed on silicon wafers – a process called lithography. With its EUV process, which began large-scale production in 2019, ASML was able to significantly reduce the wavelength of the ray, or the fineness of the line, therefore progressing from ultraviolet to extreme ultraviolet.

Taiwanese manufacturer TSMC’s ability to launch 5-nanometre chips in 2020 – for comparison, a single hair is between 50,000 and 100,000-nm wide – is in part thanks to EUV machines. But ASML didn’t need EUV technology to stand out. The company has an 85% market share with its less advanced lithography machines and already

supplies these machines to all of the large chip makers. And ASML claims it is the only company on the market with an EUV process.

“ASML is quite simply the most important company in the world and no one knows about it,” effused Julien Leegenhoek, tech stock analyst at Union Bancaire Privée. “If ASML stops, the world will stop. There will be no more chips.” Hugo Paternoster, an analyst that specialises in semiconductors at AlphaValue, agrees: “ASML is a company that really shouldn’t be overlooked. It already has a virtual monopoly on the classic lithography market, and every manufacturer on the planet, if it doesn’t want to fall behind, will need to buy EUV machines.” But these giants – four metres high and eight metres long, weighing 180,000 kilos – don’t come cheap: €120 million per unit.

Manufacturers, however, aren’t put off by the investment, even during a time of crisis: “The demand outlook is currently unchanged,” said the CEO of ASML Peter Wennink on 15 April. In Q1 2020, ASML generated a 9.2% increase over one year in revenue, reaching €2.44 billion, with a gross margin of 45%.

FOUNDED  
1984

HEADQUARTERS  
VELDHOVEN (NL)

EMPLOYEES  
25,000

2019 REVENUE  
€11.8 BN

AMAT

### APPLIED MATERIALS, THE NUMBER ONE EQUIPMENT SUPPLIER

With \$14.61 billion in revenue in 2019, Applied Materials is the leader of the global market for manufacturers that supply machines to chip foundries (TSMC, Intel, Samsung, GlobalFoundries), ahead of Dutch group ASML. But the two leaders aren’t direct competitors. While Applied Materials dominates the market for metal deposition and etching equipment, ASML is the global leader for photolithography machines (see opposite).

FOUNDED: 1967

HEADQUARTERS: SANTA CLARA (US)

EMPLOYEES: 21,000

2019 REVENUE: \$14.61 BN

AMAT

### SMIC, THE CHINESE FOUNDRY

“While SMIC operates the most competitive chip foundry in China, its semiconductors are still several generations behind those produced by TSMC, with much lower production volumes,” Len Jelinek from the consultancy Omdia points out. But most experts believe that SMIC will catch up to its competitors sooner or later, thanks to support from the Chinese government.

FOUNDED: 2000

HEADQUARTERS: SHANGHAI (CN)

EMPLOYEES: 18,000

2019 REVENUE: \$3.116 BN

981

### LAM, THE SHARP SUPPLIER

On 26 February, US company Lam Research, which supplies equipment used to make chips, announced that it partnered with ASML to develop a new metal deposition and chip engraving technology adapted to the EUV lithography process. Lam Research is expected to benefit from the large-scale deployment of EUV machines (see opposite). The company also dominates the industry that processes photosensitive resin used to manufacture chips.

FOUNDED: 1980

HEADQUARTERS: FREMONT (US)

EMPLOYEES: 11,000

2019 REVENUE: \$9.65 BN

LRCX

# WHAT WILL CHIPS OF THE FUTURE LOOK LIKE?

The race to miniaturise electronic components is facing physical and economic roadblocks. In order to increase their power, chips need to be completely reinvented in a historic industrial breakthrough.

BY BERTRAND BEAUTÉ

Here lies Moore’s Law. As manufacturers try to produce ever-smaller electronic components, the semiconductor industry is reaching a limit. “We may be able to reduce the size by another few nanometres, but we can’t go much further than that. We only have 10 or 15 years left maximum with the current model,” says Mihai Adrian Ionescu, a professor at the Nanoelectronic Devices Laboratory at the École polytechnique fédérale de Lausanne (EPFL).

Miniaturisation is up against three obstacles. First: a physical limitation. The size of transistors – a type of switch that transforms an electric current into binary impulses – is getting dangerously close to the size of an atom: at 5 nm, the smallest transistors currently available are only the length of a few dozen silicon atoms laid end to end. And yet at the atomic level, the quantum laws governing the infinitely small replace the laws of traditional physics and disrupt the functioning of the chip.

Second: a thermal issue. Billions of transistors stacked onto each chip result in increasingly untenable thermal output. Third: economics. Moore’s Law allowed for a significant democ-

ratization of electronic devices, because the power of semiconductors increased at a constant price. But now, the cost per mm<sup>2</sup> is increasing faster than the chip’s power as a result of the technology’s growing complexity.

## One by one, industrial players are quitting the race towards miniaturisation

In this context, “following Moore’s Law is no longer possible,” said Jensen Huang, CEO and co-founder of Nvidia, at the 2019 Consumer Electronics Show (CES) in Las Vegas. Of course, this isn’t the first time that the famous law has been declared finished. Others, such as David Ku, CFO of MediaTek, prefer to call it a slowdown rather than a death. But the meaning is the same. Moore’s Law states that the number of transistors etched into a standard chip will double every year at equal cost. This is no longer the case.

To multiply the number and processing power of these small components on a given surface area, the preferred solution was always to reduce the size of the transistors. The first microprocessor, sold by Intel in 1971, held 2,300 transistors that were each 10 micrometres (µm) wide, or 0.001 millimetres. Current generations, such as the Apple A13 Bionic used in the iPhone 11, hold more than 40 billion 7 nm transistors (see infographic on p. 55). As production costs skyrocket, it becomes difficult to push chips even further.

Rock’s Law, which states that the price of semiconductor factories doubles every four years, is in the running to replace Moore’s Law. And the result is that one by one, industrial players are quitting the race towards miniaturisation. In 2018, US company GlobalFoundries, which produces chips for AMD and IBM, and Taiwanese firm UMC, which produces chips for Qualcomm, Infineon and MediaTek, gave up the fight, stopping development of 7 nm products.

IBM, which sold its production business to GlobalFoundries in 2015, Toshiba, and Sony also gave up. As a result, only three companies in the world remain in the running: Intel, Samsung and TSMC. Only the last two will be able to break the 5 nm barrier this year, as Intel is nearly two years behind (see also p. 46). Compared to the 7 nm process, 5 nm technology reduces energy consumption by 20% while increasing performance by 10%, according to Samsung. ▶

“There’s a real debate in the industry about whether or not to continue miniaturisation,” says Julien Leegenhoek, a tech stock analyst at Union Bancaire Privée (UBP). “Some companies, which seem to be behind, are highlighting the fact that they’re developing new higher-performance architectures. Other companies, however, are still trying to miniaturise.” According to their roadmap, TSMC and Samsung hope to begin producing 3 nm chips in 2022. And after that? Intel is hoping to reach 1.4 nm by 2029, but technological breakthroughs would need to occur in order for that to be possible. And an ever-increasing number of companies in the industry believe a rethink of the entire electronics process is more credible.

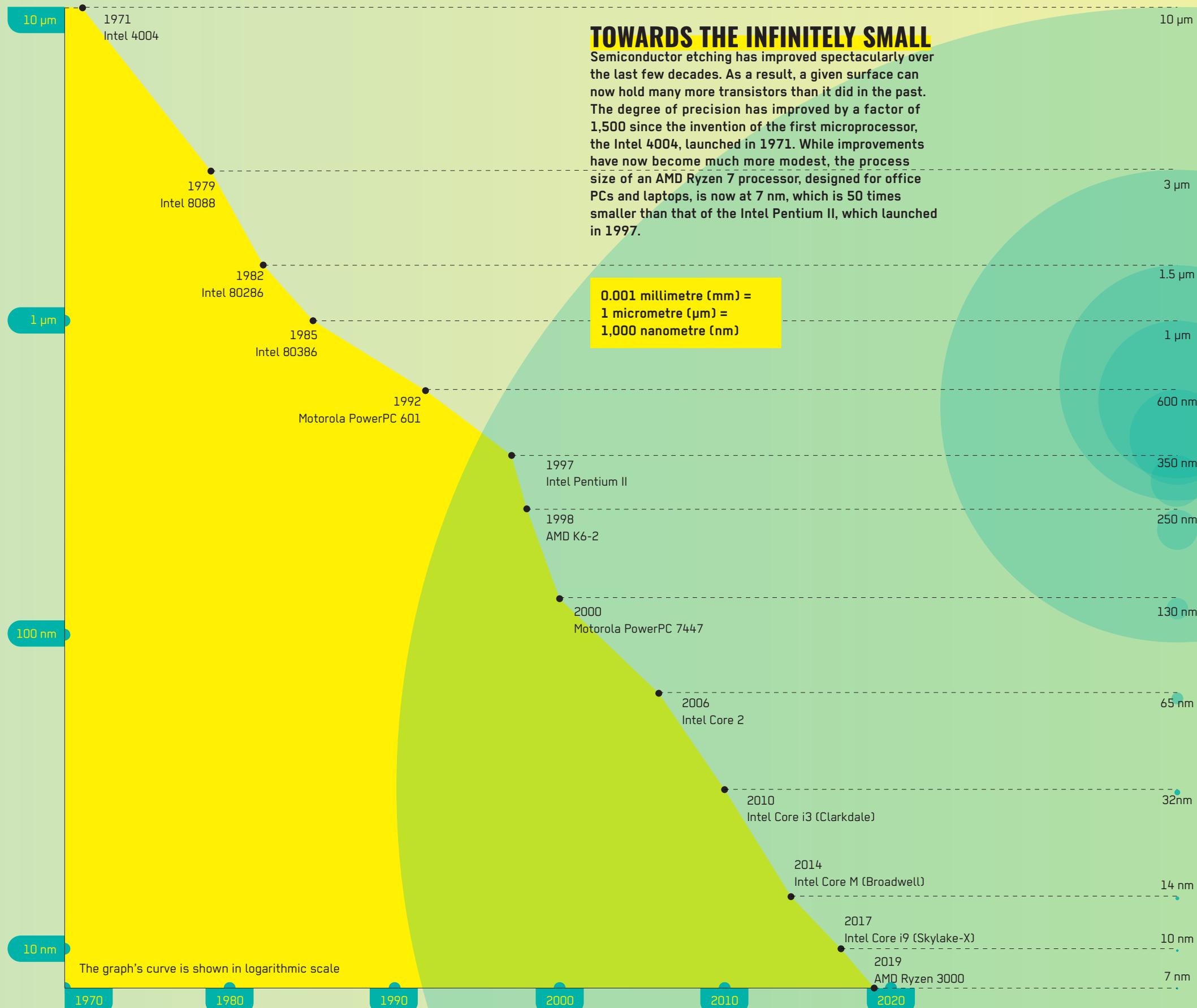
As of March 2016, the International Technology Roadmap for Semiconductors (ITRS), which sets objectives for the entire industry, declared the end of Moore’s Law and launched a new approach called “More than Moore”. Gone is the age when miniaturisation and increased performance were the only goal. Now there are new targets, such as changing the architecture of chips and adapting their capacities to each use case.

“We’re living through a fascinating time. For decades, engineers focused solely on improving a technology that dated back to the 1950s,” says Ionescu from EPFL. “Now they are developing new architectures. Electronics still has a promising future, but it has become an open field once again, one in which everything needs to be created from scratch. When it comes to traditional chips, the United States dominates the processor market and Asia rules the memory market. The paradigm shift that we’re living through is a golden opportunity for Europe to become a leader in the electronics of the future.” To achieve that goal, several approaches have emerged, but none have won a general consensus within the industry. We take a closer look at them. ▶

## TOWARDS THE INFINITELY SMALL

Semiconductor etching has improved spectacularly over the last few decades. As a result, a given surface can now hold many more transistors than it did in the past. The degree of precision has improved by a factor of 1,500 since the invention of the first microprocessor, the Intel 4004, launched in 1971. While improvements have now become much more modest, the process size of an AMD Ryzen 7 processor, designed for office PCs and laptops, is now at 7 nm, which is 50 times smaller than that of the Intel Pentium II, which launched in 1997.

0.001 millimetre (mm) =  
1 micrometre (µm) =  
1,000 nanometre (nm)



## COMPONENTS STACKED HUNDREDS HIGH

Traditionally, chips were constructed as flat surfaces and transistors would be placed on top. To continue to increase the density of the transistors, manufacturers had the idea of building layers of transistors vertically, like floors of a skyscraper. The memory chip industry was the first to try this approach. In 2013, Samsung was the first manufacturer to produce NAND 3D flash chips, named Vertical NAND, by piling 24 layers of transistors on top of each other. Seven years on, products from the Korean conglomerate and its competitor SK Hynix now have 128 layers, allowing storage capacity of 1,000 gigabits. And SK Hynix doesn't plan to stop there: it's already working on the next generation with 176 layers. But what works for memory chips isn't necessarily possible for microprocessors.

LARRY LEUNG/FEATURECHINA/NEWS.COM



On May 27, 2017, Google's AI system, AlphaGo, defeated Ke Jie, the world's Go champion.

According to the article, for the first time, the company was able to perform a calculation much faster than with traditional supercomputers. It only took three minutes and twenty seconds for Google's quantum processor to solve an extremely complex calculation, whereas it would have taken the most advanced computers currently available 10,000 years to do so. Was it a marketing ploy? IBM quickly countered the article, putting Google's advance into perspective. In a note published on its blog, Big Blue said it successfully completed the calculation in question in only two and a half days with a traditional computer. This back-and-forth is proof that the quantum computer war is well under way. All the big names, such as IBM, Google and Intel, are working on this technology, which was long confined to the depths of research labs.

Imagined in the early 1980s by Richard Feynman, winner of the Nobel Prize for Physics, quantum computers will revolutionise computing. In regular chips, information is encoded in the form of bits that take one of two values – 0 or 1 – based on whether or not there is an electric current passing through a transistor. Conversely, quantum bits (or qubits) can take both 0 and 1 simultaneously. It is due to this strange property that quantum computers are incredibly fast, making them the holy grail when it comes to processing gigantic calculations.

But don't expect to have one in your home. In order to function, quantum chips need to be kept at extremely cold temperatures close to absolute zero (-273°C). "We imagine that quantum computers will remain in the cloud and there will be a sort of quantum internet available so that everyone can benefit from this extraordinary computing power," says Ionescu, a professor at EPFL. "But we're still very far from that. We still need at least 20 or 30 years of research." ▲

"The big problem is heat dispersion," says Mihai Adrian Ionescu, a professor at EPFL. "Memory only consumes electrical current when data is being read from or written to the chip. So heat is produced only sporadically, and it's not that much. Microprocessors, on the other hand, generate a lot of heat."

Intel seems to have found a way around that. Its Lakefield microprocessor, of which a prototype was presented in 2019, has five cores with a 10 nm process: one core is used for increased performance while the others are energy-saving. This is the first microprocessor of its kind in the world. It will be used in Microsoft's Surface Neo tablets, which were supposed to launch in late 2020 but could be pushed back a few months due to the global pandemic. "It's an intermediary step," says Ionescu. "The real objective is to produce heterogeneous 3D chips, which include memory, processing circuits and radio-frequency components. In the next

five years, this type of product is expected to be on the market."

## FLEXIBLE AND ROLLABLE CHIPS

Embedding microchips into fabrics and other clothing has been on the horizon for several years. The sport and health industries have already begun working on this concept, with sensors of all kinds that can track performance or physical constants. But the ultimate objective is for these chips to be flexible so that they can be embedded in the clothing itself.

In 2011, for example, the Laboratory of Nanoscale Electronics and Structures (LANES) at EPFL was able to create the first chip made of molybdenite, a material that exceeds the physical limits of silicon in terms of consumption and mechanical flexibility. According to EPFL, molybdenite could be used to create computers or devices that can be rolled up and applied to the skin.

But these chips still need to be fully developed, and a source of energy that does not require batteries needs to be found. How? The laboratory is investigating the use of energy available in the environment: movement, heat and sun exposure. "In the next five to 10 years, we'll likely see flexible chips on the market," says Ionescu.

## COMPONENTS INSPIRED BY THE BRAIN

Artificial intelligence (AI) is at the heart of every discussion. While cloud giants are already proposing AI solutions, the real revolution could come from neuromorphic chips. "We're trying to imitate the human brain as much as possible, particularly the decision-making and learning processes," explains Ionescu of EPFL. Despite its limited capacities, the human brain is actually very capable of learning to complete certain tasks, such as detecting and identifying the same

object in many different videos. While current artificial intelligence systems can also complete such a task, as they can categorise massive amounts of data, they also use extremely large amounts of energy, which means they have to go through the cloud in order to reach their full power.

For example, AlphaGo, Google's AI that crushed all the top Go champions in 2017, consumes ten thousand times more energy than a human does when playing the same board game, according to the CNRS. The reason is the separation of the memory and processing cores. To solve this problem, the industry is trying to produce artificial neurons where each has its own memory and computing system. Electronics giants are keenly aware of current systems' limitations, and IBM, Intel, Qualcomm and Samsung are looking to develop their own neuromorphic chip. In March 2020, for example, Intel announced that it had completed its Pohoiki Springs platform, built

from 768 Loihi neuromorphic chips, which imitates the functioning of 100 million neurons – the equivalent of the brain of a small rodent. According to Intel, the system consumes less than 500 watts of energy, whereas a standard office computer uses approximately 200 watts per hour.

The company will use Pohoiki Springs for automatic learning applications, including a possible insight into the spread of coronavirus. But the US group cautions that the technology is still in the research phase and isn't designed to replace conventional computing systems at this stage.

## QUANTUM COMPUTERS: THE HOLY GRAIL

The news made headlines. On October 2019, Google published an article in the prestigious scientific journal *Nature* about the extraordinary performance of its quantum computer.

An engineer by training, Éric Baissus spent eight years at Texas Instruments. In 2002, he founded the start-up Open-Plug, which he led until it was acquired by Alcatel-Lucent in 2010. He became CEO of Kalray in 2014.

INTERVIEW

## “AI NEEDS SMART CHIPS”

French pioneer Kalray develops smart processors for data centres and autonomous vehicles. We interview its CEO, Éric Baissus.

BY BERTRAND BEAUTÉ

KALRAY

**A**rtificial intelligence is a gold mine for the semiconductor industry. According to consultancy firm IHS Markit, the sector will triple in size over the next six years to reach \$128.9 billion in 2025, compared to \$42.8 billion in 2019. Thus far, the market is primarily split between two players: Intel and Nvidia. But these two companies are being increasingly challenged by other established ones such as AMD, as well as by a swarm of start-ups that have innovative technologies of their own. One of the newcomers up against the American old guard is French start-up Kalray, which is making bold moves. After 10 years of research and development, in 2020, the company is beginning production of its Coolidge processor, designed for smart data centres and the next generation of vehicles. We interview Kalray's CEO, Éric Baissus.

**How can a small French company like Kalray compete with US giants?**

Small companies can sometimes advance faster than larger ones. Especially since artificial intelligence is completely reinventing the semiconductor market. This opens up the door for newcomers, that have disruptive technologies, to go further than well-established players. Remember, in the early 2000s, Intel was the king of processors. And then came smartphones. Despite its power and technological advance, Intel completely missed that opportunity and UK start-up ARM took over the smartphone market. Artificial intelligence will lead to a disruption in the semiconductor industry similar to what we saw with smartphones. For the time being, no one knows who will lead this giant market.

**Like ARM, Kalray doesn't have production sites. Why did you decide to outsource your production to Taiwanese company TSMC rather than manufacture your own chips?**

It's a question of having 10 billion dollars. Now, everyone in the high-performance processor industry is fabless, because building a manufacturing plant for powerful electronic chips is extremely expensive and you need immense volumes to make it profitable.

**A self-driving car produces a gigabyte (GB) of data per second that needs to be analysed very quickly**

For small companies like ours, the fabless model is a considerable advantage. We can rapidly generate revenue without a massive investment in production tools. Currently, our chips are produced by TSMC, which is the largest chip manufacturer in the world, but we could also turn to Samsung or GlobalFoundries. There are also initiatives to develop production capacities in Europe and we're actively participating in those.

**You are developing "smart" chips. How are those different from chips that are already on the market?**

Smart systems need to process a massive amount of data in order to make critical decisions in real time. A self-driving car, for example, produces a gigabyte (GB) of data per

second that needs to be analysed very quickly in order to decide what to do next, such as accelerate, turn or brake. But current artificial intelligence algorithms use a lot of energy and computer processors aren't built to process such a large amount of information so quickly. So there's a real demand for smart chips that are truly built for the demands of AI, meaning they are both very powerful and energy-efficient.

Kalray is one of the pioneers in this field. For more than 10 years, we've been developing a new type of chip, a Massively Parallel Processor Array (MPPA). This technology is called "manycore". Our Coolidge processor, which we are currently rolling out to our clients, has 80 cores which can process 25,000 billion operations per second, with an energy consumption of only 5 to 25 watts (which ranks it at the same performance level as the Jetson Xavier processor from Nvidia, which is a leader in the field). As a comparison, a desktop computer has four cores and consumes about 100 watts of energy. With our product, we are targeting two markets: smart data centres and the next generations of vehicles, particularly smart vehicles.

**Why would you increase the number of cores in a processor?**

It's a bit like putting multiple engines in a car. Fifteen years ago, semiconductor manufacturers only looked at the clock frequency, that is, the speed at which the engine runs. But they reached a limit: beyond 3.5 to 4 GHz, processors overheated. To solve this problem, manufacturers reworked the architecture of their chips to accommodate several cores, allowing each core to run at a lower frequency. The latest smartphones, ▶

for example, contain up to eight cores. But there's a glass ceiling in the industry: besides Nvidia, not many companies know how to manufacture products that can have up to 50 cores. At Kalray, we have exceeded that limit.

#### Who are your competitors?

Mainly the traditional companies in the semiconductor industry. For data centres, it's US companies Broadcom and Intel, as well as Israeli group Mellanox, which was acquired in 2019 by Nvidia for \$6.9 billion. For cars, we're an alternative to Nvidia, which is the market leader when it comes to artificial intelligence used in vehicles.

#### Kalray chips are etched using a 16 nm process, whereas your competitors like Nvidia are already at 7 nm. Isn't that an issue?

There is a movement in the industry towards increasingly smaller transistors, because that improves performance. As a result, 7 nm chips are 30-35% more powerful than 16 nm chips, with 25% less energy consumption. We're also following the miniaturisation movement, but we're not in the first wave. Our 7 nm processors will be available in 18 months. This delay allows us to use proven technologies that are less expensive. In terms of the performance difference, our manycore technology makes up for it.

#### The automotive sector is particularly affected by the pandemic. Does that call your forecasts for that industry into question?

It is likely that the car industry will be impacted in the short term. But since our automotive sector outlooks are designed for the medium- and long-term, they won't necessarily be affected by the crisis – especially since we've always been very careful and conservative in our projections. For Kalray, the automotive industry is a strategic market that creates a lot of value, but we were estimating



The Coolidge processor can process 25,000 billion operations per second.

before the pandemic that we wouldn't generate significant revenue in the industry before 2023 or 2024. This perspective remains unchanged and we continue to work with the Renault-Nissan-Mitsubishi Alliance, which is one of our shareholders, as well as about 10 top players in the automotive industry.

For example, the autonomous vehicle prototype Symbioz, developed by Renault, uses our processors. Revenue from our chips being used in prototypes is limited, of course. But when our clients begin production, this will represent several hundreds of millions in potential revenue each year.

#### And what about data centres?

With the massive adoption of rapid storage memories, data centres will have an absolutely enormous need for computing power and artificial intelligence over the next few years. It's a new market that is beginning to emerge and will take off, generating approximately €1 billion in 2022. Our goal is to become an industry leader, with a market share of 10% in 2022, meaning €100 million in revenue. We're already working with server

manufacturers such as Taiwanese company Wistron, which is one of the largest producers in the world, as well as French company 2CRSi.

#### In February, the European Union presented a white paper with its recommendations to preserve its sovereignty regarding artificial intelligence. Why is that important?

In the future, many critical systems will be based on artificial intelligence – self-driving cars, of course, but also defence and nuclear power plants. It's an extremely sensitive area because AI makes decisions for you. So what happens if a supplier country, for example, no longer wants to sell its technologies to another country? All of that country's strategic activities will be impacted. So it's critical that the European Union maintains its sovereignty in terms of artificial intelligence.

#### On 2 April, in the middle of the pandemic, Dutch group NXP invested in Kalray. Did you need liquidity to make it through the crisis?

Having a significant cash flow is obviously positive, and it provides secu-

rity in these unstable times. But our financial situation didn't require it. The investment from the NXP group, which is now a shareholder alongside other large companies such as the Renault-Nissan-Mitsubishi Alliance and the Safran Group, proves that NXP is very interested in our processors.

For us, in terms of credibility, it's a major announcement: when a company that's been known for years in the automotive chip field, with €8.8 billion in revenue, invests in your company, that means your technology really is relevant. It's also important for our business, because in partnership with NXP, we're going to develop a shared solution to deploy our technology in the automotive market.

#### With NXP's investment, Kalray is now valued at approximately €80 million. In your opinion, is that a fair price for the company?

This valuation was calculated using the average share price in the days leading up to the transaction. Without offering too many thoughts on the development of our valuation, I of course believe that in the medium-term, Kalray could be worth much more if we achieve our ambition of becoming the global leader in processors for new smart storage servers. ▽

FOUNDED  
2008

HEADQUARTERS  
MONTBONNOT-  
SAINT-MARTIN (FR)

EMPLOYEES  
70

2019 REVENUE  
€1.27 MILLION

ALKAL

## KALRAY: THE POWER OF CORES

Founded in 2008, Kalray went public in June 2018. The company, which develops multicore smart processors, is up-and-coming in the growing edge computing market, by targeting two specific sectors: smart data centres and autonomous vehicles. "In these two fields, I think that Kalray is well-positioned to be a major player in the years to come," says Éric Baissus, CEO of the young company.

In 2017, nearly 99% of hardware dedicated to artificial intelligence was concentrated in the cloud. But the proliferation of sensors in everyday products is changing the landscape. This trend will lead to a decentralisation of smart systems in edge computing. As a result, AI will be included in products such as cars, healthcare devices and industrial machines, but also in new types of data centres that are located closer to the data sources.

"With the emergence of cloud computing, the artificial intel-

ligence market will fragment, as CPUs and GPUs aren't the most efficient hardware for this activity," says Frédéric Yoboué, an analyst at Bryan, Garnier & Co. "Several start-ups, which develop chips specifically for this type of application, could gain market share in some specific segments, such as UK company Graphcore, Israeli business Habana (acquired by Intel) and French firm Kalray."

While it's difficult to say who will come out on top, Yoboué says: "Kalray can count on its strategic partners, such as NXP, Renault and the Chinese internet giant Baidu, as it takes its first steps into the edge computing market."

After 10 years of research and development, the French company is starting to produce and roll out its products to its clients this year. Kalray is targeting 100 million in revenue in 2022. All of the financial analysts that follow Kalray recommend purchasing shares.



Presented at the 2017 Frankfurt Motor Show, the Renault Symbioz concept car is operated by Kalray processors.

# CHINA DREAMS OF BECOMING A SEMICONDUCTOR GIANT

Still feeling the sting of US sanctions, Beijing has set its sights on developing its own electronic chip industry. This daunting and costly endeavour is now starting to produce results.

BY JULIE ZAUGG IN HONG KONG

China may have become the world's factory for new technology, but the country is still struggling to make a name for itself in one sector: electronic chips. "Only 16% of semiconductors used in China are produced domestically," says Piero Scaruffi, a Silicon Valley historian. "The rest is imported." In 2018, this dependence cost China \$312 billion.

Beijing has wanted to balance that trade deficit for a long time. "Developing a domestic chip industry has been one of the Chinese government's priorities for at least a decade," says Len Jelinek, a semiconductor expert with the consulting firm Omdia. In 2014, Beijing set up a \$150 billion fund to invest in the semiconductor industry. The Made in China 2025 Plan launched in 2015 established specific targets: under the plan, the country would produce 40% of its chips by 2020 and 70% by 2025.

But the real turning point came on 16 April 2018. On that day, the United States banned American companies from selling their chips to ZTE, one of China's leading telecommunications groups, which is accused of exporting hardware to Iran. Heavily reliant on US-made computer chips, ZTE suddenly found itself in a chokehold.

"That's when Chinese companies became aware that their access to

US technology could be cut off with a snap of the fingers, particularly regarding semiconductors," says Jeffrey Towson, an American expert on Chinese technology. "That realisation convinced the Chinese government to develop its own semiconductor manufacturing chain to reduce its reliance on the United States."

**In October 2019, China created another \$29 billion fund devoted to semiconductors**

National efforts became even more urgent in 2019 when Washington stiffened its sanctions, banning US companies from selling their products to dozens of Chinese firms, including the tech giant Huawei. Economic disaster began to loom, as chips are essential in order to produce Huawei smartphones, IT servers and electric cars, which China mass produces. The next step came in October 2019, when China created another \$29 billion fund devoted to semiconductors.

Chinese strategy is focused on two main pillars. First, it aims to create national champions from the private sector by offering subsidies, tax rebates and low-interest loans.

This move has brought several promising firms to the fore, such as SMIC, HiSilicon (a Huawei subsidiary) and the Yangtze Memory Technologies group (see features on p. 44 and onwards). Alibaba, Tencent and the Gree group, the world's largest air conditioning manufacturer, have also assembled in-house initiatives to produce semiconductors.

The second pillar in China's strategy is acquiring expertise. At the end of 2019, the Shanghai-based firm Wingtech Technology bought the Dutch semiconductor manufacturer Nexperia. Before that, in 2018, the Beijing conglomerate Tsinghua Unigroup bought the French chip component producer Linxens. Beijing also managed to attract Korean groups Samsung and SK Hynix, US companies Intel and Global Foundries, and Taiwanese firms TSMC and UMC. All have set up joint ventures or opened plants in China.

Thanks to this massive investment, China is starting to catch up with its American competitors. "In terms of chip design, China is only 12 months behind," says Malcolm Penn, who heads the consulting firm Future Horizons. HiSilicon's Kirin chips, which now feature in some Huawei smartphones, are some of the best around. Alibaba also unveiled its Hanguang 800 chip in September 2019. The test platform MLPerf, known for its objective industry benchmarks, says the ▶

Hanguang 800 outperforms Intel and Nvidia products.

Although China has begun designing chips to rival US products, they cannot yet be manufactured in the country. For example, the Hanguang 800 chip is built by the Taiwanese foundry TSMC, which produces almost 50% of the chips ordered worldwide, including for Apple and Huawei.

In comparison, SMIC, China's largest semiconductor maker, has only recently begun manufacturing 14-nanometre chips, while TSMC has launched production of 5-nanometre chips. "SMIC's semiconductors are always several generations behind those produced by TSMC, with much lower production volumes on top of it," Len Jelinek from the consultancy Omdia points out.

Jeffrey Towson agrees: "Developing a state-of-the-art plant is extraordinarily expensive and requires technical expertise that China doesn't have." TSMC's latest production plant cost \$17 billion.

But price isn't the only problem. More importantly, China lacks the manufacturers. "The highly complex machines used to produce chips are built by a handful of firms in the United States, the Netherlands and Japan," says Scaruffi, Silicon Valley historian. And those manufacturers tend to focus on their long-standing customers, like Samsung, TSMC and Global Foundries, which currently dominate their revenue base.

Exacerbating matters, the Trump administration is doing everything it can to make sure China can't acquire the best machines for its plants. In 2019, it pushed the Dutch group ASML to cancel the sale of one of its photolithography machines to SMIC.

China's workaround is to invest in the memory chip market, which is more accessible than the processor and graphics card markets. "Memory chips are relatively easy to produce on a large scale, and that's an advantage for firms serving a vast market like China," Penn says. Chinese companies Yangtze Memory Technologies and ChangXin Memory Technologies

are on the verge of launching mass production of these units and are expected to generate between 3% and 5% of global production by the end of the year.

"China also has an ace up its sleeve in the form of more basic chips for low-end smartphones and smart appliances that use Internet of Things technology," says Towson. Chinese manufacturer Gree released its first air conditioners fitted with self-produced chips in June last year. Meanwhile, Unisoc, a subsidiary of Tsinghua Unigroup, has become world leader in chips for smartphones in the under-\$100 range.

But Beijing has higher ambitions. "China wants to lead chip design for artificial intelligence," Towson says. "Because this is a new area, no manufacturing standards have been set." This virgin territory is a perfect place for new players to emerge (see p. 58). "The debate isn't about whether China will eventually dominate the chip industry," Towson adds, "but whether the reversal of fortune will take place in three years or ten." ▲

Richard Yu, CEO of Huawei's consumer division, at the presentation of the group's new 5G chip on 6 September, 2019 at the IFA in Berlin. Deprived of US chips, China has increased its investments to become technologically independent.



## TO READ, TO DOWNLOAD



Currency Press,  
2019  
CHF 20.-

### DON'T BE EVIL: HOW BIG TECH BETRAYED ITS FOUNDING PRINCIPLES — AND ALL OF US

By Rana Foroohar

"Don't be evil": this saying from Google's early beginnings promised a radiant future in which technology would inevitably make the world a better, safer and smarter place. Twenty-odd years later, we are now faced with digital surveillance, erasure of private life and the emergence of fake news, and our reality seems quite far from the utopia that was first predicted. Rana Foroohar, an American journalist specialising in new technologies who writes for the *Financial Times*, describes how we've arrived at this point and the ways in which we can still resist.

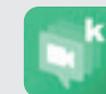


W.W. Norton Company,  
2020  
CHF 30.-

### AMERICAN OLIGARCHS: THE KUSHNERS, THE TRUMPS, AND THE MARRIAGE OF MONEY AND POWER

By Andrea Bernstein

In *American Oligarchs*, investigative journalist Andrea Bernstein delves into the saga of the Trump and Kushner families. Based on hundreds of interviews and more than 100,000 original documents, the author meticulously retraces the recent history of these two families, from their arrival in the United States to their rise to supreme power. A fascinating book that reads like a novel, shedding raw light on the inner workings of this new American oligarchy.



App Store,  
Google Play  
Free

### INFOMANIAK MEET THE ETHICAL SKYPE

Developed by the Geneva-based hosting provider Infomaniak, Infomaniak Meet is a completely free video conferencing app that hopes to be an "alternative to US solutions" such as Zoom, Skype and Google Hangouts. Infomaniak Meet is based on the open-source software Jitsi Meet. The data exchanged on the platform are encrypted and transit through Infomaniak's data centres in Switzerland.



App Store,  
Google Play  
Free, in-app  
purchases

### PLAGUE INC A VERY CURRENT SIMULATION

Plague Inc. has seen its popularity explode since the emergence of COVID-19. In the game, players can simulate the spread of a disease around the world which can eradicate the entire human population, while thwarting the attempts of unfortunate victims to find a cure in time...



App Store,  
Google Play  
Free

### CORONA SCIENCE FIGHT THE NEW CORONAVIRUS

Developed by Bern University of Applied Sciences and the Midata cooperative, the Corona Science app aims to gather as much COVID-19-related data as possible on the Swiss population in order to advance scientific knowledge. Anyone, regardless of whether or not they have had the virus, is invited to supply personal data which are then processed anonymously and made available to researchers on an open-source platform.



Google Play  
Free, in-app  
purchases

### FOOTEJ CAMERA 2 AN EMBEDDED CAMERA ASSISTANT

Footej Camera had already made a name for itself among the Android camera apps thanks to its simple interface and range of options. This second version includes all the professional quality tools that made its predecessor so successful, such as manual ISO selection, captures in RAW format, and HDR+ support on compatible devices.

# ETSY

## crafts boom thanks to the coronavirus effect

GEOFFROY VAN DER HASSELT / AFP

The Brooklyn-based e-commerce platform is one of the biggest stock market winners during the pandemic. Here's the story.

BY ANGÉLIQUE MOUNIER-KUHN

**E**tsy is the latest Wall Street wonder: part tech stock, part vintage and handmade knick-knacks. Could it be a metaphor for the post-pandemic world? Created in 2005 by amateur cabinetmaker Robert Kalyn and two of his friends in Brooklyn, the e-commerce platform is now home to a community of 2.7 million creatives of all kinds who sell their products, and more than 47 million buyers of handmade or vintage items. Jewellery, accessories, crafts, gift ideas, furniture, clothing – you can find a little bit of everything on Etsy, from the sleekly designed to the unapologetically kitsch. In 2019, the company, which has over 1,200 employees, made sales of \$5 billion in gross value of goods, up 26.5% compared to the previous year.

But Etsy, listed on the Nasdaq since 2015, struggled to capture the interest of investors in recent years. After fluctuating, its share price reached its lowest in two years in March, coming in at under \$30. But then came an announcement from US President Donald Trump that reversed the trend: since then, Etsy jumped nearly 69% in April, compared to 15.4% for the Nasdaq Composite index, and the home-made craft empire is one of the biggest winners of the COVID-19 crisis. On 3 April, based on advice given by the CDC (US federal health agency), the White House recommended for the first time that Americans wear cloth masks to slow the spread of the virus. Cloth masks were suggested due to an insufficient supply of surgical masks.

“This is voluntary,” said the US president immediately. “I don’t think I’m going to be doing it.” But at Etsy, the starting gun had already been fired. “Calling all sellers: start making masks,” said the notification sent to all vendors on the site. “The Etsy community is uniquely positioned to address this crucial need during a global health crisis,” said CEO Josh Silverman in a release.

Most of the United States is under stay-at-home orders and given the soaring unemployment rate, there is hardly a lack of labour. More than 60,000 people answered the call and started up their sewing machines. Etsy quickly reconfigured its search engine to showcase the masks. As a result, Etsy sold more than 12 million handmade masks in April – worth \$133 million – and brought in four million new customers. Even better, non-mask sales were up 79%, as the traffic brought in by the masks benefited the rest of the site.

**More than 60,000 people started up their sewing machines**

Early fans of the platform often lament that the company, which once promoted friendliness and internal consensus, has lost its soul over the years as CEOs came and went. But on paper, Etsy’s mission remains the same: “Keep commerce human”, which means allowing creatives to

### ANALYST ADVICE

#### “FAVOURABLE WINDS”

In a research note published on 7 May, the New York broker Oppenheimer revised its rating on Etsy shares to “outperform” and increased its price target from \$52 to \$85. “COVID-19 has transformed adverse conditions into favourable winds for Etsy, and the platform was able to gain new customers and re-engage old ones,” said the analyst, who commends the company for capitalising on this windfall to strengthen its marketing efforts. But it does point out that the macroeconomic slowdown could spread to Etsy sales, as the products sold on the platform are essentially discretionary goods. With the exception of masks, of course.

profit from their production in a sustainable, responsible way. This is the opposite of the “mass market” approach taken by competitor e-commerce platforms, which have also benefited from the health crisis.

“The masks are an excellent example of the capacity of this platform and its sellers to meet a demand for necessary equipment, which grows its potential market,” says Tom Forte, an analyst at DA Davidson. According to Forte, who has followed the company for a long time, this “is one of the best achievements in Etsy’s history”. Of course, this now drives up its earnings outlook. In early May, Etsy revised its predictions upwards for Q2, predicting between \$310 and \$340 million in revenue (an increase of 70%–90% over one year) compared to the \$213 million expected by analysts. ↙ ↘ ETSY

# MADE IN CHINA - THE COOLEST OF LABELS

Chinese consumers love their home-grown products. Some fashion brands, such as Li-Ning and Peacebird, have become cult classics and are starting to expand abroad. We take a closer look.

BY JULIE ZAUGG

Last October, fashion models took to the catwalk of the Hôtel Salomon de Rothschild in the heart of Paris to strut their stuff amid a frenzy of camera flashes. They wore oversized trench coats, luxurious down jackets and sleek schoolgirl dresses. The fashion show, named “China Cool”, was organised by the Chinese e-commerce platform Tmall. The purpose of the event was to present a series of Chinese fashion brands that have become cult favourites in their home country.

“Made in China” can no longer be associated with cheap, poor-quality products. In recent years, China has seen the emergence of brands that have as much (if not more as far as Chinese consumers are concerned) cachet as their Western inspirers.

“It started around a decade ago, with the arrival of Chinese designers who had trained at leading European or American fashion schools, such as Masha Ma and Huishan Zhang,” explains Babette Radclyffe-Thomas, an expert in Chinese fashion. “Then over the past three years, ‘cool’ consumer brands have appeared.”

Some have only just emerged, such as the Perfect Diary cosmetics group founded in 2017. Others are established fashion houses that have skilfully reinvented themselves, an example being the sportswear manufacturer Li-Ning.

These brands have various identities. Fashion labels like Peacebird, Bosideng and Urban Revivo mix the codes of fast fashion, typical of places such as Zara, with traditional Chinese motifs. Meanwhile, Roaringwild, Hi Panda and Wookong, three brands created less than 10 years ago, have taken inspiration from streetwear.

“More recently, we have seen the arrival of names that play on retro imagery, a first in China where people generally look to the future,” says Dao Nguyen, founder of the consulting firm Essenzia. This can be seen in Li-Ning’s ‘80s-style trainers, the modernisation of Pechoin cosmetics, White Rabbit candies, and soaps from The Shanghai Soap Co., all brands created before the advent of the People’s Republic of China in 1949.

## Androgynous cosmetics

In the field of cosmetics, “successful brands have adopted the androgynous codes of the video game and cosplay platform Bilibili, extremely popular among China’s

Generation Z,” notes Elijah Whaley, a specialist in Chinese digital marketing at the Park Lu agency. In addition to Perfect Diary, the brands Kaleidos and Hedone are following this aesthetic inspired by the world of manga.

This new Chinese wave came about after a major societal change. “The generation that grew up in the ‘80s and ‘90s, the one that rebuilt the country after the Cultural Revolution and transformed China into the ‘workshop of the world’, is starting to give way to a cohort of younger consumers, who are familiar with global trends and want to see their country stand out on the international scene,” says Nguyen. >

MARECHAL AUIRORE / ABACA / NEWSCOM



A model wearing Chinese brand Masha Ma, during Paris Fashion Week fall/winter 2018/2019.

This patriotism has completely transformed the perception of the “Made in China” label. “The term is no longer associated with poor-quality or old-fashioned goods, not at all,” notes Janet Tsai, a specialist in Chinese brands at the firm Ogilvy. “Alongside this, Western brands have lost some of their prestige among Chinese consumers.”

Moreover, Chinese brands have the added advantage of having an in-depth knowledge of local trends and preferences. “A Chinese cosmetics brand is not going to market a line of lipsticks with purplish or bluish shades: they simply do not work with an Asian complexion,” notes Babette Radclyffe-Thomas.

Similarly, fashion designers can use the data gathered by e-commerce platforms such as Tmall – which represents their main sales channel – to analyse the products that work best and adapt their next collection accordingly.

Most of these brands have also turned to community marketing, which is very popular with young Chinese consumers. They are present on social networks like WeChat, invest in streaming platforms such as TikTok, and establish partnerships with “influencers” who will promote their products.

Some go even further. “Perfect Diary has created a virtual avatar called

Xiao Wanzi, which invites consumers to join private chat rooms where they are presented with exclusive products, given make-up tips, and offered special promotions,” explains Whaley. “It is a sort of personalised marketing that guarantees consumer loyalty,” he adds

**“These brands don’t really need to export... the Chinese market is already large enough”**

Babette Radclyffe-Thomas, expert in Chinese fashion

Meanwhile, Peacebird, Urban Revivo and Perfect Diary are targeting the Asian market, with shops and online sales channels set to open in Singapore, Malaysia, Thailand and South Korea.

However, as Radclyffe-Thomas points out, these brands don’t really need to export: “The Chinese market is already large enough”. According to market research company eMarketer, by 2021, China will have replaced the United States as the largest consumer market in the world, with sales equivalent to \$5,800 billion. ▲

Milk candies from White Rabbit, a brand, a brand founded in 1943, have been successfully updated. Here a store in the city of Xi’an, in Shaanxi province (2019).



TIAN DONGHAI / IMAGINECHINA / IMAGINECHINA VIA AFP



BARRY HUANG / REUTERS

Dwayne Wade at a promotional event with sportswear brand Li-Ning in Beijing. The iconic Miami Heats NBA player, who retired this year, will have helped to make the brand more popular in the United States.

### Expanding to New York and Paris

Although holding a strong position in their domestic market, Chinese brands are struggling to establish themselves abroad, the negative image of “Made in China” proving difficult to shake. This was made clear by the Bosideng clothing company, which ventured to London and New York a few years ago. “Its shops were unsuccessful because Western consumers had not heard of the brand and the French Moncler was already well established on the luxury down jacket market,” says Radclyffe-Thomas. The New York outlet thus closed in 2016.

Li-Ning, on the other hand, is starting to gain attention outside of China, thanks in particular to collaborations with the American basketball player Dwyane Wade and the Berlin design firm Random Identities. Its products are now sold in a handful of specialised outlets in London, New York and Paris.

#### LI-NING

##### THE STAR OF SPORTSWEAR

Named after its founder, a gymnast and Olympic medallist, Li-Ning was created in 1989. “It was long considered a cheap sportswear brand lacking in technology,” notes Dao Nguyen, founder of the consulting firm Essenzia. But everything changed in 2017. A high-end division was created and products were sold only in luxury boutiques in China. It later began making appearances at Fashion Weeks and selling its products in trendy shops in the West. In 2019, its revenue increased by 32%, reaching 13.87 billion Hong Kong dollars (\$1.79 billion). The brand now enjoys cult popularity thanks to its retro trainers and clothing.

HEADQUARTERS: BEIJING

EMPLOYEES: 3,610

2019 REVENUE: \$1.79 BN

▲ 2331

#### BOSIDENG

##### THE CHINESE MONCLER

Established in 1975, Bosideng was originally a supplier of down jackets for brands like Adidas and North Face. Then, in the early 2010s, the Hong Kong-based brand began to promote its own line of luxury down jackets, even opening outlets in New York and London. In China, it now has the same status as Canada Goose and Moncler, thanks in particular to prestigious collaborations with designers like Tim Coppens and Antonin Tron. For the financial year ending March 2019, the company listed on the Hong Kong Stock Exchange saw its revenue grow by 17% to 12.1 billion yuan (\$1.7 billion).

HEADQUARTERS: HONG KONG

EMPLOYEES: 6,400

2019 REVENUE: \$1.7 BN

▲ 3998

#### PEACEBIRD

##### THE HIPSTER'S FAVOURITE

The Peacebird brand, based in the city of Ningbo, has existed for more than 25 years. Having long been limited to secondary cities in China, it repositioned itself about two years ago to seduce hipsters from the country’s major metropolises, thanks to a series of collaborations with cutting-edge designers. Its latest collection combines futuristic sportswear and pieces inspired by the world of Harry Potter. Listed on the Shanghai Stock Exchange, it saw its sales reach 7.9 billion yuan (\$1.1 billion) in 2019, up 3%.

HEADQUARTERS: NINGBO, ZHEJIANG

EMPLOYEES: 11,750

2019 REVENUE: \$1.1 BN

▲ 603877

TRAVEL

# Raja Ampat: an underwater technicoloured dream

In need of a far-flung trip? *Swissquote Magazine* whisks you to the coast Papua, in anticipation of better days.

BY JULIE ZAUGG



**T**ravelling to Raja Ampat is an adventure in itself. To get there, you must first head to Jakarta, the capital of Indonesia. From there, take an aeroplane to Sorong, a small dusty city on the western tip of Papua, one of the wildest provinces in the gigantic archipelago made up of more than 17,000 islands. From there, take a ferry, then switch to a speedboat. The sea travel takes more than four hours in total. >



As soon as you arrive in Yebeu, a small island of only 1.6 sq. km covered in thick jungle and surrounded by white sand, you will immediately forget any travel fatigue. Palm trees sway gently in the warm, humid breeze. Bright orange hermit crabs crawl slowly along the beach. Birds sing melodious songs from atop the tree canopy. Other than about 10 wooden bungalows along one side of the island, there is no trace of any human presence.

– swim about in the transparent waters. Occasionally a turtle comes along to snack on a piece of coral. Further below, a group of barracudas pass by furtively.

Many of these marine species are native to Raja Ampat. Others have become so rare that this is one of the last places in the world to see them in the wild. Some of the most spectacular species include epau-

lette sharks, which can “walk” with their fins along the ocean floor; giant clams, which are fluorescent blue and can grow to almost two metres in size; and tiny pygmy seahorses, which change colour to blend in with their environment.

And of course the majestic manta rays. You can find them on a rocky point, where they clean themselves. Boats are not allowed to dock there,

## This archipelago is home to more than 1,600 types of tropical fish

But the main attraction is underwater, of course. Around a wooden pontoon, baby sharks circle between schools of fish. In the distance, dolphins and flying fish jump against the horizon. Further offshore, the underwater life looks like a psychedelic kaleidoscope. Soft orange and purple coral lay next to vast sections of bright red Gorgonian coral, interspersed with anemones full of clown fish. Above this underwater garden, schools of multicoloured fish – striped, spotted, rainbow

## DIVE IN RAJA AMPAT

All hotels have their own dive centres with certified instructors. Most dive sites are less than an hour from the resorts by speedboat. Resorts offer all-inclusive packages which can include 2 to 4 dives per day, one of which may be a night dive. Snorkelling fans are also welcome to join these expeditions. Most of the sites are no deeper than 5 metres, which is perfect for snorkelling. Visibility is excellent – except from June to mid-September when the wind picks up – and the water temperature remains between 28 and 30 degrees all year round.



## THREE MAGNIFICENT HOTELS

### Cove Eco Resort

A dozen comfortable bungalows connected by a wooden walkway dot the coast of Yebeu island. Each bungalow has an open-air shower and private terrace. Guests enjoy an all-inclusive experience and share meals cooked with inventive ingredients around a communal table. Each day, chartered boats bring snorkellers and scuba divers to two different dive sites. On Wednesdays, guests can visit Pianemo, a string of limestone islands in the middle of the ocean.

coveecoresort.com

### Misool Eco Resort

Located on the southern tip of Raja Ampat in a natural marine park, this hotel has its own coral reef, as well as 25 dive sites less than 15 minutes away by boat. Guests can watch the birth of sea turtles, look up at a starry sky free from light pollution and explore exquisite lagoons. Visitors can choose between luxury villas on land or bungalows built above the sea.

misool.info

### Sorido Bay Resort

This hotel, built about 20 years ago, is one of the first hotels on Raja Ampat. Made up of small white-walled houses decorated with Melanesian artwork, it is one of the most accessible hotels (located an hour and 30 minutes from Sorong by speedboat) and the only hotel on Kri island, which is one of the most beautiful islands in the region. Sorido Bay Resort organises excursions to see birds of paradise and is home to several cuscus, a small marsupial with large eyes.

papua-diving.com/our-resort

so visitors have to swim a few hundred metres to reach it. As soon as you put a diving mask on, you'll see at least four rays. They move in an aerial ballet, moving their large wings and putting on a show for astonished divers.

## Tourism is a recent development. The first hotels began to appear around 2010

Raja Ampat is home to the largest marine biodiversity in the world. This Melanesian archipelago is home to 75% of all coral species known in the world, and more than 1,600 types of tropical fish. This incredible variety is due to the archipelago's location within the coral triangle, a zone that includes Indonesia, the Philippines and part of Malaysia.

Raja Ampat is also located along the South Equatorial Current, “a warm ocean current that circulates from east to west between the Pacific Ocean and the Indian Ocean, which produces ideal conditions for the growth of coral and marine life,” said Marlon Arthur Huwae, an eco-tourism expert at the University of Papua. This vast region of small islands is also very isolated, with only 50,000 inhabitants spread across 40,000 sq. km.

Tourism is a recent development. The first hotels began to appear around 2010, following a series of government programmes put in place to train local residents in tourism careers and provide subsidies to families wishing to open homestay accommodation.

But unlike other Indonesian islands popular among travellers, such as Bali or the Gili Islands, there are no nightclubs, restaurants or hotel chains on Raja Ampat. Instead, there are a series of high-end resorts focused on eco-tourism. Built entirely from wood, the resorts do not use PET bottles or plastic cutlery, and have an airy architectural style that makes air conditioning unnecessary. The resorts only serve local food, such as fresh fish and tropical fruit.

These efforts are supported by locals. “At Raja Ampat, fishermen impose Sasi laut, a moratorium of six months from April to September, to allow the fish populations to grow again,” said Huwae. The government has limited the number of visitors to 50,000 per year and have designated areas where fishing is forbidden entirely.

These measures are not just beneficial to nature. For swimmers, floating between fish without any other humans or plastic in the water is a unique experience that has unfortunately become all too rare.



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# BOUTIQUE



## SWISS QUALITY

Swiss brand Scott, renowned for its mountain bikes, also knows how to design electric ones. Demonstrating this is its new urban model "Silence eRIDE", in particular the luxurious EVO version equipped with a carbon fork. Very manoeuvrable, with high-performance integrated daytime running lights and capable of going at 45 km/h using its Bosch engine, this bike is attractive in the post-pandemic era.

[scott-sports.com/ch](http://scott-sports.com/ch)  
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## GREEN SURFING

Based in Montpellier, the start-up Yuyo specialises in environmentally-friendly surfboards that are made on demand. The boards are 3D-printed from plastic waste and layered with non-polluting bio-composite materials. The design and tech specifications can be completely customised.

[yuyo.surf](http://yuyo.surf)  
From CHF 874.-



## CYCLING JERSEYS MADE IN SWITZERLAND

Zug outfitter Qloom has added some fun to its latest collection of cycling clothes, which are both stylish and technical. The close-fit styles are made from light, breathable materials. We particularly like the azure blue short-sleeve Lennox Head jersey, which makes us think of Australia.

[qloom.com](http://qloom.com)  
CHF 99.-



## SPORTY ELEGANCE

The third generation of the TAG Heuer Connected watch, the latest from the Swiss watch-maker, is focused on versatility. Inspired by the brand's classic watches, it combines design with everyday functionality and sport monitoring. Equipped with multiple sensors and an integrated GPS, the watch measures performance during activities such as golf, running, cycling, walking and fitness workouts.

[tagheuer.com](http://tagheuer.com)  
From CHF 1,750.-



## A SMART GREENHOUSE ON YOUR BALCONY

Grow organic food at home with a smart greenhouse from start-up Myfood. The City model is 3.5 m<sup>2</sup> and can produce up to 100 kg of fruits and vegetables thanks to an ecosystem that is a mix of permaculture and aquaponics. A dedicated app helps growers monitor the greenhouse from afar and regulate temperature, humidity levels and soil pH.

[myfood.eu](http://myfood.eu)  
From CHF 5,000.-



## TABLE BARBECUE

Cookut reinvents the art of grilling with its barbecue grill that can be placed directly in the middle of the table. Mobile and compact, it can cook up to 20 sausages, eight skewers or beef ribs, either at home or away, thanks to its convenient carrying case. The grill is easy to use and can be set up in less than 10 minutes. Just pour water in the lower tray and place charcoal in the upper tray.

[cookut.com](http://cookut.com)  
CHF 105.-



## PLAY LIKE MESSI

In partnership with Google and EA Sports, Adidas is launching its GMR connected insole with a chip inside that can be worn in football cleats. The device functions like a tracker and the wearer's sport performance in real life can be transferred to the video game *FIFA Mobile*. It records distance travelled, speed, and the number and power of passes and shots.

[adidas.ch](http://adidas.ch)  
CHF 39.95.-

## TRIED AND TESTED

## MAKING BEER AT HOME

BY GÉRARD DUCLOS

*Swissquote Magazine* tried its hand at home brewing. It was a disaster.

**M**aking your own beer at home is a project you think you'll get around to someday but never do, due to lack of time or desire. But if you brew your own beer, you'll always have a fermented beverage on hand – you become self-sufficient in alcohol. That prospect alone makes it worth trying, especially in the current situation. Here's the surprise: on paper, home brewing sounds shockingly simple. To brew 20 litres of beer, all you need is a fermentation keg (a big plastic bucket), a bubbler, a bit of yeast, sugar, and a tin of malt extract. That's it! And it's affordable: you can buy an entire kit for about 60 Swiss francs from one of the main suppliers in western Switzerland.

After just a few days of impatiently waiting, I receive the package. All the equipment and ingredients are included, along with a rather brief set of instructions, but it looks like they'll be easy enough to follow. It all seems so simple! Under the cover of darkness, I finally begin preparing. First, you warm the malt extract, which looks like a kind of brownish treacle, and then pour it into a clean brewing bucket... Well, a saucepan will surely do, I think to myself – and then I realise that I was supposed to use the fermentation keg that comes with the kit.

So I pour all the malt extract into the keg, which is much harder than it seems because malt extract is very sticky (and much of it remains stuck to the bottom of the pan).

Step one complete. I'm now ready to move on to the next instruction. I have to add the water and the sugar, but in a specific order and in very precise proportions that could almost be taken straight from an alchemist's tome. The amount of sugar and water changes depending on the type of malt that is used. Not to worry, the instructions include a detailed table on this very subject. Since I purchased the entry-level Pilsner kit, I need 50 grams of sugar per litre and 16 litres of water. You need to be very meticulous when adding the sugar and the water: first, mix the sugar in two litres of warm water, then pour the rest of the water into the fermentation bucket. It helps to have an adequate measuring tool when doing this, otherwise calculating the proportions quickly becomes a chore.

After dissolving the yeast in a small glass of water and adding it to the keg, I put on the lid and add the bubbler. And it's done. All that's left to do is wait. A tip I learnt along the way: make sure the bucket is on a surface that won't get damaged, as

it tends to ooze a concentrated liquid that isn't easy to clean up. Your floor (and your spouse) will thank you.

The instructions recommended leaving the keg for at least 7 to 10 days in a warm place. After studiously adhering to this, I decide to have a taste on that fateful tenth day. As I'm about to open the tap for the first time, emotions run high. What flavours and aromas would we experience from this divine beverage brewed by my own hands? Will it be a summer beer, "light, blonde and thirst-quenching for everyday drinking", as promised by the packaging on the malt extract? The light amber murky liquid, fills my glass, then carefully comes to my lips... and is absolutely undrinkable. It's a bitter, acidic kind of cider that in no way resembles a summer beer.

It's hard to say what caused this disaster. Perhaps proportion errors, mismanaged fermentation, a combination of many small – and big – mistakes in preparing the beer, or simply the brewer's gross incompetence. As the equipment is reusable, I could try again from scratch, though next time hopefully with the help of an experienced friend or at least a few quality online tutorials. Clearly not everyone has what it takes to be a brewer... ▾

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