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FINANCE AND TECHNOLOGY UNPACKED

PORTRAIT
Stadler picks up speed

LIVESTREAMERS
Vying for clicks

SAUDI ARAMCO
Revving up for the IPO

DOSSIER

5G
THE RACE IS ON

Novel applications
Companies to watch
Interview: Olaf Swantee, CEO of Sunrise

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5G: tensions are high

By Marc Bürki,
CEO of Swissquote

They say that whoever masters data masters the world. This is extremely relevant p. 45 to the trade war raging between Washington and Beijing these past few months. At the centre of this battle is a Chinese company: Huawei, accused of espionage by the Trump government and now blacklisted by several US companies, including Google. One may wonder who benefits from the situation, given that Huawei, according to independent experts, is now far ahead in the highly strategic 5G market. This key technology, which is currently being launched, will have speeds of several gigabits of data per second, which is approximately the wireless equivalent of fibre optics.

Decidedly a source of tension, 5G is also, rather unexpectedly, the subject of a popular revolt in Switzerland. As a pioneer in Europe, wise Switzerland is accused of adventurism by opponents of this new standard, who believe it p. 56 to be dangerous and harmful. Health concerns – which we outline in a fully researched article – are often paired with a rejection of consumerism and of a technology perceived as superfluous.

This is a valid question. What is the purpose of 5G? Its advocates, starting with operators, are selling a dream. Virtual reality, connected objects, autonomous cars... So many applications p. 40 are finally made possible via this new ultra-fast, reactive mobile network. In practice, these usages will very likely become widespread, but only in two or three years, when the coverage and power of the network is in full force. Currently, average consumers can already enjoy speeds that are said to be up to 10 times faster than 4G. But there still needs to be a use for it.

Sunrise, whose CEO Olaf Swantee granted us a long interview, seems p. 32 to have found the right niche. While its slogan "5G for people" seems to be focused on smartphone users, 5G service is actually an alternative to fibre optics in rural regions that do not have high-speed internet access. The Zurich-based firm is bringing its technology to these areas first. It's an easy way to seduce towns and villages, by offering them a "fibre over the air" service, according to Olaf Swantee's favourite expression. In the United Kingdom where a similar pilot project is currently underway, the slogan is very clear: "5G Rural-First". This might inspire Sunrise's future marketing campaigns...

Happy reading!

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SCANS

finance

CHINESE-SWISS STOCK MARKET CONTRACT

The headquarters of SIX Group in Zurich.

FABRICE COFFRINI / AFP

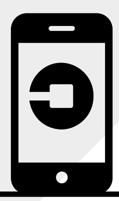
The Swiss and Shanghai stock exchanges have signed a partnership agreement. Some financial instruments can be listed on the other country's platform, which would allow Swiss companies to access cash reserves from their Chinese counterparts, and vice versa. It is also expected to encourage Chinese companies to be listed on the SIX in order to access more international capital. In 2013, the two countries signed a free trade agreement, followed by a monetary agreement a year later between the Swiss National Bank and the People's Bank of China.

"We are investing in the UK. We hold a long term bullish view on the UK wealth management opportunity"

David Durlacher, CEO of Julius Baer International.

Sacred Games, the Netflix series created for the Indian market is advertised on the streets of Mumbai.

INDRANIL MUKHERJEE / AFP



$120 billion

The valuation achieved by Uber when it went public on the New York exchange in early May. The ride-hailing service is the largest online platform to go public since Alibaba, which reached a valuation of $169 billion in 2014.

oil

BIG DATA USED FOR FRACKING

Fracking has made oil extraction a complex science. To improve yields using this technology, ExxonMobil has partnered with Microsoft. The Redmond firm will provide cloud computing solutions in order to collect as much information as possible in real time about operations in the Permian Basin in Texas. The tool will allow ExxonMobil to make more effective decisions in terms of where wells should be drilled and how they are operated. The Texas-based group will then be able to detect – and repair – leaks more quickly. ExxonMobil is hoping to increase its production to 50,000 barrels a day by 2025. Amazon has developed a similar service and has started exploring partnerships with BP and Shell.

MSFT XOM


An oil extraction site in North Dakota (US).

INGRAM PUBLISHING / NEWSCOM

digital

INDIA: A TARGET FOR STREAMING GIANTS

The Indian market is enormous and the quality of its television shows leaves much to be desired. This environment is a tempting opportunity for streaming giants. Disney, which owns Indian platform Hotstar, created Hindi versions of *Criminal Justice* and *The Office*. Netflix published a series called *Sacred Games* for the Indian market. Amazon also produces content specifically for India. The three giants have also developed packages priced to suit Indian households' low purchasing power. A Netflix subscription only costs 250 rupees (3.65 francs) per month, while Amazon's is limited to 999 rupees (14.6 francs) per year.

DIS NFLX AMZN

auto

SGS PUTS SELF-DRIVING CARS TO THE TEST

ISTOCK

Geneva-based SGS has created a joint venture with Taiwanese company Allion Labs to develop a testing and certification offering for the electronic systems that will be used in self-driving vehicles to help detect any potential technological failures. Currently, the manufacturers of these vehicles are forced to use a multitude of partners to obtain this service. SGS-Allion Automotive Communications will begin its operations in Asia – in particular in China and Japan, where the roll-out of self-driving vehicles is most advanced – before targeting the US and European markets.

SGSN

RANKING

THE TOP 5 CHEESE-EXPORTING COUNTRIES
(based on the value of exports in 2018)

1. GERMANY
$4.6 BN
2. NETHERLANDS
$4.1 BN
3. FRANCE
$3.7 BN
4. ITALY
$3.3 BN
5. DENMARK
$1.8 BN

Source: The World Factbook

MILLENNIAL AMERICANS' TOP 5 FAVOURITE BRANDS
(According to a survey of 400,000 consumers)

1. NETFLIX
2. Google
3. amazon
4. YouTube
5. Target

Source: Morning Consult

THE TOP 5 CANNABIS COMPANIES WITH THE MOST DEBT

1. CONSTELLATION BRANDS
$13.6 BN
2. SCOTTS MIRACLE-GRO
$2 BN
3. AURORA CANNABIS
$599 M
4. TILRAY
$420 M
5. APHRIA
$47 M

Sources: YCharts, company reports and press releases 2019

SCANS

348

The number of unicorns – or unlisted start-ups valued at $1 billion or higher – that exist worldwide, according to CB Insights. Ride-hailing services are particularly well-represented.

digital

MARKETING AGENCIES CONQUERING THE WEB

Arthur Sadoun, chairman and CEO of Publicis Group, here at an event in Paris (2018).

ERIC PIERMONT / AFP

Until now, marketing agencies have made very little from online advertising, which has primarily benefited tech giants like Google and Facebook. But now, agencies want to turn the tables. In April, Publicis acquired data marketing firm Epsilon for $4.4 billion – the company's largest acquisition since it was founded in 1926. This transaction follows last year's purchase of Acxion, a similar company, by IPG for $2.3 billion. For its part, Accenture will also acquire cloud computing company Cirruseo. With these acquisitions, advertising companies hope to amass more consumer data. PUB IPG ACN

ecology

ELECTRIC MOBILITY DRIVING PROFITS FOR GLENCORE

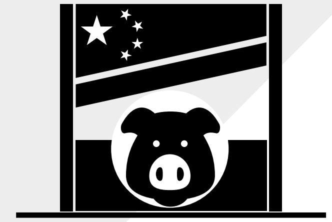
A piece of raw cobalt. The recycling of this strategic material for the manufacture of batteries will help limit its shortage.

SAMIR TOUNSI / AFP

The lithium-ion batteries that power electric vehicles have an average lifespan of 10 years, after which they must be recycled. This factor has led to a vast industry designed to recover the raw materials inside these batteries. In 2018, the market was worth $2.2 billion. It is expected to grow 21% yearly between 2019 and 2026, as the first electric vehicles are retired. This is particularly profitable for the recycling division of Switzerland's Glencore, one of the main players in the market. Its operations, concentrated in North America, process raw materials from 18 countries. GLEN

"Frankly, by the time you sit on one of our aircraft ... you're just pissed at the world"

CEO of United Airlines Oscar Munoz, regarding the many inconveniences, wait times and other annoyances that airline passengers have to deal with.



1 MILLION+

The number of pigs in China that have had to be slaughtered since August because of the African swine fever that has ravaged the country's farms. This has caused the price of pork to skyrocket, increasing by 36% in early April. China could lose 200 million animals as a result of the epidemic, according to some estimates.

"If I had to start the service again, I probably would not emphasize the follower count or the 'like' count as much"

Jack Dorsey, CEO of Twitter, during a TED Talk about unwholesome messages circulating on the platform.

hemp

THE CANNABIS INDUSTRY IS FLOURISHING IN CHINA

NEWSCOM / JORGE RAMIREZ PORTELA

Illegal until just a short time ago in China, industrial cannabis growing is now booming, and the country now produces nearly half of all global stocks. In 2018, cannabis brought in $1.2 billion, mostly in the form of textile fibres obtained from the stem of the plant. But several companies, such as Shineco and Hanma Investment, are now eyeing a far more lucrative market: CBD, an anti-anxiety product derived from the cannabis flower. By next year, Chinese sales of this oil will have quadrupled, reaching $228 million, according to New Frontier Data. TYHT

KICKSTARTER

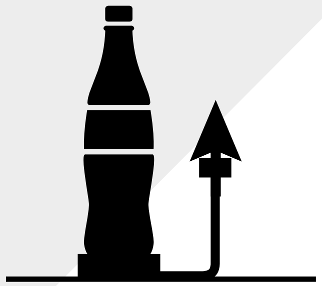
LASTSWAB

REUSABLE COTTON SWABS

Who hasn't seen the tragic photos of squid and seahorses holding on to a cotton swab in the middle of the ocean? Each day, 1.5 billion swabs are produced worldwide. After being used just once, many end up in the ocean, where they take years to decompose. To fix this problem, Danish design firm Faco has created a reusable cotton swab. Dubbed LastSwab, it has a silicone end and a rigid stem. It can be washed hundreds of times without being damaged. It also comes with a biodegradable hygienic carrying case, ideal for travelling. This environmentally-friendly cotton swab comes in an all-purpose version, as well as another model with a longer, smoother point designed for applying make-up. Eight colours are available.

FUNDS RAISED	AVAILABLE
$715,000	AUGUST 2019

SCANS



+2%

The increase in revenue for Coca-Cola over the last 12 months, which can be attributed to Brexit. UK distributors and consumers have started to stockpile to avoid shortages when Britain leaves the EU. The United Kingdom makes up approximately 20% of European Coca-Cola sales.

“The price is too high”

Eric Yuan, CEO of Zoom, commenting on the 85% increase in the firm’s share price after it went public in March.

toys

HASBRO LOOKING FOR THE LATEST TRENDS

A *Transformer* robot on the Hasbro stand at the San Diego Comic-Con International Convention (2014).

SANDY HUFFAKER / REUTERS

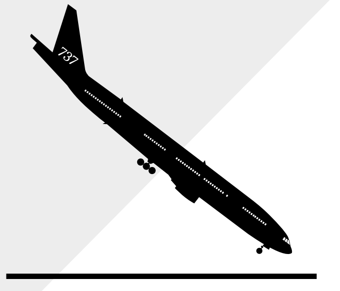
Toymaker Hasbro posted a surprise 2% increase in revenue in Q1, making $732.5 million. The US group owes this result to its clever product modernisation strategy. It has launched an online version of its card game *Magic*, as well as new editions of *Monopoly* inspired by the series *Game of Thrones* and video game *Fortnite*. It is also enjoying the success of its *Bumblebee* film released in December 2018, which has introduced a new generation of children to *Transformers* toys.

HAS

THE FLOP

Samsung delays the launch of the Galaxy Fold

It was supposed to be a mobile phone revolution: in late April, Samsung had planned to put its first foldable smartphone on the market. With a double screen that could be unfolded to create a surface roughly the size of a tablet, this $2,000 device was particularly useful for videos, mobile gaming and reading. But when the first smartphones made it into the hands of journalists, it all went south. Some reviewers found debris behind the screen, resulting from a 7 mm gap that appears when the phone is folded. Others discovered it became dented after putting it in their pockets with other objects. Some even had the screen die one hour after being unfolded. The screen of the Galaxy Fold is made of plastic, rather than glass, meaning that it is too fragile. Its launch was delayed with no further comment.



$1.1 billion

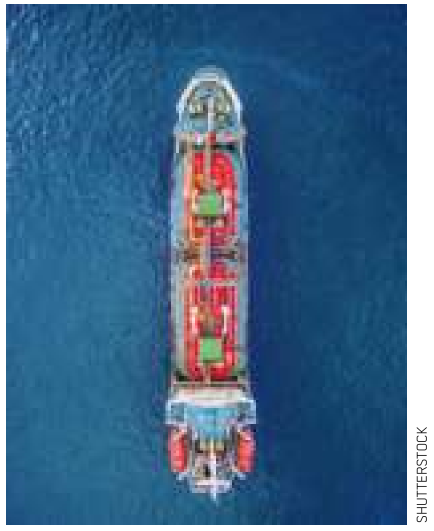
The fall in revenue posted by Boeing in the first quarter of the year due to the grounding of its 737 Max aircraft, which was involved in two deadly accidents in five months. The aeronautics group has had to cancel all orders for this model.

energy

TRAFIGURA AND THE CURSED OIL

Texan group Valero claimed that Swiss company Trafigura sold it poor-quality oil. The bad oil was part of a shipment of 100,000 barrels sent by the Geneva-based group in February 2018. Those barrels were re-sold to the National Shipping Company of Saudi Arabia, which used them to fuel its ships. One of the ships had a motor failure, drifted at sea for two days, and then had to sit for six days in an Egyptian port because of the fuel, according to charges against Valero. Valero has in turn pressed charges against Trafigura.

VLO TRA18



SHUTTERSTOCK

consumption

FRANCE GOES CRAZY FOR E-COMMERCE

LIONEL BONAVENTURE / AFP

France is number one when it comes to buying food products online: 6.6% of purchases are already made online, compared to only 0.7% in Germany and 4.7% in the United States, according to a 2018 Nielsen study. This market is already worth €6 billion and is expected to increase to €13.5 billion by 2025. France owes its first-place status to its rapid adoption of the drive-through model, where order pick-up locations are placed next to big box stores so that major retailers don’t have to pay for the last – and most expensive – mile of delivery. France has 5,000 of these drive-throughs, run by Auchan, Leclerc and Carrefour. And there are more and more popping up in cities, meaning shoppers can walk to them.

SCANS

“Reward all of your workers fairly. Respect the dignity of the men and women who work just as hard as you do to make Disney the amazing company it is”

Heiress Abigael Disney in an open letter to the company's management demanding salary increases at Disney.

$300 billion

The sum that will be invested globally over the next five to 10 years to develop electric vehicles, according to a Reuters survey of auto groups. Mercedes, General Motors, Geely and Nissan are leading the pack.

transport

TURKISH AIRLINES: FUTURE AIRLINE GIANT

Turkish Airlines hostesses at the inauguration of the new Istanbul Airport (2018).

MURAD SEZER

The new Istanbul airport, which opened in early April, can welcome 3,000 flights per day and 90 million passengers per year. By 2028, it will be able to receive 200 million passengers annually. It is the hub for Turkish Airlines, which operates most of the connecting flights. The airline is hoping to become a mainstay for routes linking Europe to Africa and Asia, two regions in which it has significantly extended its network in recent years. This is bad news for Gulf companies, such as Emirates, Qatar and Etihad, which have dominated this segment until now.

THE IPO

PINTEREST SUCCESSFULLY GOES PUBLIC ON NYSE

Pinterest went public on the New York Stock Exchange in April. The social network, which allows users to create an online image board, saw its share price quickly rise 30%, currently valuing the company at $16 billion. In 2018, revenue was up 60%, reaching $756 million, but Pinterest nonetheless recorded a loss of $63 million. The Palo Alto company only began selling advertisements on its platform in 2014 and didn't expand outside the US until 2016. It is also suffering from increased costs as a result of its huge cloud computing requirements. It will pay Amazon $750 million by 2023 for this service. Another challenge is that three-quarters of its 250 million users are women, and the social network is struggling to increase its male audience. PINS

TRENDS

the figure

MIGUEL PATRICIO

A marketer in charge at Kraft Heinz

Title
CEO of Kraft Heinz

Age
52

Nationality
Portuguese

Miguel Patricio is the new CEO of Kraft Heinz, following the sudden departure of his predecessor Bernardo Hees. Patricio, who studied economics in Sao Paulo, worked at Philip Morris, Coca-Cola and Johnson & Johnson before joining beer giant AB InBev in 1998, where he spent 20 years. Within the Belgian group, Patricio held successive positions in Canada, the United States and China before becoming AB InBev's head of marketing in 2012, a position he held until last year. At Kraft Heinz, he will have to repair the damage caused by the questionable strategy implemented by 3G Capital, one of its main shareholders. The firm pushed Kraft Heinz to focus on budget cuts at the expense of brand development.

the country

COLOMBIA

Fragile recovery in Colombia

Colombia is expected to see 3.2% growth this year – higher than Brazil, Mexico and Argentina. The economy has started to recover after the South American country signed a peace agreement with the FARC revolutionary armed forces in 2016. The recovery is buoyed by the construction industry as well as the oil industry, which has just begun to take off but already represents nearly half of Colombia's exports. The introduction of fracking techniques to drill certain deposits in the Andean regions should further increase oil production to reach more than one million barrels per day. The country can also count on its robust auto industry, as well as one of the largest shipbuilding industries in the world. But an influx of Venezuelan refugees fleeing the regime of Nicolas Maduro could destabilise this fragile recovery. Unemployment reached 11.8% early this year, the highest since 2013. This spring, indigenous demonstrators blocked a strategic motorway, leading to increased prices for certain foods. In March, inflation reached 3.2%.

Population
50 million

GDP per capita
$6,625

Growth
+2.9% (2019)

Main economic sectors
oil, automanufacturing, shipyards

A sample of GlaxoSmithKline's new malaria vaccine, Mosquirix, presented here at the Ewim Polyclinic in Ghana (2019).

DR

the innovation

MOSQUIRIX

Company
GlaxoSmithKline

Launch
April 2019

Projected cost
At least $810 million

The first malaria vaccine

Malaria kills 435,000 people per year, primarily children in Africa. Until now, there was no vaccine for the disease, which is spread by anopheles mosquito bites.
But things have started to change. In late April, GlaxoSmithKline began vaccinating infants in Malawi against malaria, with the help of a new product called Mosquirix. The campaign will continue on to Ghana and Kenya, the two other countries targeted by the programme led by the World Health Organization (WHO). The WHO hopes to vaccinate up to 360,000 children per year in the three countries by 2020. Mosquirix was developed in Belgium in the 1980s by a GlaxoSmithKline employee. The vaccine's development was primarily financed by the Bill and Melinda Gates Foundation and PATH, a US NGO. It includes genetic material from Plasmodium falciparum, the parasite responsible for the disease, as well as the chemical adjuvant AS01, which increases the immune response.

In 2015, Mosquirix was approved by the European Medicines Agency (EMA), despite mixed results from clinical trials.
The vaccine's effectiveness in children varies between 26% and 50%, compared to 97% for the measles vaccine, for example. In its decision, the EMA confirmed that "Mosquirix provides modest protection against malaria". While its effectiveness is only relative, health officials hope that it will help reduce the number of victims in conjunction with the rest of the antimalarial arsenal, which includes medicines and mosquito nets coated with repellent.


Chopard
THE ARTISAN OF EMOTIONS – SINCE 1860
HAPPY SPORT COLLECTION
Chopard
AUTOMATIC

In 2016, the Rhaetian Railway (RhB) ordered 36 "Capricorn" trains from Stadler Rail, for 361 million francs, the largest order in RhB's history. The first model was unveiled in April.

GIAN EHRENZELLER / KEYSTONE

Stadler picks up speed

The Thurgau-based railway stock manufacturer is bringing in orders left and right and just triumphantly went public on the Swiss exchange. After conquering the world with its "Flirt" regional train, Stadler is now turning to high-speed trains.

BY JASMINE LECKER

The figures are almost unbelievable: in 2004, Stadler Rail had 1,100 employees and generated revenue of 556 million Swiss francs. Today, it makes 2 billion in revenue and has nearly 8,900 employees. While the railway industry grows year over year (+2.7% yearly by 2023 according to the European Rail Industry), the Thurgau-based railway stock manufacturer has grown at a higher than average rate for the past 15 years and just had a successful IPO on the Swiss exchange in April (read inset on p. 20). And this is just the beginning. The executive team is aiming for four billion in revenue by 2020.

The Bussnang-based group did recently exceed that goal. In late 2018, its orders reached 13.2 billion Swiss francs. And it already has a significant amount of orders this year. In March, it signed its largest contract ever for underground metros: 127 two-car trains for the Atlanta subway in the United States, for a sales price of $600 million. Minsk, Barcelona, Berlin, Glasgow and Liverpool also ordered underground trains from Stadler.

But the company's core business is still heavy rail (see infographic on p. 22). Its current success is largely due to its "Flirt" train. Sold as early as 2002 for regional routes and 2008 for intercity travel, this train – whose fastest version can reach 200 km/hr – is Stadler's moneymaker. It built Flirt trains for 18 countries, mainly in Europe, but also in the United States, Canada and Algeria; "from Africa to the Arctic Circle," says Stadler on its site. The "Kiss", a double-decker variation, is also a top seller.

CUSTOMISABLE TRAINS

For Vincent Ducrot, head of Transports publics fribourgeois (TPF) and former head of the Major Lines and Travellers departments at Swiss Federal Railways (SBB), the Flirt is a perfect example of one of Stadler's strengths: the ability to produce many models of the same basic train that can then be customised. "The Flirt is designed around a single platform and then adapted based on client needs, similar to automobiles," explained the rail market expert. While effectively industrialising is difficult in this industry due to country-specific requirements, Stadler's structure makes it possible to do just that.

"The organisation of the entire company is based on its Bussnang location," said Ducrot. "That's where the expertise is concentrated." And even though Stadler now ▷

has factories and assembly sites in Hungary and Belarus, its much larger competitors Alstom, Bombardier and Siemens are scattered even more, according to Ducrot: "Stadler builds trains, while other large groups assemble parts from all over the world". Some companies even need to have experts travel between their locations to make up for the lack of local expertise.

Furthermore, Stadler's ability to offer customisable trains means it can access markets that its giant rivals cannot. "Thanks to its relatively small size, the company has maintained its flexibility and agility," said Ducrot. For example, Stadler is the only manufacturer able to build narrow gauge (or metric) trains, which are used by TPF and Rhaetian Railway. "When you put out a call for bids for this type of train, only Stadler responds." Furthermore, the Thurgau company stands out for the quality of its products and its timeliness. While it doesn't have the most robust catalogue, "what it delivers is very well-made and on time".

On 15 April 2019, Thomas Ahlburg, CEO of Stadler Rail, and Renato Fasciati, director of the Rhaetian Railway, inaugurated the first train of the new regional train "Capricorn" in Altenrhein.

GIAN EHRENZELLER / KEYSTONE

A SUCCESSFUL IPO

Stadler Rail successfully went public on the Swiss stock exchange on 12 April. The issue price was set at 38 Swiss francs, on the high end of the initial indicative range (between 33 and 41 francs). At the end of the first day on the exchange, the share price exceeded 43 francs. It is currently priced at around 44 francs and the company's capitalisation exceeds 4.3 billion francs.

"An IPO is a natural step in the development of the company and it will further reinforce its visibility in global markets," said Stadler when it announced the IPO on the SIX Swiss Exchange on 19 March. Going public will allow the company to invest in new technologies, as well as the tram, metro and locomotive sectors in particular. The percentage owned by the president of the executive board, Peter Spuhler, went from 80% to 40%.

Following the IPO, Stadler and financial analysts who were following the company had to observe a hold period for communications, which is why they were unable to answer our questions for this article. So unlike other dossiers, this profile doesn't include any investment recommendations.

THE "CONTRACT OF THE CENTURY" AT BOMBARDIER

Editor-in-chief of *Schweitzer Eisenbahn-Revue*, Walter von Andrian confirmed that Stadler has a virtual monopoly on the narrow gauge train market. "That means that in some ways it can set the prices." However, Stadler missed the "contract of the century" for double-decker high-speed trains for Swiss Federal Railways in 2010; it went to Bombardier instead. According to Ducrot, one of the people who signed the contract, Stadler offered a train with a motorisation system concentrated at the ends of the cars rather than spread throughout the train, and this was one of the primary reasons Stadler lost the contract. This technical decision is a disadvantage because it reduces the number of seats on the train.

SBB ordered 59 duplex trains for 1.9 billion Swiss francs from Bombardier, with an option to purchase 100 additional compositions. Given the many delays and difficulties with the Canadian manufacturer, there is still hope that SBB could go back to the market for the additional trains. But von Andrian said that Stadler has never built a double-decker train capable of reaching 200 km/hr with a car incline system when turning or a roll compensation (ed. note: this neutralises the effect of centrifugal force and allows the train to go faster), "which is an incredible technical challenge". Furthermore, he doesn't think that Stadler will be able to deliver on time.

But the company, led by Thomas Ahlburg since 1 January 2018, isn't discouraged. While Bombardier struggled to fulfil its complicated order, Stadler was successful five years ago, providing SBB with new high-speed trains for the underground Gotthard Tunnel (which in this case are only one level). The deal, worth 1 billion Swiss francs, was for 29 cars and an additional 92 if needed. Capable of reaching 250 km/hr, the "Smile" and "Giruno" trains will be gradually introduced on the Basel-Lugano-Chiasso and Zurich-Lugano-Chiasso routes starting in December. This model was also developed based on the Flirt.

> **"Stadler will have to manage moving from a family structure to a public company"**
> **Vincent Ducrot**, director of Transports publics fribourgeois

"This project is completely strategic," said Ducrot. "In Europe, many high-speed trains are reaching the end of their lifespan and will have to be renewed, but very few companies are able to make them." Von Andrian is more sceptical: "Demand is significantly lower than for regional traffic. To be truly competitive, these trains need to reach speeds of 320 km/hr (such as Siemens' ICE trains in Germany and Alstom's TGV trains in France), which isn't possible due to the weight of the train." But Ducrot believes it is feasible with a few adaptations.

ULTRA-CONCENTRATED MARKET

Still, in order to compete, Stadler must lower its prices for the standard gauge train market, according to two experts. "Stadler builds beautiful, high-quality trains, but they are expensive," said the head of TPF. ▷

KEY FIGURES

2 bn
In Swiss francs, 2018 turnover.

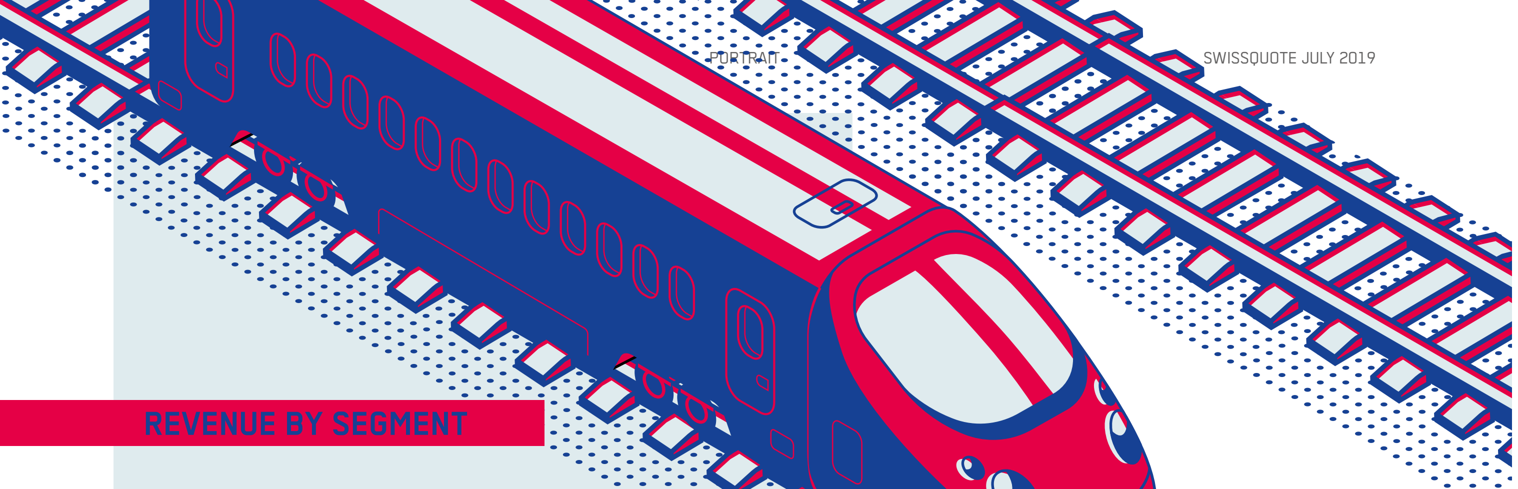
62.2%
Percentage of revenue generated in Switzerland, Austria and Germany.

7.5%
Operating profit in 2018.

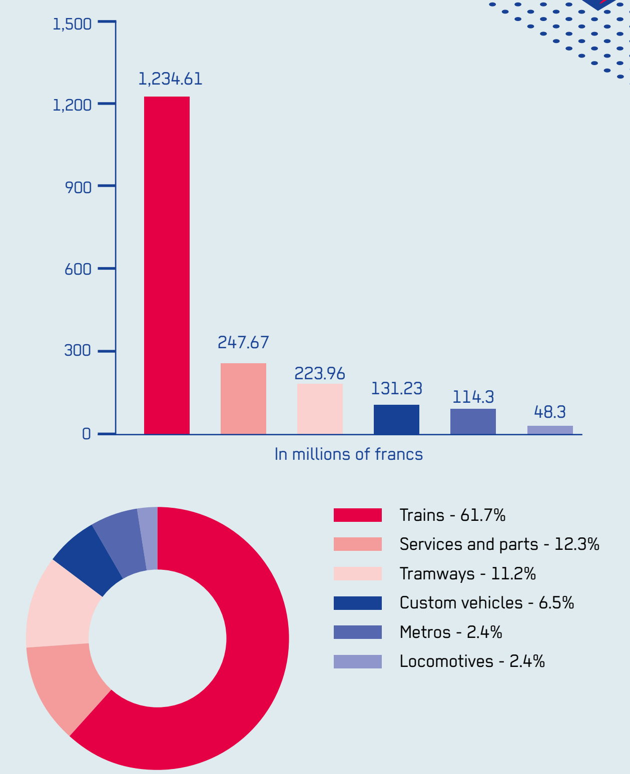
8,874
Number of employees worldwide, of which approximately 3,000 are based in Switzerland.

13.2 bn
The value of the order portfolio in late 2018.

1942
Year the Stadler firm was founded in Zurich by engineer and entrepreneur Ernst Stadler, who died in 1981.



REVENUE BY SEGMENT



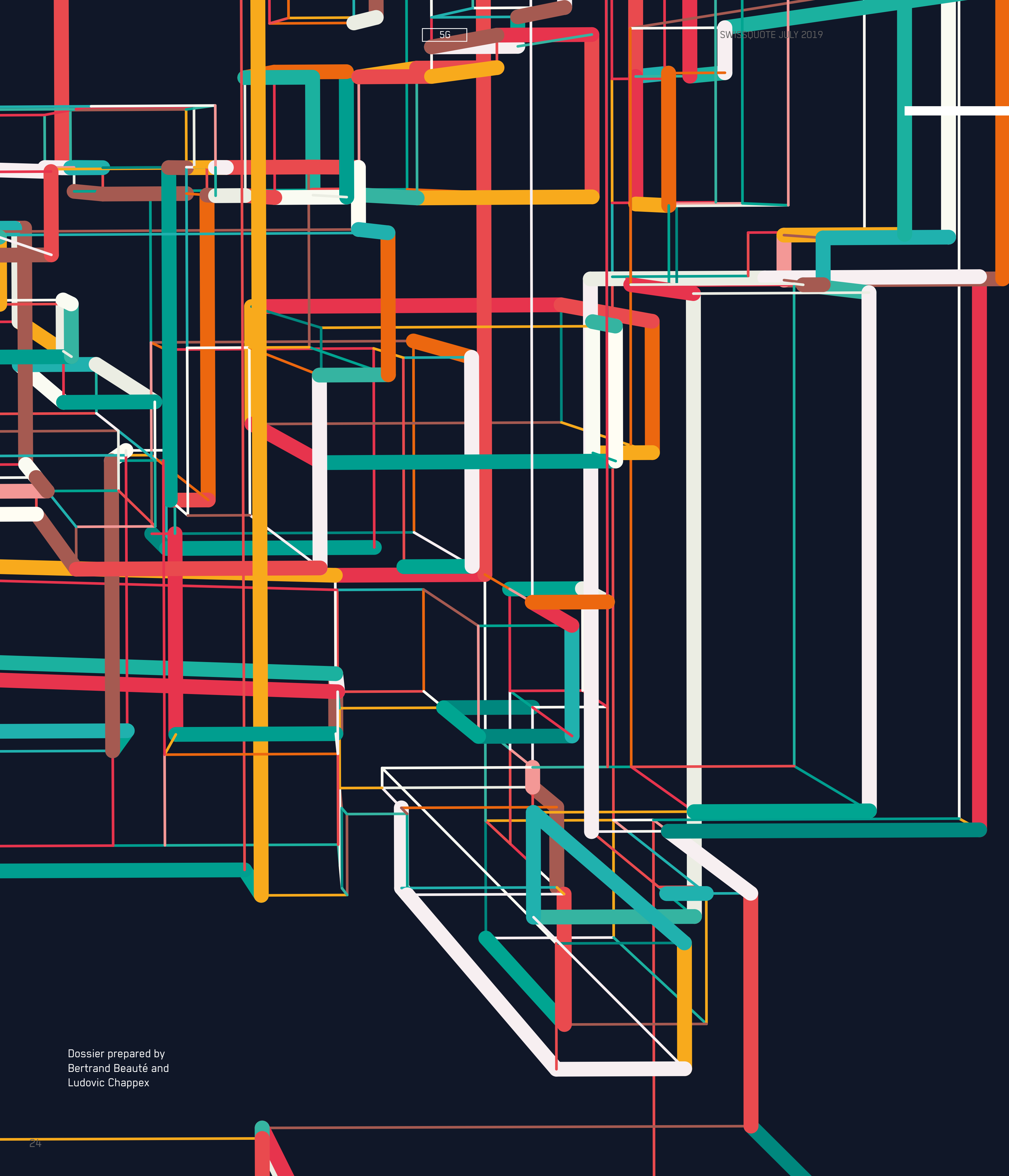
"After a race for complexity in recent years, transport companies are now aiming to produce simpler trains at a lower cost that can be easily maintained." While Stadler's small size is an advantage when it comes to flexibility, it limits the possibility for economies of scale. This is in the context of an ultra-concentrated market: in the west, Bombardier, Siemens and Alstom make for a powerful triumvirate. If it wasn't for the veto from Brussels, Siemens and Alstom would have merged.

Another titan is rising in the east: China Railroad Rolling Stock Corporation (CRRC), created in 2015 from a merger of two conglomerates controlled by Beijing. It's the global leader with its eye on Europe. But Ducrot believes that European quality standards are too high for a new player to come on the market overnight. Furthermore, railroad companies follow national preference to a certain extent. That said, Japan's Hitachi is well-positioned, with incredibly functional trains that are perfectly in line with new transport standards.

To reduce costs, von Andrian believes that Stadler has no other choice but to move even more production internationally, especially for its standard gauge trains, as it has already started to do. "Costs are simply too high in Switzerland for Stadler to remain competitive." He said that even in Switzerland, Stadler locations are never far from the border, close to foreign workers…

To continue its growth, Stadler should try to preserve the advantages that have made it successful so far, while simultaneously adapting to the fact that it is now one of the industry's main players. What's more, the CEO is no longer its historical leader. Former UDC national councillor Peter Spuhler, who purchased the firm in 1989, is now "only" the president of the executive board as of last year. Vincent Ducrot sums it up nicely: "Stadler will have to manage moving from a family structure to a public company." SRAIL

5G SWISSQUOTE JULY 2019



Dossier prepared by
Bertrand Beauté and
Ludovic Chappex

DOSSIER

5G The race is on

Since April, a 5G mobile network has been a reality in Switzerland. This new network will transform the way we use mobile internet by 2022.

BY BERTRAND BEAUTÉ

It won by a hair. On 3 April at 11 pm, South Korea officially became the first country to launch its 5G network – the new generation of mobile telephony. South Korea beat the United States by only a few hours, winning the symbolic title of the global pioneer in the industry. Of course, this victory in the final sprint is above all a marketing win for South Korea, which is reinforcing its image as a small country at the cutting edge of technology. But it also illustrates the importance for countries all over the world of ensuring they don't lag behind in the race for 5G.

"The new generation of mobile telephony is a technological leap forwards compared to 4G. It will certainly be an essential competitive factor for companies," says Philippe Horisberger, deputy director of the Swiss Federal Office of Communications (OFCOM). "Countries that are behind in building their network ▷

could fall behind economically in the future. The divide between latecomers and pioneers will be difficult to overcome."

In the 5G race, Asia and Uncle Sam are in the lead, with networks already operational in South Korea, China and the United States, in particular. In other words, "Europe is lagging behind," says Julien Leegenhoek, a tech stock analyst at Union Bancaire Privée (UBP). "If things don't change, European countries may not be the first to develop the most modern, tech-savvy applications."

Dubbed "wireless fibre", 5G promises to revolutionise mobile internet by offering never-before-seen services thanks to its ultra-fast speed (see case studies on p. 40). For example, it will be possible to download a high-definition film to a smartphone in just a few seconds, at speeds of up to 10 Gbit/second (compared to 1 Gbit/second for the most advanced 4G network). Experts are already envisioning new immersive experiences in augmented or virtual reality in areas such as sports broadcasts, news and gaming.

However, in the immediate future, the general public isn't the main target audience, as Sylvain Chevallier, a telecoms partner at consultancy firm BearingPoint, explains: "5G will certainly be faster, which is obviously a positive for consumers in terms of usability. But consumers won't experience a major technological shift, even though download speeds are twice as fast. For industry, however, 5G is a real revolution."

"All industries willlikely be impacted by the arrival of 5G"
Philippe Horisberger, deputy director of OFCOM

The Internet of Things (IoT), which has been a hot topic for years, will be able to finally take shape. Thanks to its "slicing" architecture, the new generation of mobile telephony will be able to handle millions of connections simultaneously in situations in which 4G, which was only sized for a few objects, becomes saturated. "5G will support the development of the Internet of Things by allowing a very large number of devices to be connected simultaneously," says Chevallier. "This will lead to a wide range of new services."

This is due in particular to 5G's very short latency – or network response time – of about one millisecond, which is 10 times less than that of 4G. "This performance boost opens the door to developing resource-heavy applications, such as autonomous vehicles and telemedicine," says Chevallier. "If you're in an autonomous vehicle, you'd rather have it react instantaneously than have to wait for the response time, even if it's just a few dozen milliseconds."

TOWARDS SMART FACTORIES

"All industries will likely be impacted by the arrival of 5G," says Horisberger, deputy director of OFCOM. "Manufacturing processes in industry, for example, will be transformed. In the future, robots will all be connected and able to be directed in real time, with their artificial intelligence hosted in the cloud, giving factories more flexibility."

THE 4G NETWORK IS CLOSE TO SATURATION

Remember when an SMS didn't send on New Year's? It's the same phenomenon in the smartphone era. As many users have already found out, internet speeds tend to slow down in places where there are lots of people, such as stadiums and full commuter trains – and the reason is because the 4G network becomes saturated. A February 2019 study conducted in 70 countries by telecoms network specialist Opensignal showed that average speeds fell by two, three or even five times their normal speeds during peak times in various regions of the world. Switzerland is no different. The 4G network is 1.9 times slower on average during the peak hour of the day, which is 9 pm, compared to the least busy hour (3 am). During the most favourable times, speeds can reach up to 55.5 Mbit/second, but during the day, the average speed is only 35.7 Mbit/second.

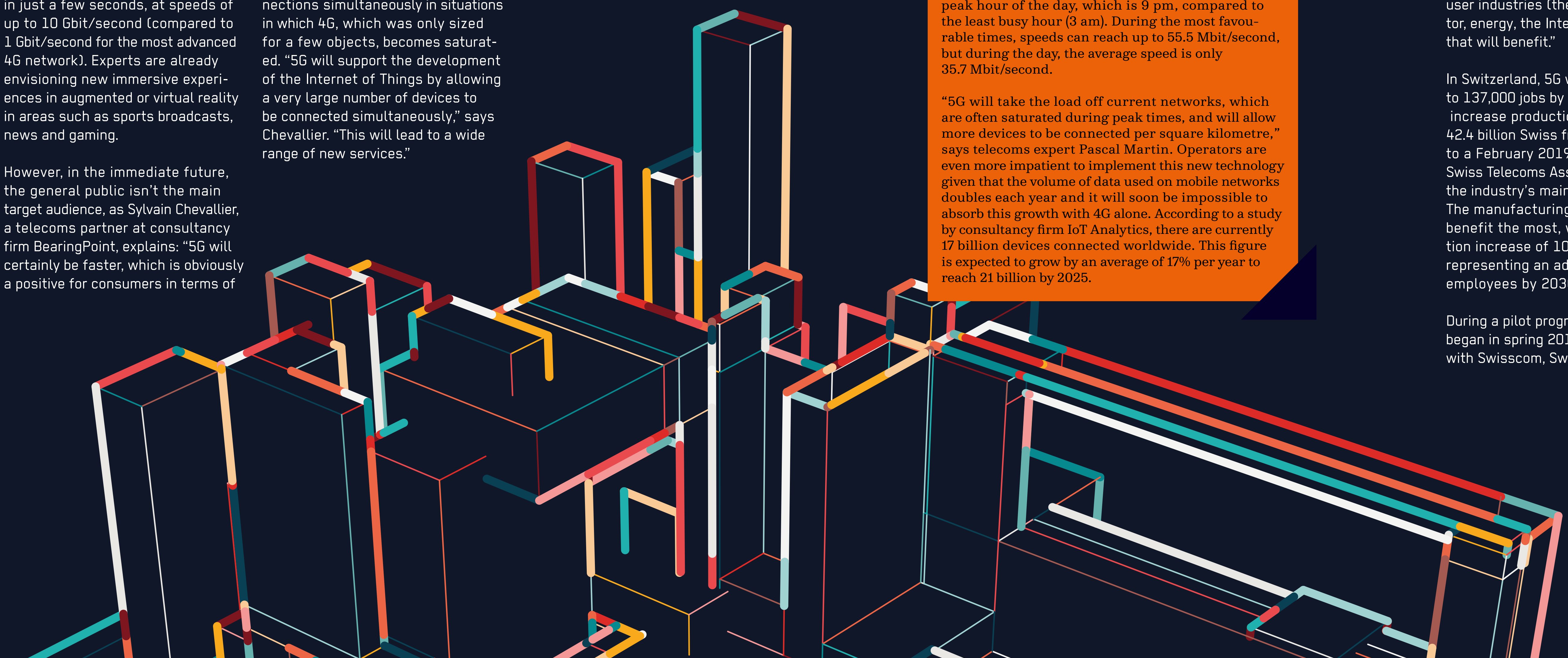
The 4G network is 1.9 times slower on average during the peak hour of the day

"5G will take the load off current networks, which are often saturated during peak times, and will allow more devices to be connected per square kilometre," says telecoms expert Pascal Martin. Operators are even more impatient to implement this new technology given that the volume of data used on mobile networks doubles each year and it will soon be impossible to absorb this growth with 4G alone. According to a study by consultancy firm IoT Analytics, there are currently 17 billion devices connected worldwide. This figure is expected to grow by an average of 17% per year to reach 21 billion by 2025.

For industry, 5G is the essential fuel required to digitalise the entire economy. And the financial possibilities are equal to the challenging task at hand. According to a study from consultancy firm TMG published in December 2018, 5G mobile services could create $2,200 billion in value globally between 2020 and 2034, or 5.3% of global GDP during the same period. "The first companies to profit from this will be those that develop the ecosystem – i.e. telecoms suppliers such as Huawei, Nokia and Ericsson, as well as chip manufacturers such as Qualcomm (see our selection on p. 48–53)," says Thomas Coudry, a telecoms analyst for investment bank Bryan, Garnier & Co. "But in the medium term, it is user industries (the automotive sector, energy, the Internet of Things) that will benefit."

In Switzerland, 5G will create up to 137,000 jobs by 2030, and will increase production by up to 42.4 billion Swiss francs, according to a February 2019 study by the Swiss Telecoms Association (ASUT), the industry's main lobby group. The manufacturing industry will benefit the most, with a production increase of 10 billion francs, representing an additional 20,600 employees by 2030.

During a pilot programme which began in spring 2017 in partnership with Swisscom, Swiss company ▷



Ypsomed – a specialist in injection systems – automated a production line with 5G (read the interview on this page). According to results published in March 2018, this technology resulted in a productivity boost. "5G is a key factor in the fourth industrial revolution: artificial intelligence. Smart production can't do without it," says Simon Michel, CEO of Ypsomed.

"5G is a key factor in the fourth industrial revolution: artificial intelligence"
Simon Michel, CEO of Ypsomed

In this context, any delay in implementing 5G could end up being detrimental, depending on the economic environment. According to ASUT, delaying the development of the 5G network by three years would reduce growth from this technology by 10 billion Swiss francs and would make companies less competitive.

"5G GUARANTEES MORE STABLE SPEEDS THAN WIFI"

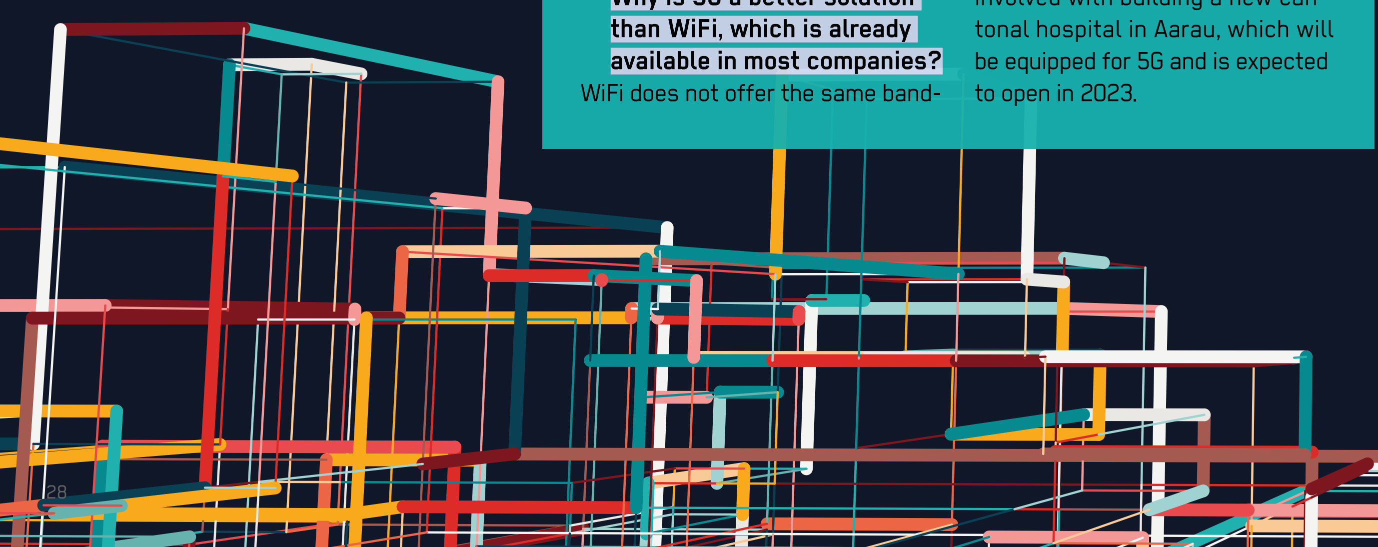
Urs Lehner, member of the Swisscom executive board and head of the "Enterprise Customers" division, explains the advantages of 5G for companies.

Last year, Swisscom began a pilot project for the industrial use of 5G with Bern-based company Ypsomed, which makes insulin pens for people with diabetes. The goals are digitalisation and real-time monitoring of goods throughout the production process. We take a closer look.

What are the concrete advantages of 5G for a company like Ypsomed?
First, 5G offers lots of flexibility and an easy installation. Compared to fibre optics, for example, 5G doesn't require lots of work to implement and configure the network. Furthermore, in a production environment using a 5G network, devices are no longer relying on physical machines within the company to function. Instead, they're virtual, using what we call the Mobile Edge Cloud. So for companies we're not just making a 5G network available; we're offering a turnkey IT service. These solutions will save companies money in materials, software and maintenance costs.

Why is 5G a better solution than WiFi, which is already available in most companies?
WiFi does not offer the same bandwidth stability. 5G is a superior service because it can guarantee a perfectly constant speed. In many critical industries, this is an essential requirement, such as a remote surgical operation, for example. The other key advantage of 5G compared to WiFi is that the latency time (ed. note: the delay from when information is sent and when it is received) is just a few milliseconds. That's another key advantage, particularly when millions of data must be processed in real time.

What kinds of companies are interested in these technologies? Are you partnering with other Swiss groups?
We're currently working on about 10 projects with large companies in industries such as pharma, logistics and retail. Due to confidentiality agreements, we can't name any names yet. We should be able to provide more information this autumn. In the public sector, we're exploring opportunities for 5G use with the police, the military and Swiss Federal Railways. We're also involved with building a new cantonal hospital in Aarau, which will be equipped for 5G and is expected to open in 2023.



5G

SWISSQUOTE JULY 2019

SWITZERLAND HITS THE BRAKES

Until now, Switzerland has been the European leader. In mid April, Sunrise and Swisscom launched their 5G network in nearly 150 locations, making Switzerland one of the world's five 5G pioneers. But this is starting to change. Because of growing concern from the population, several cantons – Vaud, Geneva and Jura – have adopted moratoriums on the construction of new antennas, effectively freezing the spread of 5G. They are waiting to find out more about the technology's health effects (see also p. 56). "We're at the head of the pack," says Horisberger. "Now is not the time to slow down if we want to stay in the race."

Jean-Pierre Bienaimé, secretary general of the Brussels-based 5G Infrastructure Association (5G-IA), qualifies this concern: "5G will develop gradually. Europe will be significantly behind if it's not ready by 2022, in other words, if it misses the boat for what I call the real 5G."

The first 5G, currently available in a handful of countries, including Switzerland, is a "non-standalone" version using a network core that is still 4G. As a result: "It's more of a 4G++ than a true 5G," says Bienaimé.

In Switzerland, the 5G network will allow speeds up to two gigabits/second by late 2020, which is roughly double the speed of the best 4G. That's enough to boost video playback on smartphones, but certainly not enough to revolutionise industry.

"We're still a long way from being able to fully explore the potential of 5G," says Coudry, a telecoms analyst for investment bank Bryan, Garnier & Co. "In the short term, the main benefit this technology brings to operators is absorbing the growth in data volume at a lower operating cost than that of 4G. Some are talking about halving the cost of a ▹

gigabyte. We won't see new applications emerge until 2022–2023."

COMPETING NETWORKS

But widespread adoption of this technology isn't a sure bet just yet. There are alternative solutions: "The Internet of Things didn't wait for 5G before developing," says Julien Leegenhoek, analyst at UBP. "Operators have a real incentive to describe this new network as revolutionary and to promise a number of unprecedented applications. But there are competing networks, such as WiFi."

While 5G advocates are already announcing the death of WiFi, some experts don't believe this scenario will actually occur, especially because of 5G's prohibitive implementation cost.

"At the end of the day, it's likely that several standards, including 5G and WiFi, will share the connected objects market," says Leegenhoek. The sixth generation of WiFi (802.11ax), which will start being rolled out in late 2019, will offer speeds of several gigabits and is designed for industrial applications.

> ***"The Internet of Things didn't wait for 5G before developing"***
> **Julien Leegenhoek**, analyst at UBP

For the time being, the Internet of Things will use competing technologies such as Bluetooth, the LoRaWan protocol or WiFi, and it still remains to be seen if 5G will be able to vanquish them all (see infographic on p. 31). "In reality, no one knows which technology will be used for which purposes," says Coudry of Bryan, Garnier & Co. "Nevertheless, it's hard to say right now what future services will arise as a result of 5G technology."

Philippe Horisberger of OFCOM agrees: "When 3G appeared in 2004, no one really knew what the technology could be used for. And then Apple launched its now-famous apps and mobile internet became extremely successful. It will be the same for 5G. It will result in an explosion of new innovations and applications that we have no idea about yet."

A BIG GAMBLE FOR GERMAN MANUFACTURERS

In Switzerland, only three companies (Swisscom, Salt and Sunrise) will be able to develop 5G networks. The Swiss Federal Communications Commission (ComCom) decided, like most European countries, to reserve frequencies for the traditional operators. This will not be the case in Germany. The Bundesnetzagentur decided to allocate some 5G frequencies to corporations, in addition to those set aside for telephone operators (Vodafone, Deutsche Telekom, Telefonica and United Internet). As a result, companies like BASF, Siemens and Volkswagen, that advocated for this decision, can create their own 5G networks without depending on operators. A major advantage is that these companies will be able to determine the schedule of when the network will be built and oversee its quality, as well as guarantee data privacy, since information won't go through third parties. However, experts believe that corporations will have trouble acquiring the necessary expertise. "Telephony is a skill," said Sylvain Chevallier from the firm BearingPoint. "Only a few big companies will be able to master these technologies." To assist them, manufacturers are positioning themselves on the market, such as Ericsson, which in late 2019 will sell a kit for companies with no industry knowledge to develop their own 5G networks.

COMPETING NETWORKS

5G is presented as revolutionary, but it's up against ever-improving competition.

	4G	5G	WiFi	Fibre optics (FTTH)
SPEED	300 Mbit/s	1 Gbit/s	2.2 Gbit/s	10 Gbit/s
LATENCY	25 to 35 ms	10 ms	10 ms	~0 ms
COVERAGE	98% — 98% of the Swiss population.	90% — Currently around 200 communes. All Swiss cities by late 2019 – 90% of the population.	100% — Potentially 100% of the population.	30% — 30% of the population.
ADVANTAGES	The 4G network is already well-developed in Switzerland and will continue to improve. Speeds are eventually expected to reach 1 Gbit/s.	Huge numbers of smart objects can be connected (via the IoT) – up to one million per square kilometre – and it can support applications of all kinds.	Many connected objects work using WiFi, which has the benefit of already being installed in most residences.	Fibre's impressive speeds can be used for any application.
DISADVANTAGES	The 4G network is reaching saturation and will not be able to handle the surge in data consumption.	2022 — It will only be in 2020 or even 2021 that speeds will reach 2 Gbit/s – and 5G will not reach its promised 10 Gbit/s until even later.	WiFi isn't available everywhere, particularly outside buildings.	$ — Requires a cable and isn't available everywhere. Deployment is a long and costly process.

According to the best offers currently available in Switzerland and operator agreements

Sources: Salt, Sunrise, Swisscom

INTERVIEW

"WE ARE A REAL CHALLENGER"

A pioneer of 5G in Europe, Sunrise is putting pressure on Swisscom. In a bold move, the second-largest operator in Switzerland announced the acquisition of UPC in February. CEO Olaf Swantee reveals the battle plan.

BY LUDOVIC CHAPPEX AND BERTRAND BEAUTÉ
PHOTOS: NICOLAS RIGHETTI

5G SWISSQUOTE JULY 2019

With significant increases in profits and steady growth in the number of subscribers, Sunrise seems to be doing quite well, despite sluggish revenue in the first quarter. The Zurich-based company, which is preparing to acquire cable operator UPC (see inset on p. 36) is on the offensive on several fronts. Its current challenge is to make 5G a true alternative to fibre-optic in those regions where cable networks haven't been installed. Olaf Swantee, the group's amiable and energetic CEO, sat down with us for an interview on this and many other topics, all the while having a dig at its number one enemy, Swisscom. We met Swantee at Sunrise's Vaud premises.

People in Switzerland are hesitant to move to 5G because they don't see the advantages. What will this network really do for them?

Nearly one million households in Switzerland don't have access to a fibre connection. Contrary to what you suggest, many people are actually interested in a "fibre over the air" service. Our strategy is to offer 5G to these people who live in places where internet services aren't very fast as a priority. The first customer that we set up in Switzerland is a perfect example of this. It was someone in the Aarau region whose only option was ADSL, which is much slower. This application of 5G does not have the same importance in cities like Geneva, Zurich, Basel or Bern, where fibre is easily available. Of course, this does not prevent us from also deploying 5G for mobile applications. We intend to offer coverage in all regions of Switzerland by the end of 2019.

So you're saying that fibre is still the best option for very high-speed internet.

Correct, 5G will not replace fibre. But currently, only 30% of all households in Switzerland are equipped with FTTH fibre-optic connections (ed. note: the fastest fibre). So 5G is a real opportunity for anyone who doesn't have access – both individual households and companies.

Isn't it more of an opportunity for operators to ease the 4G network, which is becoming saturated?

The data flow over our network doubles every 16 months. It's a significant challenge to absorb that growth. 5G will give us more capacity to handle the data flow increases. But that said, consumers will also benefit. Think about 4K TV or even HD TV: with 5G, it's immediate and truly amazing.

In addition to fast download speeds, the other main advantage of 5G is the reduced latency – the fast response time. It's an advantage for applications that require large upload volumes and simultaneous downloads, such as video games and virtual reality. Consumers will really see the difference between 4G and 5G.

According to the first tests conducted by bloggers, it's not as fast as promised...

Have a little patience – we're only just beginning to deploy the network. We're currently reaching speeds of around 800 Mbits per second, which is at least 6 times faster than 4G. And we'll soon see speeds of one or two Gbit/s. The latency time is currently around 11 ms – three times faster than with 4G. And the benefits ▷

are already there for TV, video game and virtual reality applications. I recently spoke with a tour operator who wanted to show hotels to clients using virtual reality. 5G will make that possible without having to use bulky equipment.

How is your business offering shaping up?
It's one of our expanding markets. And what's interesting is that a large part of our growth comes from contracts with large companies such as Nestlé, Procter & Gamble or Zurich. When I joined Sunrise three years ago, I thought that SMEs would be our target customers.

Specifically in the field of 5G, what services are you planning to offer these companies?
As I mentioned earlier, the most common commercial prospect for 5G will be a branch of a company in a location where high-speed internet is lacking. That's the case for La Poste, for example, to whom we provide internet services. Some of its subsidiaries don't have high-power infrastructure. 5G will allow us to provide them with high-speed internet.

"Some of our clients had never once changed providers before"

5G advocates talk about industrial applications, such as connected machines or telemedicine, which are more exciting possibilities.
Yes, the Internet of Things, or establishing connections with and between machines, is the most talked-about application. But that won't happen overnight, because it requires perfect coverage. For example, connected vehicles will need 100% of the road network covered. And it will take time to get there.

But that doesn't stop our competitor from promoting IoT. We're more reserved and pragmatic. But we're still discussing the possibilities of these technologies with several companies, such as Zurich airport, for example. They are interested in being able to use connected machines to optimise their productivity and lower their energy consumption.

The other area of focus for long-term development is establishing private networks for big companies. For example, a group such as UBS might need a faster network with a very quick response time in order to handle financial transactions. But again, we'll have to wait.

Are you implying that Swisscom is selling a dream?
I'm not saying that our main competitor is only selling marketing, but when I see a sign promoting the availability of 5G in Zurich, despite the fact that network coverage is less than 80%, I can tell you that's not our approach. We're not selling something that we can't provide. Our clients like working with us because we're authentic. It's important to make it clear to them what we can do.

Traditional operators have a reputation – something that reassures people. Won't Swisscom's corporate clients be a little hesitant to switch providers?
Attitudes are changing. Some of our clients had never once changed providers before. And three or four months after signing with us, when I ask if we can use their name in our marketing, they say yes. We've also built excellent relationships with many well-known companies such as Swiss, Rivella, Tamedia, Geneva airport and Zurich airport.

With the acquisition of UPC, the prospect of a Swisscom-Sunrise duopoly is on the horizon. What's stopping the two largest players from reaching an understanding on prices?
The main reason is that even after the merger, we will remain a real challenger. We'll only have a 14% market share in B2B, a 30% share in the internet sector (compared to 53% for Swisscom), and a 26% share in the mobile sector (58% for Swisscom). So we need to challenge them. Our teams want to win customers. We're aware that we are the challenger. We have to prove that we can do better than the competition.

The second reason is that we will continue to offer a progressive dividend to convince investors. And to provide this dividend in the long term, Sunrise needs to grow. What's more, I clearly announced that we were going to lower our prices.

Freenet – your main shareholder, with a 24.5% stake – is against the UPC acquisition. Is that a sign of an improvised merger that investors don't support?
Freenet did not oppose the acquisition, but said that they did not have the financial means to participate in the capital increase. We were ▷

IN FIGURES

+27.4%
The growth of Sunrise's gross operating income (EBITDA) in Q1 2019, reaching 175 million Swiss francs.

35 M
In Swiss francs, the Zurich-based company's net profit in Q1. This figure has more than doubled.

173+
The number of cities in Switzerland in which Sunrise is currently offering 5G.

1,611
The number of Sunrise employees, before its expected merger this year with UPC.

1,876 M
In of Swiss francs, the company's revenue in 2018.

surprised by this comment, which implied that more discussions on a deal were needed. But the Freenet management was an integral part of negotiations over 18 months. We signed a contract. So appearing to call it into question isn't ideal. In any event, we've met with more than 170 investors in Switzerland and abroad, and our project has been extremely well received.

Even though Sunrise shares have fallen in recent months...
The decreased share price is partly due to technical reasons. Firstly, we paid a dividend of 4.20 Swiss francs per share in April. Furthermore, new investors are very interested in purchasing shares but it's normal for them to wait for the Competition Commission to sign off on the merger this autumn. Also, some investment funds, which are designed for a smaller company, are being forced to withdraw.

What could convince private investors to bet on Sunrise?
On the one hand, the merger of Sunrise and UPC Switzerland will be beneficial for growth, innovation and efficiency. On the other hand, the progressive dividend seems to be an attractive offer, especially in a country where this dividend is not taxed. Currently, the dividend yield is around 6%. Companies that have results as excellent as ours with such a dividend are rare. With the acquisition of UPC, we're doubling our cash generation, so our capacity to return impressive dividends remains high.

What security guarantee does your Chinese supplier Huawei provide, given that the US has accused it of espionage?
It's all political drama, not based on fact. The US is punishing Huawei to put pressure on China. But federal authorities have investigated and haven't found anything to criticise Huawei about. Germany and the UK reached the same conclusion. What's more, network security is our responsibility and private data isn't put in Huawei's hands. To guarantee the security of our installations, we run tests and audits and we have software tools that are constantly being updated and that perform checks to ensure the network is working correctly. And legally, we're protected by the contracts that we've signed.

> ***"We're not the first nor the only company to work with Huawei"***

Another very reassuring fact is that we're not the first nor the only company to work with Huawei – in fact, 167 operators around the world currently work with them. It has an approximately 30% market share globally. Do you really think that Huawei would put that business in danger? They're actually quite careful as a company.

What kind of relationship do you have with Huawei?
Huawei's 5G technology is really cutting-edge. That wasn't the case for 2G and 3G, but with 4G and 5G it's dominating the market. Over the years, we have built an excellent partnership. When we have a problem, such as a network outage, Huawei is very reliable and responsive.

5G is currently experiencing a wave of rejection in Switzerland due to its supposed adverse effect on health. Does that concern you?
It's not a rational debate, but I'm not surprised. We received the same wave of criticism when we launched 3G. The big difference is that now, the criticism is accompanied by fake news spread via social media, which has become much more powerful. For example, people have written that birds were falling from the sky in the Netherlands in October 2018 because of 5G. But that's absolutely false. There weren't even any 5G tests being conducted there at the time! According to an article in the *New York Times* dated 15 May 2019, many of these rumours were put about by Moscow because Russia was falling behind in the industry and was looking to slow down other countries. I don't know if that's true, but I'm still very surprised by the sheer amount of fake news that's pretty much everywhere.

You threatened to sue if there was a moratorium on 5G in Swiss cantons. Aren't you afraid that Sunrise's reputation will suffer as a result?
We're not at that point. But it's still very surprising that some politicians are selling us frequencies for a total of 389 million francs and that others want to keep us from deploying this technology.

However, the authorisation procedures are the same as for existing masts and the equipment complies with the standards. So, if there is a moratorium on 5G, it's only logical to apply it to 4G and 3G and 2G. Also, the frequencies in question are well-known and are comparable to WiFi frequencies. We're not using higher frequencies like in the US, for example.

But still, isn't there something unspoken about the future of 5G, in that we'll inevitably see higher frequencies to reach the full power that has been promised?
No. We don't need these high frequencies and I said that to the ComCom. We're not in New York or Hong Kong where you need that kind of capacity because of the millions of people living in those cities.

What I can guarantee is that we're compliant with the current regulations and our technology is similar to that of 4G. It's an astonishing controversy. Actually, we should be proud to be the first country in Europe to adopt 5G.

UPS CABLECOM: AN ACQUISITION AWAITING APPROVAL

Listed on the Swiss exchange since 2015, Sunrise announced in late February that it was to acquire cable operator UPC Cablecom for 6.3 billion Swiss francs. This transaction, which has to be endorsed by the Comco, will make the company a key player in the high-speed internet and streaming television markets, two sectors in which Sunrise's presence currently pales in comparison to that of Swisscom.

To achieve its goal, the Zurich-based company is counting on a capital increase of 4.1 billion francs, which will have to be endorsed by shareholders in the autumn. However, there is one minor issue: Freenet, which holds a 24.5% stake in Sunrise, stated that it did not have enough funds for the transaction. But Sunrise is holding fast, as it believes it will be able to rally investors to its cause. Nevertheless, this uncertainty currently makes the investment somewhat speculative. However, Sunrise's share price improved after publishing promising quarterly results on 16 May. As a result, Sunrise has revised its annual profitability projections upwards slightly. If the Zurich company reaches its goal, it expects to pay out a dividend of 4.35 to 4.45 francs per share. In terms of synergies, it expects savings of 235 million francs from the fifth year after the acquisition. SRCG

SWISS-DUTCH RULE

With his passionate vision and a voluble, even explosive way of speaking, Olaf Swantee has been making his mark on Sunrise since May 2016, when he became the CEO of the Swiss operator. After beginning his career in computing at Compaq and Hewlett-Packard, the Dutchman, now 53, joined Orange-France Telecom as executive vice president. He was then named CEO of UK telecoms operator EE and grew the company to be a world leader. Married to a Swedish woman and father of three children born in Switzerland, Dutch-born Swantee is a Swiss citizen with a Swiss passport. He holds a degree in economics from the University of Amsterdam and an MBA from the European School of Management (ESCP) in Paris.

5G SWISSQUOTE JULY 2019

FROM NATEL TO 5G...

An increasingly powerful mobile network

1978

PTT introduced the first mobile telephone network in, working using the AMPS (Advanced Mobile Phone System) standard. Known as Natel (Nationales Autotelefonnetz, or National Automotive Telephone Network), the network made it possible for people to make telephone calls from their vehicles. In 1980, the Natel B brought true mobility, as users no longer had to be inside a vehicle to make a call. But weighing in at 12 kilos, the device wasn't exactly what you'd call portable. The subsequent Natel C, D, and E were smaller and lighter.

NATEL

1980
NATEL B

1993
NOKIA 1011

2G

The GSM (Global System for Mobile Communications) standard increased widespread access to mobile telephones. The Nokia 1011 (launched in 1993) and the legendary Nokia 3210 (launched in 1999) were particularly successful. 2G networks were ideal for voice and SMS communications. It also allowed limited access to the internet, with speeds of less than 10 kbit/second. In late 2020, Swisscom will switch off its 2G network to make space for more recent technologies, including 5G.

1993

2000

1999
NOKIA 3210

2004

With the arrival of 3G, the UMTS (Universal Mobile Telecommunications System) standard, mobile telephony entered the internet era. In the early days, 3G offered speeds of 1.9 Mbit/second under ideal conditions – enough to read email and webpages on a BlackBerry 7210. But it wasn't until 2007 and the launch of the first iPhone that mobile internet became truly widespread, with the advent of apps. The maximum speed at the time was 40 Mbit/second.

2004
BLACKBERRY 7210
10 MBIT/S

3G

2007
IPHONE 1

2007
ADVENT OF APPS
40 MBIT/S

2012

The fourth generation of mobile telephony standards (4G) was launched to great fanfare in Switzerland by Swisscom in 2012. With speeds of 450 Mbit/second for 4G+, 4G allows users to download large quantities of data, making it possible to watch streaming videos on a smartphone, make internet video calls (Skype) and interact on social media.

2012
STREAMING BEGINS
450 MBIT/S

NETFLIX

4G

2020

5G

2019
4K FILM
10-30 GBIT/S

Being launched simultaneously by Salt, Sunrise and Swisscom in Switzerland, 5G is promising to revolutionise mobile telephone use. With speeds that will eventually reach 10 Gbit/second and even 30 Gbit/second, it will be possible to download a 4K film in just a few seconds. For consumers, this technological leap will mean new services, especially for augmented reality and gaming. But it's industry that will draw the greatest benefit from this new network.

2019

A look at five concrete examples

As the capacities of mobile networks increase, 5G will allow a whole host of new uses to flourish. But beware of marketing spin.

BY BERTRAND BEAUTÉ

Phil Harrison, vice president of Google, on stage presenting Stadia. The Californian giant's streaming game service aims to revolutionize the gaming market (San Francisco, March 2019).

STEPHEN LAM / REUTERS

THE TIME FOR CLOUD GAMING

One of the advantages of 5G is its latency (the delay between the request and the signal response), which is reduced to its simplest expression – one millisecond, or 10 times faster than 4G. It's so fast that every action seems to take place in real time. The gaming industry in particular will benefit from these speeds. Currently, games that require a significant amount of resources can only be played on specific PCs. Cloud gaming is when computing power is hosted by a server and not on a consumer's device. This means that the most resource-heavy games can be played on any machine, including smartphones. So it's no coincidence that giants like Google and Microsoft are currently developing their streaming video game services, hoping to be the future Netflix of gaming.

ISTOCK

CARS THAT TALK TO EACH OTHER

In the future, vehicles will be able to communicate with each other and with the infrastructure around them. For example, when a light turns red, the car receives that information, starts to brake and warns the car behind it, and so on. The dashboard computers will also receive information in real time about traffic, accidents, available parking spaces and environmental conditions. This will help keep traffic moving in congested cities, improve road safety and reduce greenhouse gas emissions.

While the auto industry as a whole shares this vision for cars of the future, it is still unclear whether 5G will become the standard that will prevail in this enormous market. In fact, the auto industry is rather divided in terms of which standard to adopt. Manufacturers such as Daimler, Ford and PSA are proponents of the C-V2X (Cellular Vehicle to Everything) standard designed to run on 5G networks. But Volkswagen, Toyota, Renault and Volvo all support a Wi-Fi-based solution. The problem is that these two systems are completely incompatible.

Cars will be able to engage emergency braking

Behind the scenes, players for both sides are trying to convince governments to choose their technology. China, home to the largest auto market in the world, opted for C-V2X, or 5G. But in April 2019, the European Parliament made the opposite choice, going for the Wi-Fi standard ITS-G5. If the European Union maintains its position, auto manufacturers could see their costs skyrocket if they have to launch two systems, one domestically and the other for exports.

From a technological standpoint, independent experts agree that 5G will, in time, be the better technology in terms of security, reliability, signal strength and latency time. For example, cars will be able to recognise a pedestrian via their smartphone and engage emergency braking to avoid hitting the pedestrian. In places with good coverage like cities, 5G will provide geolocation in real time within one metre. But Wi-Fi advocates say that a complete deployment of 5G will take years and the technologies needed to launch it don't exist yet. Comparatively, Wi-Fi is already available and is less expensive to develop and maintain than 5G. Furthermore, operators will charge for 5G data.

VIDEO SURVEILLANCE: BIG BROTHER IS WATCHING YOU

In July 2017, a fire broke out at the Shell Pernis refinery in Rotterdam, the largest refinery in Europe. The site had to be shut down. Could this happen today? Since 2018, Shell has tested 5G video surveillance at its Shell Pernis facilities. Mobile robots equipped with ultra HD cameras continuously inspect the refinery's pipelines in order to detect possible leaks. This is a difficult task for humans, since there are 160,000 km of pipes, which is enough to circle the earth nearly four times. Several smart sensors were also distributed to measure the behaviour of the facilities in real time and to send an alert in the event of any abnormal situation. All the collected data feeds into predictive maintenance algorithms in order to reduce costs by optimising maintenance work.

More generally, 5G will significantly improve video surveillance performance, and this is not limited to industrial sites. During the Roland-Garros tennis tournament in July 2018, the technology was used to broadcast live video in ultra-high definition with 8K resolution. With such precision available in all video surveillance cameras, security guards (or algorithms, more likely) will be able to detect an anomaly at a location or identify a fugitive much more quickly. This is especially true since 5G solves another problem: with data transmitted directly to the cloud and no longer stored on a hard drive, images of all sizes can be saved virtually indefinitely. This possibility will certainly lead to issues in terms of fundamental freedoms.

A demonstration of the Chinese company Horizon Robotics. This firm develops video surveillance solutions for smart cities, based on 5G technology.

JAMES ATOA / NEWSCOM

The port of Rotterdam is one of the most important industrial sites in line for the use of 5G. Tests are currently being conducted to optimise logistics flows.

KEES TORN

FREIGHT GOES DIGITAL

In November 2017, *Swissquote Magazine* published a feature on the Dutch port of Rotterdam, one of the most innovative ports in the world. Thanks to 5G technology, the digitisation of this gigantic port – which welcomes 140,000 ships and 460 million tonnes of goods each year – will happen even faster. Since 2018, the port of Rotterdam is home to an industrial 5G field lab – a laboratory created by KPN, Shell, Huawei, ExRobotics, Accenture and ABB in order to test potential 5G applications on the docks. For example, by using smart sensors, port authorities can collect information in real time about ship traffic and containers coming and going. The goal is to cut down on docking time in order to allow more ships to come in.

In general, infrastructure operators (ports, airports, railways) are closely following 5G technology, as it can monitor goods in real time and automate loading and unloading processes by using autonomous machines. Since late 2018, for example, China's Qingdao port – the sixth-largest port in the world with 19.3 million containers per year – is testing a transhipment crane that is automated via a 5G connection, in partnership with Ericsson and port machine manufacturer Shanghai Zhenhua Heavy Industries (ZPMC).

TELEMEDICINE IN THE SPOTLIGHT

A first! According to information reported by Chinese public TV channel CGTN, a team of doctors successfully completed a remote surgery using 5G in March. A Chinese patient with Parkinson's disease received a brain stimulator, which was implanted in his brain by a surgeon located 2,500 km away. This was made possible thanks to Huawei and China Mobile's 5G network. The surgeon could direct the articulated arms of a medical robot remotely and in real time.


Remote consultation between two hospitals in Paris.

AFP

Virtual medical appointments will exceed in-person visits in the United States by late 2020

Will telesurgery, a medical dream for the past 20 years, become widespread with the advent of 5G? The answer is no. First of all, remote surgery is not new. Back in 2001, surgeons in New York operated on a patient at Strasbourg University Hospital 7,000 km away, thanks to an ultra-fast connection using fibre optics. Compared to the first remote surgery, 5G makes it possible for doctors to intervene in places that don't have cables, particularly in military operation locations, regions devastated by natural disasters or medical deserts.

But while the capacities promised by 5G make this type of intervention technologically possible, there are too many obstacles in the way of making remote surgeries widely available.

To do these surgeries, teams need medical robots that can replace surgeons' hands. These machines are extremely costly and can only be found in the major hospitals of rich countries. Furthermore, these major medical hubs are full of specialists, but telemedicine is designed to fill in for when these specialists are not available.

Regardless, 5G will accelerate the development of telemedicine. After a car accident, for example, emergency paramedics can be assisted in real time by specialists at the closest hospital. In addition, video medical consultations are currently rather rare but are expected to increase. According to Forrester, virtual medical appointments will exceed in-person visits in the United States by late 2020. But the first medical application of 5G is less obvious. In the short term, 5G will improve patient care by monitoring and guiding patients through various hospital services. It will also help older people remain independent in their own homes for longer, with the help of multiple sensors.

BEHIND THE SCENES OF A BITTER WAR

The fifth generation of mobile telephony is caught in a geopolitical trade war between Washington and Beijing.

BY BERTRAND BEAUTÉ

Brussels, Tuesday 5 March 2019. At the corner of Rue Guimard and Rue du Commerce, nearly 200 people – European civil servants, telecoms experts, journalists and lobbyists – were gathered in front of a newly renovated plexiglass building. It was here, in the centre of the European quarter, that the Chinese giant Huawei was inaugurating its Cybersecurity Transparency Centre to great fanfare. The space is open to the public, politicians and customers as a place for the Chinese firm to demonstrate its "commitment to cybersecurity".

Over the past few months, the communications department for the traditionally discreet company has been hosting increasing numbers of events like these. In early 2019, for example, journalists were invited to visit Huawei's facilities in Dongguan, China. The goal is to reassure western governments that there's nothing to worry about at a time when the United States is waging a fierce campaign against the Chinese company, accusing it of spying on the world for the Chinese government, particularly via its 5G infrastructure.

The stakes are high: 5G promises to connect a multitude of vital devices – telephones, factory machines, hospitals and airports, not to mention military applications

The stakes are high. Unlike 4G networks, which exist primarily to make telephones work, 5G promises to connect a multitude of vital devices – telephones, of course, but also factory machines, hospitals and airports, not to mention military applications (high-speed connections between soldiers, vehicles and robots). This means that 5G infrastructure will be handling extremely sensitive data – so there's reason for concern among those in high places. It's "terrifying", according to a comment made by US Secretary of Commerce Wilbur Ross in April 2018.

To protect the US from potential intrusions, Donald Trump quickly declared a "national emergency" on Wednesday 15 May in order to officially ban foreign companies that are deemed a risk to the US telecoms network market – a measure targeting Chinese companies Huawei and ZTE. And the US president isn't stopping there. "Washington is pressuring its allies, particularly Germany and the UK in Europe, to also ban Chinese 5G manufacturers," says Thomas Coudry, a telecoms analyst for investment bank Bryan, Garnier & Co.

While New Zealand and Australia have followed the lead of the United States, European countries are resisting despite enormous pressure. This March, for example, Washington threatened Germany with reconsidering its cooperation in military ▷

intelligence if Berlin didn't ban Chinese manufacturers from its 5G networks. To take the heat out of the situation, Huawei founder Ren Zhengfei had to break his silence and grant the BBC an interview in February, a move he hadn't done since 2015. "Huawei would never harm its customers," said the 74-year-old CEO before becoming more aggressive: "The United States cannot crush us. The world needs us because we are more advanced".

"What the US is currently doing is incredible and unprecedented in the history of telecoms," says an industry expert. "It's going so far as to offer financial support to foreign telecoms operators." This is because replacing Chinese companies would be very expensive for those operators. Huawei has very strong and long-standing relationships with Deutsche Telekom in Germany, Sunrise in Switzerland, BT in the United Kingdom and Telecom Italia in Italy. "We are very satisfied with our relationship with Huawei," Olaf Swantee, CEO of Sunrise, told our magazine (read the interview on p.32). "It's more a political concern than a security issue. The United States is using Huawei to put pressure on China because their trade negotiations have hit a dead end."

On Friday 10 May, the United States announced it would increase tariffs from 10% to 25% on 5,700 Chinese goods, a measure worth $200 billion, after negotiations failed. Beijing immediately declared it would take "necessary counter-measures." As a result, Chinese telecoms manufacturers are in the middle of a particularly brutal trade war.

To justify its policy against Huawei, Washington is claiming a matter of "national security". But is it really? As of now, the White House hasn't provided any substantial evidence of possible backdoors in Huawei infrastructure. The US government is condemning what it considers to be a concerning legal framework in China: article 7 of the 2017 National Intelligence Law, under which all Chinese companies must cooperate with national intelligence services. This implication is a bit rich coming from the United States, given that the NSA had the unfortunate habit of implanting backdoors in US-made routers intended for export, as uncovered by the secret documents published by Edward Snowden in 2013.

"All these security concerns are legitimate. You cannot be naive or paranoid"

Thomas Coudry, a telecoms analyst for investment bank Bryan, Garnier & Co

But Huawei isn't completely innocent. In 2010, for example, Motorola pressed charges against the company for bribing a dozen or so of its employees. One was stopped at Chicago airport, ready to leave for China with 1,000 pages of sensitive documentation in his luggage. More recently, in 2014, T-Mobile initiated proceedings against the Chinese company for stealing data on its robot Tappy,

Chinese President Xi Jinping (left) is not missing an opportunity to support Huawei. Here in London in October 2015, with company president Ren Zhengfei.

which it used to test smartphones. Huawei was also accused by the US Justice Department of offering bonuses to its US employees who stole technology from rival companies.

"All these security concerns are legitimate. You cannot be naive or paranoid about Huawei's potential risk," says Thomas Coudry, a telecoms analyst for investment bank Bryan, Garnier & Co. "But banning Chinese manufacturers is also a political and economic issue."

To understand why, we need to go back to the early 2000s. When 2G was being rolled out, Beijing decided to develop its own standard rather than adopting the European GSM. It wasn't an absurd decision, but rather a long-term vision that allowed its companies to learn the telecoms business. In less than two decades, China became the top telecoms market in the world, with national champions Huawei and ZTE booming and becoming global leaders. According to IHS Markit, Huawei now dominates the telecoms equipment sector, with a 31% share of the global market in 2017, just ahead of Swedish firm Ericsson (27%) and Finnish company Nokia (22%).

And the Shenzhen-based group, whose revenue reached $107 billion in 2018, hopes to profit from 5G to gain even more market share. Its research centres are hard at work, thanks to the $2 billion invested in this new technology since 2009. According to some experts, Huawei's 5G products will be a year ahead of its competitors and will be priced up to 20% lower. Its goal is to become indispensable, if that's not already the case – Huawei claims to have put more than 1,500 networks into service around the world. "The telecoms industry is a key industry for national sovereignty," says Sylvain Chevallier, partner and head of telecoms at BearingPoint. "It's important for states to maintain their ability to innovate in this industry."

So it's not surprising that the United States wants to avoid China dominating 5G networks, because that would make the US dependent on Chinese infrastructure. "US leadership in 5G technology is a national necessity for economic growth and competitiveness," said Ajit Pai, president of the Federal Communications Commission (FCC), at a 2018 summit at the White House.

According to some experts, Huawei's 5G products will be a year ahead of its competitors

In the short term, banning Huawei will benefit two other global 5G leaders: Finland's Nokia and Sweden's Ericsson. The two Scandinavian groups already generate significant profits in the United States, where Chinese equipment is banned. "In the rest of the world, Huawei, Nokia and Ericsson are waging a gruelling battle," says Chevallier.

Currently, the Swedish group seems best positioned to take advantage of the lack of trust in Huawei. "The first 5G deployments in the world (in the United States and South Korea) were completed with European equipment from Ericsson," says Chevallier. But it may not be enough to revive an industry that has taken a battering in recent years. "Their margins dropped considerably when Huawei came on the market," says Chevallier. This highly competitive environment led to Nokia's acquisition of French-American company Alcatel-Lucent in 2016. And figures show that telecoms manufacturers are still struggling to turn a profit. In the first quarter, Nokia recorded a loss of €59 million (read the company profiles on p. 48).

This shake-up piqued the appetites of two other players that hope to benefit from the situation. One is South Korean conglomerate Samsung, whose network branch completely missed the boat on 4G, and the other is US-based Cisco, which is lying in wait. In a February 2019 report, Cisco is presented as a future 5G leader by 2022 – the date when the technology will truly take off. According to figures from the US company, 5G connections will only make up 3% of mobile connections in the world in 2022, compared to 54.3% for 4G. The real switch-over will occur after that date, and Cisco hopes to benefit from the timing. To help make up for lost time, the company will be able to count on the unwavering support of the US government. ◢

On 15 May, US President Donald Trump placed Huawei on its blacklist, making it almost impossible for the Chinese company to buy US-made goods.

#7 COMPANIES THAT HAVE THE RIGHT FREQUENCY

In the short term, the deployment of 5G will mainly benefit telecoms equipment manufacturers and chip makers. We feature some of the best.

BY BERTRAND BEAUTÉ

#Broadcom
The RF filter expert

FOUNDED
1961

HEADQUARTERS
SAN JOSE (US)

EMPLOYEES
15,000

2018 REVENUE
$20.5 BN

CAPITALISATION
$115 BN

AVGO

Broadcom is thrilled. With the deployment of 5G, its products seem destined for success. The US company produces RF (radio frequency) filters for smartphones. The filters choose the correct range of frequencies. This type of component is playing an increasingly vital role in the move to 5G. While a current 4G telephone manages approximately 40 frequency ranges, it is expected to double for 5G.

As a result, the global filters market will take off, reaching $22.5 billion in 2023, compared to $8 billion in 2017, according to the firm Yole Développement. As a supplier to Apple and the global industry leader, Broadcom is particularly well positioned to take advantage of this market. While most analysts recommend purchasing shares, Broadcom must compete with Qualcomm, Qorvo, Skyworks Solutions and Murata.

PAU BARRENA / GETTY IMAGES

The Qualcomm booth at the Mobile World Congress held in Barcelona this February made a strong impression. The company presented its latest innovations in the 5G sector.

#Qualcomm
The king of 5G modems

FOUNDED
1985

HEADQUARTERS
SAN DIEGO (US)

EMPLOYEES
35,400

2018 REVENUE
$22.73 BN

CAPITALISATION
$99 BN

QCOM

It was a major win. In mid April, Apple and Qualcomm ended their legal battles that had been going on for several years. While the terms of the peace agreement were not published, it is without a doubt a huge success for Qualcomm, whose share price soared 30% following the announcement and has yet to fall.

According to figures circulating in the media, Apple agreed to pay $6 billion to its supplier to end the commercial disputes. But this sum is only a small percentage of the jackpot that Qualcomm won. While the chip manufacturer's products were banned in iPhones (which used Intel chips instead), the company could once again sell its semi-conductors to the Cupertino group, which would bring in $8 or $9 per every iPhone sold. While that price seems high for Apple, it's most likely the company's best solution. In fact, without this agreement, Apple may not have been able to launch its iPhone 5G before late 2020 – its partner Intel was running behind on the 5G front.

Qualcomm, which was already a market leader for 4G cellular modems and conquered nearly 50% of the global market according to firm Strategy Analytics, is now the leader in 5G chips. Its new modem, SnapDragon X50, was already chosen by ZTE, Oppo, Vivo, OnePlus and Xiaomi. Most analysts recommend purchasing shares.

SHAN YUQI / KEYSTONE

At the Hannover Fair in April, Ericsson introduced a spider robot powered by the 5G network.

#Ericsson
The Swedish revival

Ericsson employees have earned their Aquavit. After a long empty period and a difficult restructuring, the Swedish telecoms supplier has found success once again. In the period from January to March 2019, the group recorded a profit of 2.4 billion kroner (€230 million).

It's an incredible performance, especially since the company lost 725 million kroner during the same period a year earlier. The results were buoyed by operators investing in 5G such as Swisscom, which chose Ericsson to deploy its network in Switzerland. The Swedish company is now the global leader in deploying 5G infrastructure. It directly benefited from decisions made by the United States and other countries to ban Huawei infrastructure in their countries.

In Q1 2019, Ericsson's sales increased 43% in the US market compared to Q1 2018. Most analysts advise to keep shares. The fierce competition with Huawei and Nokia for the 5G market could weigh on margins.

FOUNDED 1876
HEADQUARTERS STOCKHOLM (SE)
EMPLOYEES 95,400
2018 REVENUE SEK 210.8 BN
CAPITALISATION SEK 299 BN
ERIC

#ATC
The tower manager

A long, calm river: since 2002, the share price of American Tower Corporation (ATC) has continually increased, going from $1.5 in September 2002 to more than $200 today. And it will likely climb even more. For technical reasons, 5G networks need many more relay antennas in place than for 4G. ATC is no other than the global leader for the sites that host the antennas. The company builds towers and then rents them to operators that install their antennas on top. The US company now has more than 170,000 communications sites across 17 countries, including 41,000 in the United States. Most analysts recommend keeping shares, as they are already well valued.

FOUNDED 1995
HEADQUARTERS BOSTON (US)
EMPLOYEES 5,000
2018 REVENUE $7.4 BN
CAPITALISATION $89.5 BN
AMT

#Cellnex
Europe's tower leader

The news broke in early May. After Sunrise decided to sell off its telecoms antennas business to Cellnex, Salt – another Swiss operator – sold its fleet of 2,800 antennas for €700 million.

The company now has 45,000 towers across six European countries (Spain, France, Italy, Switzerland, Netherlands and the UK), compared to only 7,000 in 2014. Comparatively, its competitor American Tower Corporation (ATC) has 170,000 sites around the world, but only 4,500 in Europe. Most analysts recommend purchasing Cellnex shares.

FOUNDED 2015
HEADQUARTERS BARCELONA (ES)
EMPLOYEES 1,400
2018 REVENUE €898 M
CAPITALISATION €8.89 BN
CLNX

AND ALSO...

CISCO: THE US LEADER

When it comes to 5G infrastructure, Cisco is far behind Huawei, Ericsson and Nokia. But the US company hopes to become an industry leader by 2022, when the "real" 5G will be deployed with speeds of 10 Gbit/second. It's a difficult challenge, but Cisco can count on support from the White House, which considers 5G to be a national priority.

EMPLOYEES: 74,200
2018 REVENUE: $49.33 BN
CSCO

INTEL: OUT OF THE RACE

Following the partnership between Qualcomm and Apple, Intel announced in April 2019 that it was leaving the smartphone market. The group will continue to supply its 4G chips used in the iPhone 7 but its 5G modem, dubbed XMM 8160 and expected in 2020 to equip the future iPhone, will not be released. Nevertheless, Intel won't completely abandon 5G. It will focus on developing 5G chips for PCs – a sector that the company has more control over compared to the smartphone industry.

EMPLOYEES: 107,000
2018 REVENUE: $70.8 BN
INTC

MEDIATEK: 5G CHIPS

In December 2018, Taiwanese chip manufacturer MediaTek presented its first 5G modem, the Helio M70. The group mainly collaborates with Chinese smartphone manufacturers, such as Oppo and Vivo, and is expected to profit from the boom of 5G mobile phones.

EMPLOYEES: 74,500
2018 REVENUE: TWD 275.5 BN

#Nokia
The patient Finnish company

FOUNDED 1865
HEADQUARTERS ESPOO (FI)
EMPLOYEES 102,800
2018 REVENUE €22.56 BN
CAPITALISATION €24.17 BN
NOKIA

One person's misery doesn't necessarily mean joy for another. While Nokia was expected to benefit from the arrival of 5G and the US ban on Chinese suppliers (Huawei and ZTE), the Finnish supplier is actually going through a difficult period. In Q1 2019, the company recorded an unexpected loss of €59 million, compared to a profit of €239 million in the first three months of 2018.

Analysts polled by Reuters were expecting total profits to range between €175 million and €457 million. After selling off its telephone business to Microsoft in 2013, the former global leader in mobile telephony changed course to focus on the telecoms infrastructure market and acquired Alcatel-Lucent in 2016. Since then, the company has suffered from a sluggish demand for 4G equipment. The move to the next generation is expected to spark a new cycle for Nokia, which already has more than 30 contracts signed around the world for 5G infrastructure, particularly with operator Salt in Switzerland.

But so far, Ericsson is the best positioned to take advantage of Huawei's setbacks, and analysts remain cautious about Nokia shares.

ANDREU DALMAU / KEYSTONE

Nokia CEO Rajeev Suri at the Mobile World Congress in Barcelona.

#Qorvo
The other radio frequency specialist

FOUNDED 2015
HEADQUARTERS GREENSBORO (US)
EMPLOYEES 8,600
2018 REVENUE $3.09 BN
CAPITALISATION $7.85 BN
QRVO

In early April, US radio frequency parts manufacturer Qorvo announced it was acquiring Active-Semi International. With this acquisition, Qorvo hopes to "create new growth opportunities in 5G", according to the press release. As a wireless network specialist, Qorvo provides radio frequency solutions (antennas, filters, amplifiers) for WiFi, 4G and 5G modems designed for smartphones.

The company is one of Apple's suppliers. Active-Semi International produces circuits designed to manage the power supply and charge of batteries. These products improve battery consumption in smartphones and connected objects. As energy efficiency becomes increasingly important, especially for objects connected via 5G, Qorvo estimates that the acquisition will increase its market opportunities to reach more than $3 billion. Due to the 5G deployment, Goldman Sachs revised its recommendation from "neutral" to "buy".

MURATA: JAPAN'S FILTER EXPERT

A supplier to Apple, Japanese group Murata makes RF (radio frequency) filters, which are particularly important for 5G to work properly. The company is expected to benefit from the boom of this technology.

EMPLOYEES: 77,500
2018 REVENUE: ¥ 1.575 BN
6981

SAMSUNG: A GIANT AWAKENS

In February, French telecoms operator Orange surprised many by choosing Samsung to develop its 5G network. Very far behind its competitors Nokia, Ericsson and Huawei, the South Korean company is investing heavily to break into this market. But Samsung's Network division still has a long way to go. According to Dell'Oro Group, the company only has a 3% share in the global telecoms infrastructure market, compared to 28% for Huawei.

EMPLOYEES: 320,000
2018 REVENUE: $219 BN
005930

SKYWORKS: THE ANTENNA TUNER

Like its competitors Murata, Qorvo and Broadcom, Skyworks Solutions develops RF electronic components for smartphones. The US company is well-known for its range of Sky5 modules specifically used for 5G.

EMPLOYEES: 8,400
2018 REVENUE: $3.868 M
SWKS

ZTE: THE OTHER GIANT

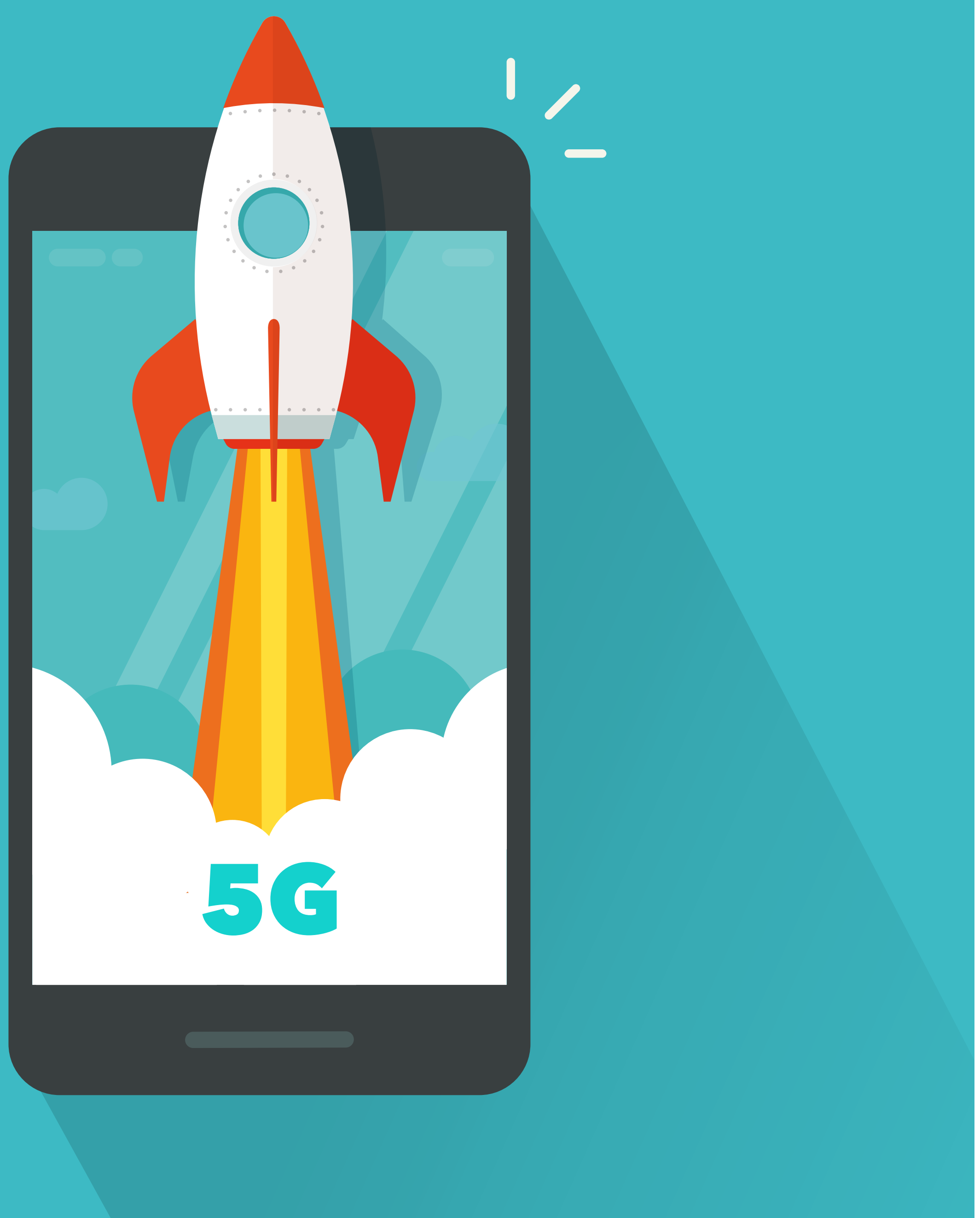
Another Chinese firm, ZTE, is active in 5G networks. At the Mobile World Conference in Barcelona in February, it won the 2018 Global 5G Infrastructure Technology Leadership Award". But hit by US sanctions, the company is struggling.

EMPLOYEES: 75,000
2018 REVENUE: CN¥ 85.51 BN
000063

SMARTPHONES MANUFACTURERS ARE RACING TOWARDS 5G

After a tough year, mobile phone manufacturers are counting on 5G to boost sales

BY BERTRAND BEAUTÉ



Putting the cart before the horse? While no country in the world has yet launched a 5G network, all smartphone manufacturers (with the notable exception of Apple) made the most of the global renown of the Mobile World Congress, held in Barcelona in February, to unveil their first devices that are compatible with the technology. But why were companies so excited to unveil their smartphones when the 5G market doesn't even exist yet? "Samsung and especially Huawei are also telecoms equipment manufacturers which design antennas and other infrastructure necessary for 5G," says telecoms expert Pascal Martin. "For them, launching new devices is a way to push operators to deploy 5G as fast as possible and as a result make their investments in R&D profitable."

For other brands, such as LG, Oppo and Xiaomi, the move to 5G is more of a marketing strategy: "It allows these groups to present themselves as innovative, at the cutting edge of technology," says Martin. "There's the same approach with foldable smartphones: they are flagship models that are designed to make the brand stand out." In short, they boost sales in a slumping market. According to analysts International Data Corporation (IDC), 1.4 billion smartphones were purchased globally in 2018, down 4.1% over one year – the worst year in the history of the industry.

"The arrival of 5G could boost this very mature sector by accelerating the need to upgrade devices," says Sylvain Chevallier, a partner in charge of telecoms at consulting firm BearingPoint. But this transition could happen very gradually. "Given the services available with a good level of 4G coverage, the advantages of 5G aren't very clear for consumers," says Julien Leegenhoek, a technological assets analyst at Union Bancaire Privée (UBP). "How many people need an ultra-fast connection on a daily basis and are willing to pay more for it? For the time being, demand for this type of service seems pretty low."

"The advantages of 5G aren't very clear for consumers"

Julien Leegenhoek, a technological assets analyst at Union Bancaire Privée

According to consulting firm TrendForce, only 5 million 5G smartphones are expected to be sold worldwide in 2019, equivalent to 0.4% of all mobile telephone sales. This could increase to 7% of total sales by volume in 2020 and 18% in 2022. That's not enough to revive the global smartphone market, which may even shrink by almost 5% in 2019, according to estimates from IDC.

APPLE IS THE EXCEPTION

On the list of brands announcing their new 5G smartphones, one notable company is missing. Apple won't launch a 5G iPhone before 2020, unlike its main competitors. Is this a risky move? Not necessarily. The Cupertino firm has prior experience in this type of situation. During the transition from 3G to 4G, Apple also waited a year before unveiling a compatible model, and did not encounter any blowback. As for the move to 5G, Apple's hesitation stems primarily from the legal issues it has been embroiled in in recent months. For its 4G models, Apple relied on Intel – but Intel wasn't able to supply 5G chips until 2021.

To break the stalemate, Apple had no choice but to reconcile this April with Qualcomm, its former processor supplier, with whom it had been in a legal battle since 2017. The US company is the only one capable of providing Apple with the essential 5G modems, as there are no other contenders (Huawei is banned in the United States and Samsung produces its own components). By signing a new contract with Qualcomm, Apple accelerated the arrival of the 5G iPhone and stabbed Intel in the back. Outpaced, Intel announced a few days later that it was pulling out of the smartphone market. ◢

IS 5G DANGEROUS?

The ultra-connected future promised by 5G has sparked growing concerns. Some fear that this technology could lead to health problems. Here's the latest on what science says.

BY BERTRAND BEAUTÉ

On Friday 10 May, about a thousand people showed up to support the citizen collective "Stop 5G", marching next to the Federal Palace on the Waisenhausplatz in Bern. They were seeking the immediate adoption of a moratorium on the development of 5G antennas. This new demonstration is proof of a growing wave of dissent against the latest generation of mobile telephony in Switzerland. At the time that this article was written, 61,710 people signed the petition "against 5G" and a survey conducted in mid April by the magazine *L'Illustré* showed that 54% of Swiss residents feared that 5G waves could be harmful to their health.

Operators are dismissing the concern. "We've already done this," said Urs Schaeppi, CEO of Swisscom at a press conference on 10 April. "Some people were asking the same questions about 3G. And no health risks have been shown." Olaf Swantee, CEO of Sunrise, told us exactly the same thing (read the interview on p. 32). In short: keep moving, nothing to see here!

"Operators are trying to make us believe that 5G has no risks, that it's exactly like 3G or 4G. But that's not true," said Olivier Bodenmann, a Vaud engineer who is very active in the Stop 5G movement. "This technology has never been tested. So the people will be guinea pigs without our consent."

More than 25,000 scientific articles have been published on the impact of radio frequencies used by mobile telephones

To try to calm the uproar, the government tasked the Federal Office for the Environment (OFEV) in September 2018 to conduct a study on "the risks of launching 5G networks". The results will be published this summer. "It's strange to just be doing research now when operators have already launched 5G and the network is growing every day. Shouldn't we have studied the potential effects beforehand?" asked Bodenmann. "Furthermore, the impartiality of the government is questionable, considering it has already sold 5G frequencies to operators."

So what's the truth? Over the last 30 years, more than 25,000 scientific articles have been published on the impact of radio frequencies used by mobile telephones. "Some believe that this research is insufficient, but the scientific knowledge acquired on this subject is now much more than we have on most chemical products," said WHO, before affirming: "As of now, no undesirable health effects attributable to prolonged exposure to radio frequencies have been confirmed."

This conclusion was refuted by opponents who bring up several research articles, some of which are worth citing. In November 2018, for example, the very official US National Toxicology Program (NTP) published the results of a study that

Hundreds of people protested against 5G on 10 May in Bern because of the harmful effects that they believe could engender this technology.

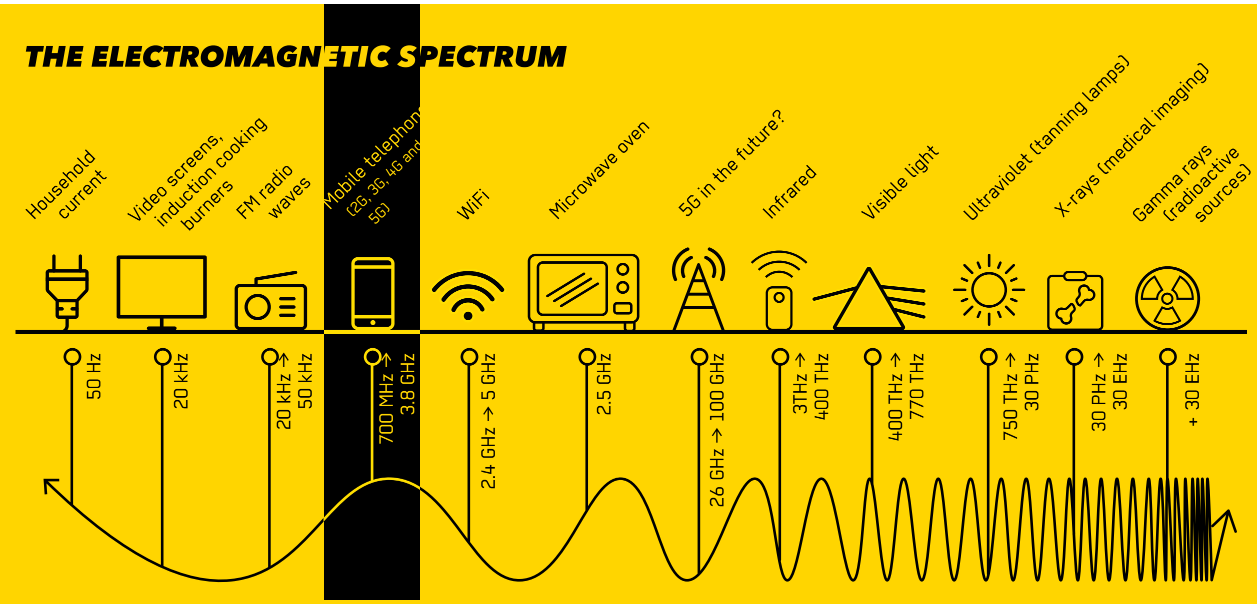
STEFAN WERMUTH / AFP

was presented as the largest study ever done on the subject. Conducted over nearly 10 years for approximately $30 million, the study shows that male rats exposed to radio frequencies of 900 MHz, used by 2G and 3G, have a higher chance of developing certain types of brain cancers.

But surprisingly, the female rats were spared. Even more surprising is that the life expectancy for male rats exposed to the radio frequencies was higher than the control group… "We believe that the link between radio frequencies and tumours in male rats is real," wrote the authors. "But these results cannot be transposed to humans, especially because the rats received waves all over their bodies which has never been the case for telephone use."

One of the largest studies on humans, known as "Interphone", was published in the *International Journal of Epidemiology* in 2010. The results showed that no increased risk of tumours was observed after using a mobile telephone over 10 years. Some of the data suggest an increased cancer risk for people who use mobile phones the most, but due to bias and errors, no conclusion can be made. Faced with this uncertainty, WHO advised to limit exposure to radio waves and decided to classify radio waves as "possibly carcinogenic for humans" in 2011, even though it believes "no significant risk increase has been proven in adults or children, regardless of the type of cancer".

Is 5G different than previous generations? More toxic? "In Switzerland, the frequencies used for 5G are very similar to those for 4G," said physician Pierre Zweiacker, author of *Vivre dans les champs électromagnétiques* [Living in electromagnetic fields] and former head of the Electromagnetic Compatibility Laboratory at EPFL. "From this perspective, the situation will be very similar to what we know ▷



The multiplier prefixes (kilo, mega, giga, tera, peta and exa) are separated by a factor of 1,000. The X-ray wave thus has a frequency approximately ten million times greater than that used in mobile telephony.

today. So 5G will not be more dangerous than 4G."

Indeed, the frequencies currently used in Switzerland for mobile telephones (2G, 3G and 4G) range from 800 to 2,600 MHz. 5G extends this range slightly, from 700 to 3,600 MHz. But it is a known frequency, as WiFi frequencies go up to 5,000 MHz (see infographic).

However that is likely to change. In the current spectrum, 5G speeds cannot exceed 2 Gbit/s. But promoters of this technology have promised speeds of 10 Gbit/s to 30 Gbit/s. To reach that speed, it will be necessary to use "in the longer term an even higher range of frequencies (the range of tens of gigahertz), also called millimetre waves", wrote the federal government in a letter to the Cantons on 17 April 2019. While no timeline has been set, the prospect is concerning. "Millimetre frequencies are much more unknown in the telephone industry," said Zweiacker. So new studies will have to be done to prove they are harmless, even though these frequencies are already used in other technologies such as radar and radio navigation.

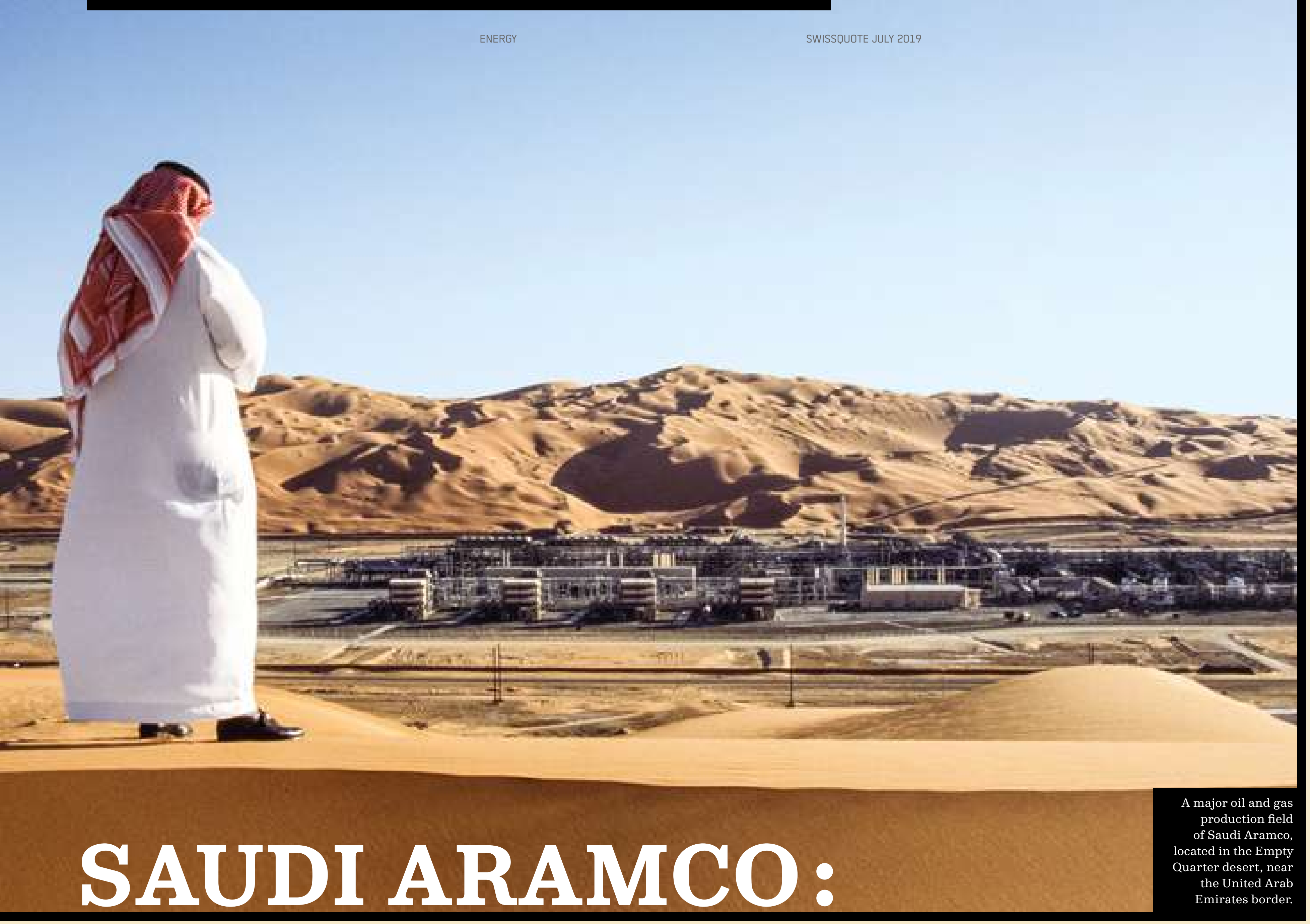
Another issue brought up by 5G opponents is the number of antennas. Currently, approximately 19,000 locations host nearly 35,000 relay antennas in Switzerland, i.e. one antenna for every 230 residents. "With 5G, the number of relay antennas will increase because as wave frequencies get higher, their reach decreases," said Zweiacker. "Nevertheless, the legal limits remain unchanged. So exposure will still be below recommended levels."

Implemented in 1999, the Ordinance on Protection against Non-Ionizing Radiation (ORNI) limits antenna emissions to 4 to 6 volts per metre (V/m) and exposure, which is what humans receive, to 28 to 61 V/m depending on the frequencies. For years, operators have lobbied intensely to raise these limits. They haven't been successful yet.

But the issue still stands: currently Switzerland does not have a system to measure 5G waves, particularly due to the fact that adaptive antennas will be used, which direct waves towards users, whereas traditional antennas just radiated waves everywhere. Therefore, how can the government ensure that radio frequency levels are below the authorised limits?

"We don't know how to measure the emissions from these antennas, but they're being built regardless," said Bodenmann. "I worry that measuring methods will change so that 5G stays within the legal limits." "When 3G (UMTS) and 4G (LTE) were introduced, measuring methods could only be developed once these technologies were already in place, which took several months each time," reassured the federal government in its letter to the Cantons.

But deep down, perhaps people are angry for a different reason: "I'm not against the technology," said Bodenmann. "But what's the purpose of always going faster? 4G is generally sufficient for the vast majority of the population. 5G was invented to make us consume more, force us to buy new smartphones and connected objects... without worrying about the impact of radio waves on our health. It makes no sense."◢



A major oil and gas production field of Saudi Aramco, located in the Empty Quarter desert, near the United Arab Emirates border.

NEWSCOM / BARRY IVERSON PHOTOGRAPHY

SAUDI ARAMCO: THE GIANT PREPARING FOR ITS IPO

ENERGY SWISSQUOTE JULY 2019

The mysterious conglomerate is gradually revealing more about itself before going public. It's the largest oil group in the world, making more profits than all its competitors combined. We take a closer look.

BY JULIE ZAUGG

In late March, Saudi Aramco announced a bond issue worth $12 billion. To present this offer, which was entrusted to JPMorgan Chase and Morgan Stanley, the Saudi oil giant organised a promotional tour in eight cities across the US, Europe and Asia. In London, investors were welcomed in upscale meeting rooms in the Corinthia Hotel. In New York, the CEO of JPMorgan Chase Jamie Dimon made an appearance. The finance world didn't need any persuading: Saudi Aramco bonds attracted bids of $100 billion.

Investors were drawn in by a 469-page prospectus, published before the bond issue. The document provides the first look behind the scenes of the world's largest oil group. "The group's oil production is multiple times greater than all of its competitors combined, it has access to immense reserves and its operational costs are much lower than its competition," says Norman Valentine, research director at energy consulting firm Wood Mackenzie.

The Saudi firm, which produces approximately 10% of the world's crude oil, generated $360 billion in revenue last year. It has 257 billion barrels in its reserves, and its ▷

3 FIGURES

$111 BN
Saudi Aramco's net revenue in 2018 – more than Royal Dutch Shell, ExxonMobil, Chevron, Total and BP combined.

13.6 M
The number of barrels that the Saudi firm extracted per day in 2018. As a comparison, ExxonMobil produced 3.8 million barrels per day.

$1,500 BN
The current valuation of Saudi Aramco, which is expected to go public in two years, according to Bernstein Research.

enormous Ghawar field is also the world's largest: this field alone generates 3.8 million barrels per day – equivalent to US giant ExxonMobil's total daily production across all fields. Furthermore, extracting one barrel costs Saudi Aramco only $7.50, compared to around $30 for competitors, which makes it extremely profitable.

"Its very low production costs are the result of Saudi Aramco's monopoly on Saudi oil," explains Jim Krane, from the Center for Energy Studies at Rice University in Texas.

AMERICAN ROOTS

Saudi Aramco owes its beginnings to US oil companies. In 1933, Standard Oil of California received an oil lease from the Saudi government, 50% of which was transferred to Texaco three years later. In 1938, the two partners – operating under the name California-Arabian Standard Oil – discovered large oil reserves, sounding the starting gun for the Saudi oil industry. In 1944, their joint venture was renamed Arabian American Oil Co. (Aramco). Four years later, Standard Oil of New Jersey (the future Exxon) and Socony Vacuum (the future Mobil) purchased 30% and 10% of Aramco's shares respectively. In 1950, the firm began to share its profits with the Saudi state, pressured by King Abdulaziz. Between 1973 and 1976, Aramco was gradually nationalised, with support from the United States and Israel during the Yom Kippur War. True to its American origins, the company has retained its liberal values. Many of its employees live in residential complexes filled with restaurants, cinemas and basketball courts. There are also several women in executive positions.

NEWSCOM / BARRY IVERSON PHOTOGRAPHY

The Ras Tanura oil refinery, largest in the world, owned and operated by Saudi Aramco, situated in the eastern oil-rich province on the shores of the Gulf.

"The group also enjoys another advantage: crude oil from this region, concentrated near the Gulf, is naturally pushed to the surface by significant underground pressure, and it contains very little water, which makes extraction easier." And since the oil fields are located on land owned by the state, the company doesn't need to acquire the land or pay commission to its owners.

Too good to be true. And yet, Saudi Aramco's profitability is not perfect. Each barrel extracted in 2018 only brought in $26, whereas firms such as Shell and Total recorded profits of $38 and $31 per barrel, respectively. "Saudi Aramco's tax bill is extremely high because the Saudi government depends almost entirely on the company to finance its operations," explains Ayham Kamel, head of Eurasia Group's Middle East and North Africa research team. Between 2015 and 2017, the oil giant contributed more than 70% of Riyadh's income, according to figures from Fitch Ratings. Last year, Saudi Aramco paid $102 billion in taxes to the Saudi government, as well as a dividend of $58 billion.

The Saudi firm generated $360 billion in revenue last year

"The government doesn't hesitate to pressure the company to generate more money," adds Kamel. It also sets its production levels based on "energy sovereignty objectives and other considerations", according to the bond issue prospectus.

Indeed, the crown prince hopes to finance his big projects for futuristic cities with revenue from Saudi Aramco

Because of this association, the company could suffer from political instability generated by the current transition to the third generation of the Al Saud dynasty led by Mohammed bin Salman, according to Krane. Indeed, the crown prince hopes to finance his big projects for futuristic cities and luxury tourist complexes along the Red Sea with revenue from Saudi Aramco.

"The volatility of oil prices is another risk for the company," says Valentine of Wood Mackenzie. In 2016, when prices fell to $32 a barrel, Saudi Aramco made just $13.3 billion in profits – 12% less than it made in 2018. Furthermore, demand for black gold will likely fall over the next decade as governments begin initiatives to fight climate change. "This context will reduce oil prices," says Kamel.

To mitigate this risk, the Saudi conglomerate is looking to diversify its sources of revenue. "It is seeking to double its gas production over the next 10 years and increase its refining capacity to 10 billion barrels per day, but it is also aiming to process three billion barrels into petrochemical products, such as plastics," says Alan Gelder, a refining specialist at Wood Mackenzie. Funds generated by its bond issue will help finance the acquisition of 70% of SABIC, a Saudi petrochemical group, for $69 billion.

"Saudi Aramco has recently invested in refineries located in South Korea, Malaysia, China and India – countries where the demand for oil will continue to grow in the coming years," Gelder adds. Last year, the group acquired a gigantic refinery and petrochemical complex in Johor on the Malaysian peninsula. In February, it signed a $10-billion contract with Chinese arms company Norinco to develop a similar site in Panjin, in north-eastern China. It has also begun exporting its gas in liquid form. "Its first liquefied natural gas (LNG) cargo was sold in late April," says Gelder.

The next step for the conglomerate will be to go public. Initially announced in 2016, it has been pushed back several times. "The IPO is now planned for 2021," says Valentine. Only 5% of its shares will be up for sale, for a value of $100 billion – but it will be the largest IPO ever listed. Stock exchanges will be sure to compete fiercely to try to land this big listing.

ANALYST'S ADVICE

"A PROFIT-MAKING MACHINE"

Even though it hasn't gone public yet, Saudi Aramco is closely monitored by analysts. "It's a veritable profit-making machine," says Rehan Akbar of Moody's. Indeed, the Saudi firm enjoys a phenomenal cash flow when oil prices are high. "Even when prices are low, the company remains profitable, unlike many of its competitors that are faced with higher costs," says Akbar. Saudi Aramco also has a very solid balance sheet with low debt: it makes up just 5-15% of its assets, compared to 30% for BP, for example. The company's main risks are geopolitical, due to its location in Saudi Arabia. "This context is why we have given it an A1 ranking (ed. note: which is a lower ranking than the big Western oil companies)," says Akbar. The analyst believes that oil will continue to generate the majority of the company's revenue, at least in the near future, although refining, petrochemical products and gas account for a growing percentage of its income.

Professional livestreamers

In China, many livestreamers receive virtual gifts sent by their fans. Some are even brand ambassadors. Now streaming platforms are looking to cash in.

BY JULIE ZAUGG, HONG KONG

Mr Bags, a Chinese star streamer who loves handbags. He has partnered with big industry names, such as Montblanc and Longchamp.

ROBERTRO FRANK

The tension is unbearable. Shen Man, a Chinese livestreamer who spends her days talking with fans and singing songs on videos posted to the YY platform, is participating in the platform's annual contest. The event will crown the internet star that receives the most paid votes. "I'm not calm... Hurry up and vote!" said the 21-year-old woman with long black hair and a tense smile. Shen Man, who earns $40,000 per month from her videos, will end up earning $186,503 from her fans. And she'll win the contest.

This scene is one of many in the documentary *People's Republic of Desire*, which delves into the lives of several internet stars. The Chinese livestreaming industry is a strange world. There are young women with porcelain skin who sing playback vocals in a studio decorated to look like a bedroom, migrant workers telling dirty jokes, farmers demonstrating eel fishing and professional gamers devoted to *Honor of Kings*, a Chinese video game. Some film live, while others post short videos – less than one minute long – that are pre-recorded.

Each of these platforms has around 100 to 300 million active users per month

"It's a very lucrative industry that is worth more than 5 billion yen (757 million francs) and whose annual growth is approximately 15%," said Yuwan Hu, analyst at Daxue Consulting. In 2018, livestreaming had 425 million users, while the short videos segment had 520 million, according to Hu. The most well-known stars can earn up to 40 million yen (6 million francs) per year, but the majority of livestreamers make just enough money to live on.

The first platforms – YY and Six Rooms – began around 2008. They were quickly joined by a whole host of other sites and apps. There are now more than 200 platforms in the country. YY, MOMO and Yizhibo, all listed on the Nasdaq, are some of the biggest names (see also Analyst's Opinion on p. 69), along with Inke and Meipai, both listed on the Hong Kong exchange, and Huajio, which is preparing its IPO. Huya and Douyu are focused on gamers, whereas Douyin and Kuaishou are popular for short videos and Bilibili is the choice for anime fans.

"Each of these platforms has around 100 to 300 million active users per ▷

FACTORIES OF LIVESTREAMERS

The livestreaming industry has become so important in China that there are now incubators to cultivate internet stars. "These agencies find and train talent, provide video content and manage careers," said Zhicong Lu, a researcher at the University of Toronto. "Agencies even buy followers and virtual gifts for their stars, in order to boost their popularity."

Some of these firms take a percentage of revenue from their stars (10–20%) while others provide a monthly salary. Ruhnn, which raised $125 million in early April during its Nasdaq IPO, is one of these livestream factories. It represents 113 stars, who generated sales equivalent to 2 billion yen (303 million francs) in 2018.

month," said Hu. Douyin (ed. note: known as Tik Tok outside of China) actually has more than 500 million." Some are testing innovative formats, such as Huajiao, which just created a virtual reality livestream channel.

WESTERN LIVESTREAMING LAGS BEHIND

Livestreaming is far less advanced in the west, but there are still some well-known platforms: Periscope, Facebook Live, YouTube Live and Instagram Stories. "The one with the most users is Twitch, which specialises in videos of gamers," said Zhicong Lu, a researcher at the University of Toronto. This genre dominates the segment in Europe and the United States, along with public events streamed in real time and "private" streams which are only seen by close friends. "In China, this genre barely even exists," said Lu. "Most livestreamers are broadcasting to an audience of strangers." The sources of revenue are also different. Livestreamers in the west generate most of their revenue from subscriptions that fans pay for.

Style blogger Becky Fang sold 100 turquoise Mini Coopers in five minutes

To generate revenue, the platforms run adverts within the videos as a link or a banner. But for the most part, they rely on virtual gifts paid for by fans. Stickers of roses, beers and little hearts pop up on the screen as livestreamers receive them, and viewers pay on average a handful of yen for each sticker. "But some gifts can be up to 3,000 yen (454 francs)," said Hu. A virtual Porsche costs 666 yen (100 francs) on Inke. To encourage fans to spend more money, the names of the most generous donors are displayed in the corner of the livestream.

The platform receives a commission on virtual gifts, which can be between 30% to 70% based on the notoriety of the streamer. The star can then convert the rest into real money. Annual competitions, such as the one described in *People's Republic of Desire*, make it possible for livestreamers to earn a lot of money in a short time. "During these events, it's not unusual to see fans spend 800 or 1,000 yen (120 to 150 francs) to support their favourite livestreamer," said Zhicong Lu, a researcher at the University of Toronto who has studied the phenomenon for several years.

Another source of revenue is brand partnerships with internet celebrities. "Web stars will produce specific content designed to promote a brand's products," said Cyril Drouin, head of e-commerce strategy at Publicis in China. In 2017, Jaeger-LeCoultre partnered with Papi Jiang, a comedian with 27 million followers on Weibo, to film a video about its new Reverso watch line.

Similarly, Mr Bags, a streamer who loves handbags, partnered with Givenchy, Longchamp and Montblanc. He even produced a capsule collection with Tod's. Style blogger Becky Fang was recruited by Burberry, Giorgio Armani and Tiffany & Co. In 2017, she sold 100 turquoise Mini Coopers in five minutes after promoting the car on her WeChat account. "In China, consumers are very suspicious, because there is a lot of counterfeiting and frequent food scandals," said Drouin. "This form of promotion reassures consumers, because it's coming from personalities that consumers trust."

In exchange for their services, streamers receive payment from brands that ranges "from 5,000 yen (760 francs) for lesser-known stars to 1 million yen (151,000 francs) for big stars," said Drouin. Here too, platforms receive a commission. In 2017, sales generated through brand partnerships reached 33 billion yen (5 billion francs), according to consulting firm Frost & Sullivan.

DR

A livestreamer in action for the Douyu.com platform, here at a square in Wuhan City, Hubei Province, on 31 December, 2018.

KEYSTONE / MAXPPP

ANALYST'S OPINION

GROWTH, COMPETITION AND CENSORSHIP

The future of livestreaming is bright for investors as well. Due to the sheer number and loyalty of their users, platforms YY, MOMO and Bilibili are most favoured by analysts. Yizhibo is another platform to follow, since it is integrated with Weibo (Chinese Twitter) and hosts many celebrities, giving it a competitive advantage. Huya is also promising: despite a loss of $282 million in 2018, its share price has gone up 55% since it went public a year ago.

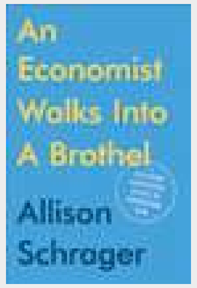
But like Huya, most streaming platforms in China are in the red. Douyu, which just requested an IPO on the New York exchange, lost $127 million in 2018 and Inke lost $36 million in 2017. This industry is fiercely competitive. Platforms are also subject to the risk that the celebrities hosted on their sites will fall in and out of favour with the public. They also haven't found a truly profitable way to make money, like many other social networks.

Furthermore, the fact that these companies are up against censorship from the government doesn't help. The Chinese government shut down 400 apps last year, accusing them of hosting content that was "violent, pornographic, or promoting gambling and other immoral values". On the Kuaishou platform, tattoos and expletives are now banned. "The platform had to hire hundreds of censors to monitor all its content," said Lu. A very popular video genre, where young women eat bananas in a suggestive manner, was also banned, as well as a series of livestreams filming teenage mothers.

Some streamers have even started to sell products through platforms integrated with e-commerce sites Taobao and JD.com. "The products are shown and described during the livestream and viewers can buy them directly via a link superimposed onto the video," said Jun Wen Woo, an online video expert at IHS Markit.

It's an interactive experience that allows consumers to ask the streamer questions and get a real idea of what the product is like. Kuaishou, Yizhibo and MOMO have also started integrating e-commerce functionality into their livestreams. Cosmetics, infant formula and produce all sell quite well this way. ◢

TO READ, TO DOWNLOAD



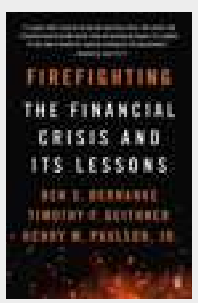
CHF 30.-

AN ECONOMIST WALKS INTO A BROTHEL

AND OTHER UNEXPECTED PLACES TO UNDERSTAND RISK

By Allison Schrager
(Portfolio, 2019)

What's riskier: making an action film or a horror one? What's the best time to get to the airport? By answering these questions and many others, New York economist Allison Schrager presents five principles for better managing risk in economics, a topic to which she has dedicated much of her career. This fascinating and enjoyable read provides clear examples and numerous interviews with figures dealing with questions of risk, from a US general in Iraq to the Manhattan paparazzi.



CHF 20.-

FIREFIGHTING

THE FINANCIAL CRISIS AND ITS LESSONS

By Ben S. Bernanke, Timothy F. Geithner, Henry M. Paulson Jr.
(Profile Books Limited, 2019)

What better than a report by the decision-makers themselves to help understand the underlying causes of the 2008 crisis? That's the subject of this highly-anticipated book, authored by former Fed president Ben Bernanke with the support of former Treasury secretaries Timothy Geithner and Henry Paulson. Examining the causes of the crisis in great detail, the three authors explain their actions that, according to them, prevented the crisis from becoming a second Great Depression. The authors hope that this enlightening read will be useful for their contemporaries and successors alike.

Free
Google Play

FIREFOX SEND

SECURE FILE SHARING

This new application from Mozilla, the developer behind the Firefox browser and messaging client Thunderbird, allows users to send encrypted files securely from end to end in just a few clicks. With a maximum size of 2.5 GB per file, the app easily covers most file-sharing needs.

Free
Google Play
App Store

GEEKBENCH 4

WHAT'S UNDER THE BONNET ?

As the name indicates, Geekbench is designed for users who like to measure the performance of their devices, including smartphones and computers. From RAM usage to graphics cards and stress tests on all types of CPUs, Geekbench 4 has everything covered.

Free, with paid upgrades
App Store

ELK

FAST CURRENCY CONVERTER

An incredibly useful and easy-to-use app, Elk converts sums of money into various currencies in the blink of an eye. The concept? Rather than requiring precise sums entered by hand, the app provides a set of pre-established and up-to-date amounts that serve as benchmarks. The free version includes a few basic currencies, but the paid version is necessary for more exotic ones.

Free
Google Play
App Store

SPEEDTEST

THE INTERNET SPEEDOMETER

When it comes to connection speeds, both wired and mobile internet providers tend to advertise much greater performance than what users really experience. Speedtest can quickly verify actual connection speed though a series of tests with conclusive results.

AUTO

Serial winner

BMW has restored its mid-range model back to its former glory. The new 3 Series features the same agile, dynamic handling that established the car's reputation, with undeniably premium styling. We tested it.

BY RAPHAËL LEUBA

BMW 320D XDRIVE

ENGINE:
FOUR-CYLINDER, TURBO DIESEL, 1995 CM3
HORSEPOWER:
190 HP AT 4,000 RPM
ACCELERATION:
0 TO 100 KPH: 6.9 SECONDS
PRICE:
STARTING AT CHF 56,000

After substantially diversifying its line-up with various SUVs, minivans and even a range of electric vehicles, BMW has got back to work on its talismanic series, the classic 3 Series saloon. The range, launched in 1975, remains a mainstay for lovers of "active" driving. Ever faithful to BMW's golden rules, this Series 3 possesses a good mix of style, practicality and performance, both in terms of handling and technological features.

Faced with the difficult task of updating its longstanding model, BMW's designers have come up with a design that meets expectations. Despite adding a few centimetres to its length (+8.5 cm to 4.71 m), this seventh generation – G20 – remains easily identifiable. The M Sport trim, the version we tested, certainly looks impressive. It compares very well with the Alfa Giulia and the Jaguar XE, to name only two competitors with the same engine architecture (longitudinally-mounted engine, rear-wheel drive or optional four-wheel drive). Its sleek, tapered lines are easy on the eye and promise an impressively low drag coefficient of 0.23 CdA, although this is somewhat mitigated by the sporty additions and the wider tyres of our 320d xDrive. The same blue used on the four-piston front brake callipers is also found on the striking edging around the laser headlamps! Fans of *Game of Thrones* will need to keep their cool when they cross swords with this king of the night! Devastatingly efficient in the dark, its adaptive LED headlights are nevertheless harmless.

At the rear, the lights are reminiscent of the i8, underscoring a large 480-litre boot that comes with hands-free opening. The three-way split-folding rear seats are a plus, but the aesthetic effect is spoiled by the visible beige panel. Inside, there is an undeniably high-end feel, boosted by the outstanding "M" seats. The early, rather austere generations of the 3 Series are long forgotten. The latest incarnation comes with an imposing array of buttons, screens and sensors, all seamlessly integrated into a sophisticated decor. It takes a while to get to grips with all the features, but the "BMW Intelligent Personal Assistant" provides the answers to any mysteries. The driver-turned-magician can use the side cameras to create the illusion of being everywhere at the same time and turn the audio volume down with a simple flick of the finger! We come back down to earth by switching the diesel engine on. Its gravelly noise is softened by the car's double glazing, and almost disappears entirely once we move off. A trusted partner for many years, the eight-speed ZF automatic gearbox is now updated with proactive settings. It goes almost unnoticed, demonstrating its efficiency. The fully pixelated dashboard leaves us somewhat lukewarm in an era where even fridges have a digital screen. It must be said that BMW's analogue dials were close to perfection in terms of legibility, and this touch of authenticity is sadly missed. On the road, we preferred to look at the remarkable head-up display, even if it meant displaying the speedometer or other power meters on the central touch screen.

This 320d xDrive is unquestionably a good long distance machine

The archetypal dynamic saloon with agile handling, the 3 Series lives up to expectations on the road. Assured through corners, well-balanced and with incisive handling, it brakes hard whilst ensuring passenger comfort with adaptive dampers combined with the various driving modes. When you add the flawless traction provided by the xDrive AWD system to this rather flattering picture, the potential of the chassis clearly exceeds that of the engine, which is somewhat unassuming. That is not to say that the 190 hp, 400 Nm two-litre diesel engine is disappointing in terms of standstill and in-gear acceleration – quite the opposite – but it doesn't deliver the kind of feeling and character that you might expect, given its evocative physical presence. This 320d xDrive Pack M, with Adblue low-emissions technology, is unquestionably a good long-distance machine (observed fuel economy of 5.5 litres on Swiss motorways and nine litres per 100 km in sports mode). However, with the price of the tested version approaching an eye-watering 85,000 Swiss francs, there are ways of opting for a livelier version if you are prepared to forgo some bits of kit. For example, the famous six-cylinder engine comes with the 330d in a 265 hp (diesel) version or with the M340i in a 375 hp version. In any case, captivated by its rock-solid image, customers are unlikely to baulk too much at spending big on such a first-rate car. That's the magic of the 3 Series. ◢

THE ALTERNATIVE

ALFA ROMEO GIULIA

A benchmark among D-segment sports cars. Focusing more on the essentials, the "berlina" sculptural design shies away from excessive high-tech equipment. Is that really such a bad thing?
2.2 JTD Q4 Veloce 210 hp
From CHF 56,000

TRAVEL SWISSQUOTE JULY 2019

The historic centre of Valparaíso.

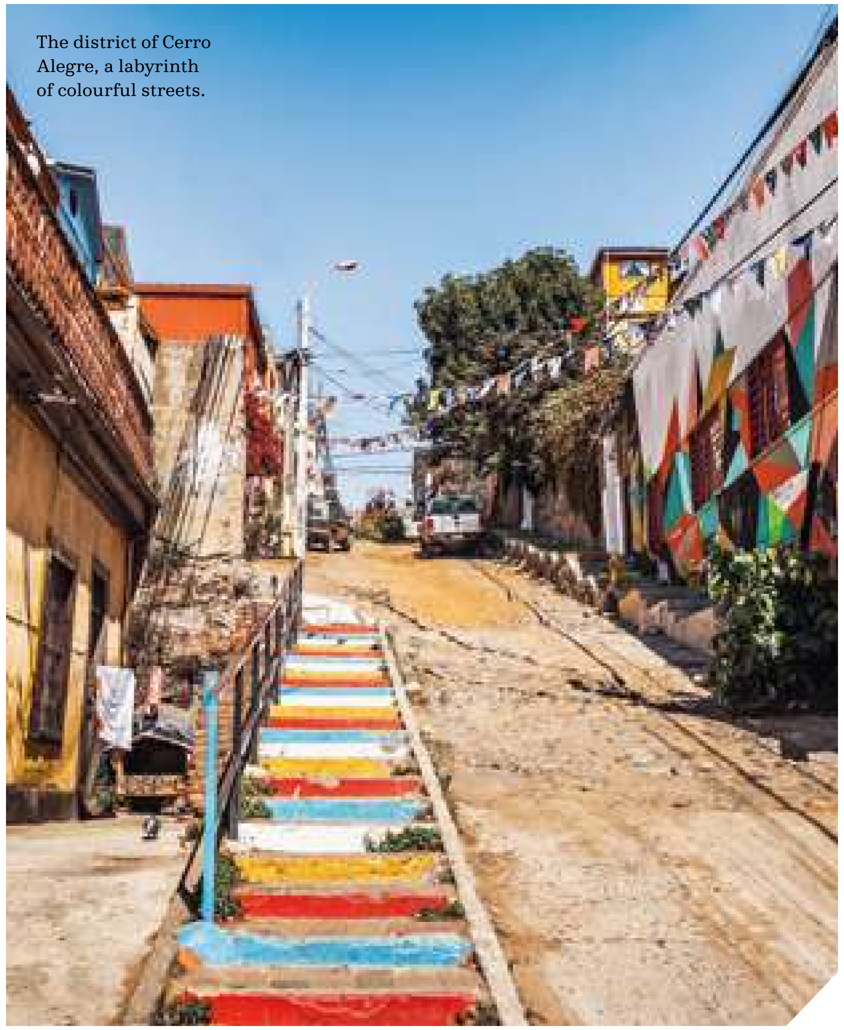
TRAVEL

The hills of Valparaíso: just a step away from paradise

Chile's urban gem is an antique theatre that looks out onto the ocean, inviting visitors to upend their sense of direction as they wander through its streets.

BY SALOMÉ KINER

Before arriving in Valparaíso, visitors from the West land in Santiago, as there is no airport in the coastal city. The immense capital city, nestled in a valley between two cordilleras, cloaks its charm under clouds of fog and glass skyscrapers. Nonetheless, Santiago is worth a stop, if only to wander the colourful streets in the Bella Vista neighbourhood. Students practice their swings in public squares. Busy businessmen have lunch in the Plaza Baquedano diners. At night, when you're practising your folk songs at ▷



The district of Cerro Alegre, a labyrinth of colourful streets.

ISTOCK

GETTING THERE

From Geneva or Zurich, flights to Santiago with a stop in Madrid start at 900 Swiss francs per person.

To get to Valparaíso, you have two options: rent a car at the airport and take route 68, or take the bus for a round trip of approximately 20 francs.

recorrido.cl

PLACES TO STAY

Boutique Hotel Acontraluz for its beautiful décor and terraces overlooking the bay.

Starting at 150 Swiss francs per night
hotelacontraluz.cl

the local bar, hunger will strike. Head to the street stalls and order a *completo*, a Chilean hot dog covered in avocado purée, traditionally followed by a *mote con huesillos*, a dessert drink made of wheat grains, caramelised syrup and dried peaches. It may sound strange, but try it – you'll love it.

The next day, walk up Cerro San Cristobal, a hill at the top of which you'll find a statue of the Virgin Mary. From there, admire the divine panorama of buildings and stadiums… hidden under a layer of smog. On the funicular back down, Valparaíso's horizon and the Pacific Ocean will seem within touching distance.

The name of the city – pronounced like a song – means "paradise", as if seventh heaven were divided into forty-four hills. It's difficult to describe the hallucination that visitors experience the first time they see the steep, multicoloured, untamed hillsides of Valparaíso. From the Mirador Paseo Yugoslavo, experience breathtaking architectural vertigo as the city descends into the ocean like a gull on its prey. Afterwards, head to the Palacio Baburizza, an Art Nouveau building that is now home to a fine arts museum.

It's difficult to describe the hallucination that visitors experience the first time they see the steep, multicoloured, untamed hillsides of Valparaíso

You can reach this exceptional vantage point via the El Pera funicular. The jolting carriages, considered historic monuments dating from the last century, are the only ones still functioning out of the 30 that used to run in the city. The neighbouring Reina Victoria funicular ends at the terrace of the Fauna, an ideal spot for having lunch while taking in views of the bay and freight ships.

At Fauna, try the *ceviche* (a marinated raw fish speciality) with a *pisco sour*, a Peruvian cocktail that has become popular in Chile, with each bar offering its own take on the drink. From there, the cerro Alegre neighbourhood is an open-air museum, best experienced by strolling through the tiny winding roads as you admire the street art frescoes and the apparent chaos of houses stacked and mixed together as far as the eye can see. Following the hand-painted signs (digital assistance is strongly recommended), you may come across La Sebastiana. A jewel perched on a hill, it is one of Pablo Neruda's three houses in Chile, along with La Chascona in Santiago and Isla Negra where he is buried. You don't need to know all the Nobel Prize winner's poems by heart to enjoy the guided tour of Neruda's former hiding place. Keeper of madcap items, lover of old maps, master prankster and king of cocktails, Neruda also loved the ocean. He loved it even more from land: the windows of his house are a succession of frames offering various views of the seascape. The documentary film that retraces his life also gives an overview of Chile's political history in the 20th century.

El Cajón del Maipo, an excursion near Valparaíso.

SHUTTERSTOCK

HIKING IN THE VALPARAÍSO REGION

Many travellers visit Chile's cities before discovering the country's natural sites packed with exceptional phenomena. From Cape Horn to Torres del Paine national park, Patagonia is globally renowned as a haven for adventure-seekers. Many less extreme excursions are also available in the Valparaíso and Santiago region known as El Cajón del Maipo. This canyon is located at the foot of the Andes, on the border of Chile and Argentina, in the Maipo river basin where several tributaries meet.

Visitors can discover terrain resembling moonscapes, as well as barren, tobacco-coloured, emerald and vine-covered landscapes and dust-covered roads that are visually striking even before you step foot on them. A paradise for kayaking, rafting and climbing, El Cajón del Maipo can be explored either on foot or on horse if you wish to reach the Las Animas waterfalls or San José volcano. The most fearless explorers will climb the San Francisco glacier.

Activities and organised tours:
cajondelmaipo.com

The riches of the Pacific can be found in the alleys of Caleta Portales. San Pedro, patron saint of fishermen, watches over this fish market that dates back to 1930. The reineta, a white fish and queen of the grill, will have you salivating at the makeshift stalls. The street vendors' faces are tanned by salt, sun and seaside life, and their voices mix with cries from seagulls perched on the roof of the market. Fillet preparers, in a tidy row, work in a fascinating choreography. Below, under the dock, a colony of sea lions flap on the beach, waiting for a tasty morsel to be tossed down. With its plastic chairs and weathered façade, El Rey del Pescado Frito is the best place to savour fried food alongside locals in the port.

The Pacific coastline is unmissable with its stunning sunsets over the water

The Pacific coastline is unmissable with its stunning sunsets over the water. While gazing at the sun as it sinks into the sea, you can also make out the Concon dunes and the beaches of Viña del Mar, a coastal resort neighbouring Valparaíso and accessible via public transport. "Valpo" seems both ancient and modern, but might not be ideal for fans of untamed landscapes. Those discerning folk can head to the hillside village of Quintay to dine with their feet in the sand, visit the former whaling factory-turned-museum and watch the waves break on the cliffs.

BOUTIQUE

SUMMER BREEZE AND SHADE

With its leaf shape inspired by nature and off-centre stand, the Leaf for Life moveable parasol absorbs wind energy, and its shape is designed to not blow away. Ideal for the beach and boating, this sunshade is equipped with a 16W flexible solar panel and a USB port for recharging electronic devices. The umbrella's material also has double UV protection.

leaforlife.com

CHF 135.-

A WELL-MAINTAINED SLOPED LAWN

With four motorised wheels, Husqvarna's Automower 435X AWD mows lawns by navigating around obstacles and even mows sloped areas at a 70% incline. The all-terrain robot can be controlled remotely via smartphone or by voice using the Alexa personal assistant. In addition to its range of 1 hour 40 minutes, it can detect objects using ultrasound and stop automatically if there is an object in its path.

husqvarna.com

CHF 5,650.-

SUSTAINABLE BAGS

California-based outdoor sports brand The North Face has partnered with London designer Christopher Raeburn to create a collection of bags made from recycled tents. Whether a tote bag, backpack or shopping bag, each model is unique, with straps emblazoned with the motto of the UK-based designer who specialises in upcycling military apparel: "Remade, Reduced, Recycled".

thenorthface.ch

From CHF 115.-

ELECTRIC JETSURFING

A new sport for gliding aficionados, the jetsurf is a motorised board that can glide on a flat sea, lake or other surface without large waves. The latest from Czech leader Jetsurf, the board is unique in that it uses an electric motor. At 180 cm long and only 15 kg, the board can reach up to 50 km/h and has a range of 35 minutes non-stop.

jetsurf.com

From CHF 11,000.-

39,000 GOLF COURSES ON YOUR WRIST

Equipped with multiple technologies including a GPS, accelerometer, gyroscope and microphone, the new TAG Heuer Connected Modular 45 Golf Edition provides golfers with 3D maps of 39,000 courses around the world, as well as a complete analysis of the golfer's performance via an app. The 45 mm watch has a white band with green stitching and a black ceramic bezel laser-engraved with the numbers 1 to 18, for the 18 holes on a course.

tagheuer.com

CHF 1,950.-

A SUITCASE FOR THE GLOBETROTTING CYCLIST

Travel the world with your bicycle: German manufacturer B&W's XXL suitcases are designed to transport a range of bike models. Equipped with a top shell that can be removed to make packing easier, a patented self-tightening buckle system and adjustable pull-handles, the newest bike box can hold an entire bicycle with a frame size of up to 62 cm.

b-w-international.fr

CHF 360.-

FAST PIZZA AT HOME

Designed by the English inventor Tom Gozney, the Roccbox can cook a pizza in 60 seconds flat. With gas and wood burners combined with a highly refined insulation system, this portable oven can reach up to 500°C in just 15 minutes. Light and compact, it is easily transportable thanks to its retractable feet. It can also be used as a barbecue grill.

gozney.com

CHF 645.-

J'AI TESTÉ

DÉGUSTER DE LA TOMME VAUDOISE À 125 MÈTRES DU SOL

PAR MARTIN LONGET

Swissquote Magazine a gravi la plus haute antenne de Suisse, à Sottens, dans le canton de Vaud. Une aventure qui allie découverte du patrimoine et sensations fortes.

La terre paraît bien loin à cette hauteur vertigineuse. Surtout au bout d'une très longue échelle verticale qui n'en finit plus de monter – ou de descendre, c'est selon. « Vas-y, encore quelques mètres », m'encourage mon guide, ancien pompier professionnel de la ville de Lausanne. Encore un dernier effort et me voici arrivé au sommet, à 125 mètres à pic au-dessus du sol. La vue sur la campagne environnante est magnifique, même en ce temps maussade.

Le concept: une ascension conviviale où l'on prend son temps

Structure unique en Suisse, l'antenne de Sottens était la pièce maîtresse de l'ancien émetteur national construit en 1931, qui a diffusé pendant des décennies les ondes de la radio télévision suisse sur la terre entière ou presque: on pouvait la capter jusqu'à Dakar, à 4'200 kilomètres de là! Mise hors service en 2010, on peut désormais la gravir grâce à un programme développé par Gecko Escalade, dont les locaux sont situés à quelques centaines de mètres de l'antenne. Le concept: une ascension conviviale – facturée entre 160 et 275 francs par personne – où l'on prend son temps. Compter environ quatre heures en tout, et en petit comité (six personnes maximum), pour découvrir l'antenne et son histoire, et déguster des produits régionaux perché dans le vide, tout en se régalant des anecdotes, nombreuses et souvent truculentes, qui se racontent sur ce géant de métal.

L'aventure commence dans les locaux de Gecko, le temps de s'équiper d'un baudrier et d'un casque et de faire connaissance avec l'équipe. Après une petite formation technique accélérée, qui a l'avantage de nous rassurer complètement sur les mesures de sécurité, drastiques, mises en place par la société d'escalade, nous voici partis à la conquête de la tour, tout à coup très imposante vue d'en bas.

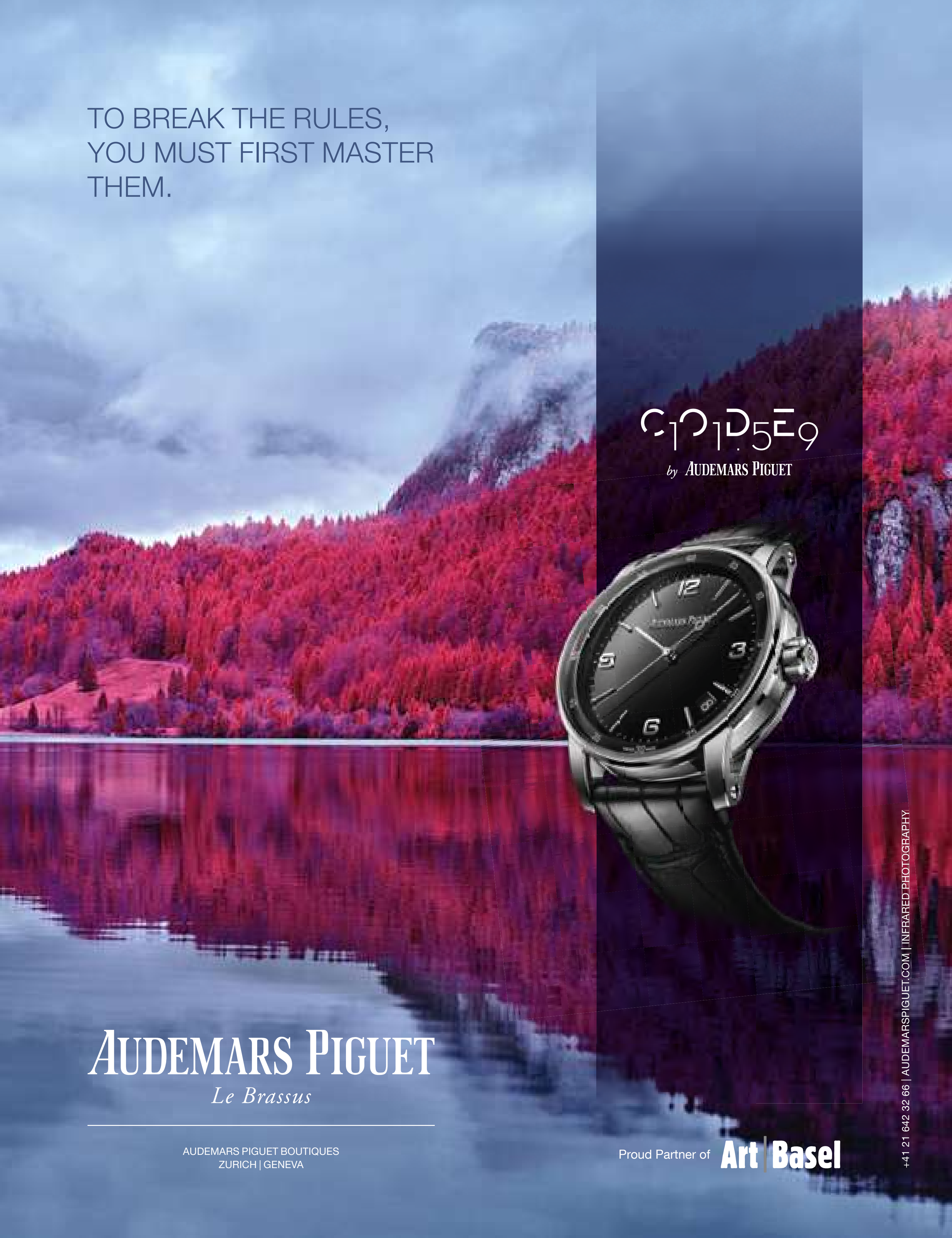
Première impression: ça monte vraiment très vite, et on se retrouve en quelques secondes ou presque à une hauteur déjà imposante. On comprend alors qu'il faudra composer avec cette sensation de vide absolue, qui nous accompagnera jusqu'à la conquête du sommet. « Cette première étape est cruciale, si on la surmonte on arrive toujours au bout », commente mon coach du jour, qui précise que les cas d'abandon sont extrêmement rares. Quant aux autres, ils sont tous redescendus sains et saufs…

L'ascension n'est pas de tout repos, le grimpeur novice pétrifié par le vide ayant le réflexe de se crisper sur les barreaux de l'échelle au lieu de s'aider de ses jambes. Résultat: ça tire sur les bras et on se crispe davantage.

Enfin parvenu à 100 mètres de hauteur, c'est la pause apéro (sans alcool) sur une petite plateforme, avant d'attaquer la dernière ligne droite. L'occasion d'admirer le paysage et de penser qu'on commence à se faire à l'idée du vide, presque malgré soi. Une impression vite démentie par la dernière vingtaine de mètres qui nous sépare du sommet: la structure devient de plus en plus étroite et tangue sous l'effet du vent, ou de notre propre poids. Peu rassuré, on escalade les derniers obstacles pour atteindre le sommet de l'antenne. Accroché à la structure par une simple corde, on a l'impression de flotter dans le ciel. Sensations garanties.

Le retour se fait à pied ou en rappel, à choix. Ne reculant devant aucun défi, nous avons opté pour la formule « offensive », qui consiste à enjamber la barrière de la plateforme située à 100 mètres de hauteur et à se laisser suspendre et descendre lentement dans le vide, en attendant de toucher le sol. Qu'on est, soyons honnête, pas fâché de retrouver.

GECKO ESCALADE


TO BREAK THE RULES, YOU MUST FIRST MASTER THEM.
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