N°4 SEPTEMBER 2018 WWW.SWISSQUOTE.COM CHF 9.-

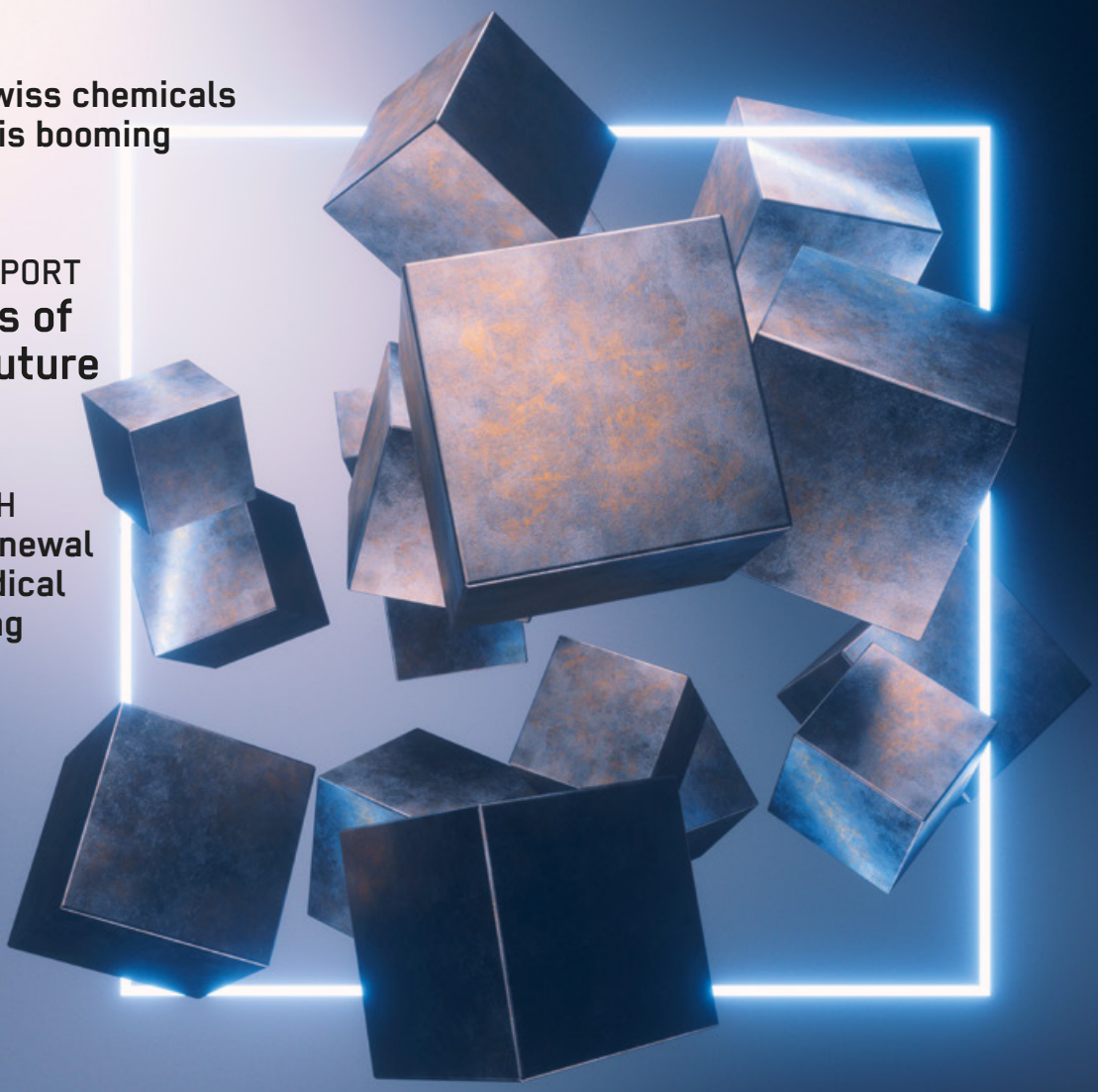
SWISSQUOTE

FINANCE AND TECHNOLOGY UNPACKED

SIKA
The Swiss chemicals group is booming

TRANSPORT
Roads of the future

HEALTH
The renewal of medical imaging



DOSSIER

BLOCKCHAIN
INVESTOR'S DIGEST

Companies to watch | Affected industries
The Swiss vanguard

ISSN 2296-3278 52

▶ GLOBAL BLOCKCHAIN TECHNOLOGIES ▶ SPECTRA 7 ▶ BLOCK ONE ▶ ETHEREUM ▶ RIPPLE ▶

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Anything to worry about?

By Marc Bürki,
CEO of Swissquote

How ironic it is to feature a special report about the promises of blockchain technology, at the very time when the market for cryptocurrencies is experiencing one of the most spectacular collapses of its young existence. In the spring of 2018, the astute IT consulting firm GP Bullhound was one of the rare industry observers to express a clear, detailed account of the extent of the imminent collapse, predicting a 90% correction. We're not there yet, but many digital currencies – even the leading ones – have suffered a 90% drop since their peak in January.

Should we be concerned? Quite the opposite. The market is still immature, and this purge offers a much-needed clean-up. It can then move forward, stronger. Once the dark hour for cryptocurrencies has passed, the survivors could very well experience unprecedented growth. The current downturn must not be misconstrued; market fundamentals are healthy. Blockchain, the technology on which cryptocurrencies are based, will eventually emerge as the leader, but we must be patient. That is the unanimous conclusion drawn by the experts we interviewed in preparing this report.

Its concrete applications seem nearly infinite. The technology offers numerous solutions in finance, where blockchain is expected to enhance efficiency and provide significant savings. For example, it would eliminate fees charged by intermediaries for international money transfers. Large banks, which fear being "Ubered" out of the market, closely track these innovations when they are not already conducting their own experiments behind the scenes.

p. 50

Until these technologies are widely adopted, the current transition period is the perfect time for implementing standards and a more rigorous regulatory framework. That is where Switzerland could play an important role. The country is already a hotbed for blockchain technology and initial coin offerings (ICOs). These ICOs are a new way for businesses to raise money.

p. 36

As for Swissquote, adopting the latest innovations is ingrained in our DNA, and we are pioneers in cryptocurrency trading. The service has been available on our platform for almost a year now, and we are the only bank in Switzerland to do so, with FINMA approval to boot.

We also contributed to founding a new organisation, Capital Markets and Technology Association (CMTA), which began operations this summer. It aims to develop the use of blockchain technology on financial markets, mainly within the context of ICOs.

This issue's special report provides the opportunity to expand the spectrum available for investors a bit further, by presenting listed companies that use blockchain technology. Our analysts have also developed a certificate dedicated to the sector...to complete the story.

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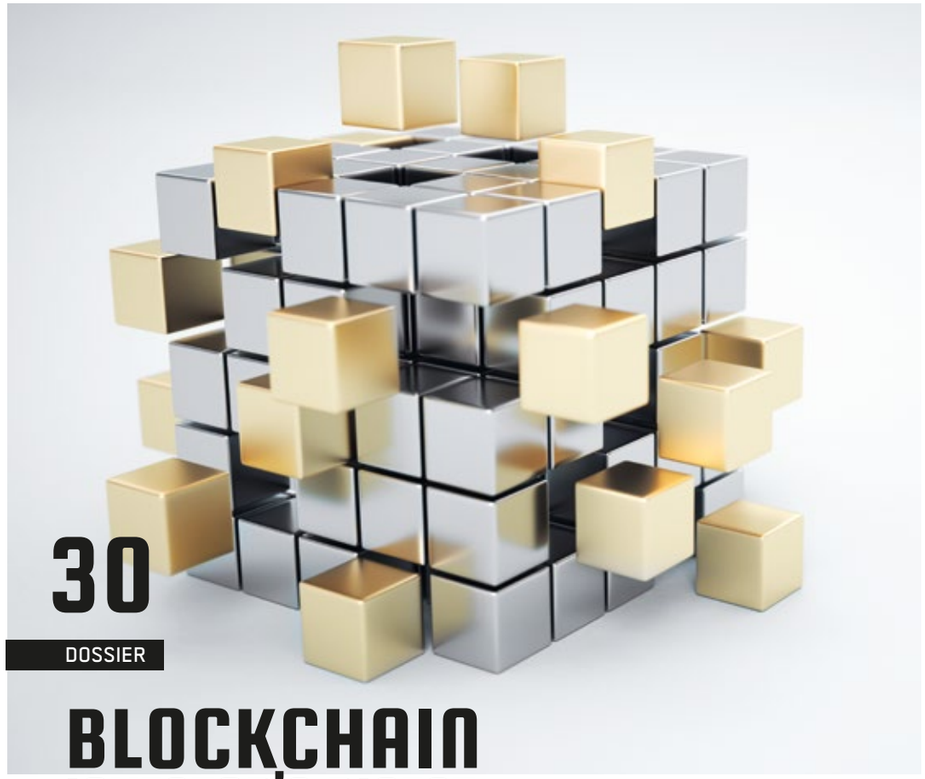
Happy reading!

SIKA

ROADS



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DOSSIER

BLOCKCHAIN INVESTOR'S DIGEST

FOCUS

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SCANS

well-being

PETS ARE MONEYMAKERS

ANICURA

The pet market is a gold mine. Mars is well aware and just acquired veterinary clinic chains AniCura, Linnaeus and VCA. It also created a €100 million fund to finance pet-related start-ups. But it's not the only company looking to make a profit in this market. General Mills recently acquired animal food expert Blue Buffalo and Nestlé purchased shares of Tails.com, a dog food delivery service. The Swiss company also wants to acquire Canada-based Champion Petfoods for more than $2 billion. GIS

"Yoda says use the force. Don't think, just feel it"

Masayoshi Son, founder of Softbank, discusses his investment philosophy.

ISTOCK

health

THE UNITED STATES APPROVES CANNABIS-BASED MEDICINES

In late June, the US Food and Drug Administration approved its first cannabis-based medicine. Epidiolex, manufactured by the UK group GW Pharmaceuticals, is used to treat patients with a rare form of epilepsy. It contains less than 0.1% of psychoactive substances. Sativex, another medicine containing cannabis, is used to treat spasms associated with multiple sclerosis. It is already available on the market in other parts of the world, marketed in the UK by Bayer (Germany), in Europe by Almirall (Spain) and in Asia, Africa and the Middle East by Novartis (Switzerland). GWPH

"For some time now, I have been deeply concerned about our country – the growing division at home and our standing in the world"

Howard Schultz, former CEO and Chairman of Starbucks, furthering rumours of a future presidential candidature.

RANKING

TOP FIVE COMPANIES WHOSE PRODUCTION PROCESSES ARE THE MOST ENVIRONMENTALLY FRIENDLY (based on various criteria determined by Corporate Knights)

1. DASSAULT SYSTÈMES (FRANCE) 86.1%
2. NESTE (FINLAND) 85.2%
3. VALEO (FRANCE) 83.6%
4. UCB (BELGIUM) 79.5%
5. OUTOTEC (FINLAND) 78.3%

Source: Corporate Knights

TOP FIVE COUNTRIES PRODUCING THE MOST MILK
(in billions of litres in 2017)

1. UNITED STATES 98
2. INDIA 72
3. CHINA 36
4. GERMANY 32
5. RUSSIA 31

Source: Statista and CLAL

THE TOP FIVE RICHEST ENTREPRENEURIAL FAMILIES
(based on their fortunes, in billions of US dollars)

1. THE WALTON FAMILY (WALMART) $151.5
2. THE KOCH BROTHERS (KOCH INDUSTRIES) $98.7
3. THE MARS FAMILY (MARS) $89.7
4. THE VAN DAMME, DE MEVIUS AND DE SPOELBERCH FAMILIES (ANHEUSER-BUSCH INBEV) $54.1
5. THE DUMAS FAMILY (HERMÈS) $49.2

Source: Bloomberg

+60%

The expected increase in demand for natural gas in China between 2017 and 2023, according to the International Energy Agency. China, hoping to rid itself of its carbon dependency, will become the world's biggest importer of natural gas starting next year.

drinks

COKE IS CHANGING IT UP

Coca-Cola is pulling out all the stops to reach consumers who want to avoid unhealthy sugary drinks. In recent months, the US group launched Coca-Cola Plus in several Asian countries. This no-calorie version contains five grams of dextrin, a fibre that can help fat absorption, especially when consumed during a meal. In Japan, the brand has also launched a coffee-flavoured type of Coca-Cola Plus, which has less sugar, as well as a version with a hint of lemon. The new bubbly drink contains none of the artificial colours that create the traditional caramel tint. KO

In January this year, Coca-Cola launched a clear version of its flagship product.

RODRIGO REYES MARIN / NEWSCOM

entertainment

COMPETITION FOR NETFLIX

France Télévisions, TF1 and M6 have come together to create a streaming platform called Salto. It will offer shows available on its channels as well as never-before-seen content. The monthly subscription is expected to cost less than €5 per month. The goal of this collaboration is to take back market share from US-based Netflix, which already has 3.5 million subscribers in France. This strategy has already been attempted by others. In the United States, Hulu allowed Disney, 21st Century Fox, Comcast and AT&T to join forces. In the UK, Freeview is a product of the BBC, ITV, Channel 4 and Sky. NFLX

SCANS

€25.5 BILLION

The revenue generated by European football during the 2016-2017 season, according to consulting firm Deloitte. The majority of this amount comes from the sale of broadcasting rights. Sky and BT alone have spent £4.5 billion to broadcast English Premier League matches.

food

SEEN AS OUTDATED, SUPERMARKETS JOIN WEB GIANTS

DR

Supermarkets are looking to counter the growing e-commerce monopoly by increasing their home delivery services. In France, the Carrefour chain entered into a partnership with Google. Starting in 2019, Carrefour products can be ordered through "Home", Google's virtual assistant. It has also partnered with its UK counterpart Tesco to encourage their suppliers to lower prices. Casino, on the other hand, has chosen Amazon. Goods sold in its Monoprix shops will be available as part of the e-commerce giant's Prime service. CA CO

automobile

AUTONEUM TARGETS ELECTRIC CARS

An Autoneum employee shapes a motor heat shield. This item keeps the cabin warm and reduces noise.

AUTONEUM

Auto parts supplier Autoneum saw slumping sales in North America, where the number of cars built fell 8% last year. This led the Winterthur-based group to seek new avenues for growth. In particular, it is in talks with UK-based vacuum manufacturer Dyson – which is developing an electric car – to supply insulation materials for the new vehicles. It also just signed a contract with Chinese auto group Geely. But a contract with Iranian company Ayegh to produce Peugeot and Citroën cars in Iran fell through, following the US pulling out of the nuclear deal. AUTN

THE FLOP

Lukewarm reception for the S9

Samsung's S9 and S9+, the flagship models of the Korean brand, went on the market in March. But they generated little enthusiasm among consumers. In the first month after launch, only 8 million devices were sold. Several resellers also started to lower prices. At AT&T, an S9 costs no more than $570, compared to $790 in March. The smartphone is struggling to generate buzz because it is very similar to the previous S8 model. Only the camera was improved slightly; it takes better photos in darkness and now has a Super Slow Motion feature. Furthermore, the S8 was already less popular than its predecessor. Sales totalled 41 million phones, compared to 48 million for the S7.

$21 BILLION

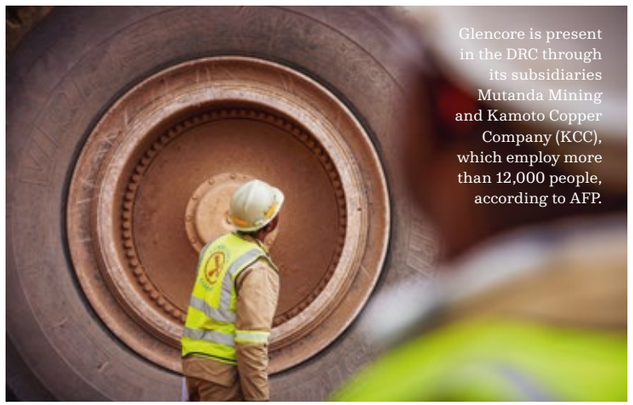
The total value of US agricultural products imported by China in 2017. Soy makes up two-thirds of this amount, alongside beef and corn. The figure demonstrates the scope of trade between these two countries, that have been in a relentless trade war over the past few months.

"Harley-Davidson should stay 100% in America, with the people that got you your success"

US president Donald Trump, following the motorcycle company's decision to outsource some of its production.

raw materials

GLENCORE BOUNCES BACK IN DRC

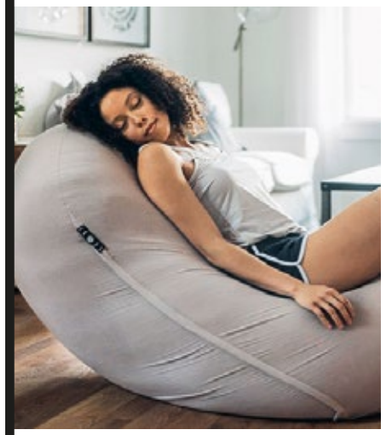


Glencore is present in the DRC through its subsidiaries Mutanda Mining and Kamoto Copper Company (KCC), which employ more than 12,000 people, according to AFP.

GLENCORE

Glencore has seen the light at the end of the tunnel in the Democratic Republic of the Congo (DRC). The Zug-based group agreed to cancel $5.6 billion in debt contracted by co-company Kamoto Copper Company (KCC) that it founded with state-owned company Gécamines. Gécamines threatened to close KCC if its balance sheet didn't improve and accused Glencore of causing the debt by granting unjustified loans to KCC. The DRC is the primary source of copper and cobalt for the Swiss conglomerate. As cobalt is used to make batteries for electric vehicles, its value has jumped significantly in recent months. GLEN

KICKSTARTER



MOON POD

MOON POD

A BEANBAG THAT SIMULATES WEIGHTLESSNESS

Float therapy, in which a person immerses themselves in a hermetically sealed chamber filled with very salty water in complete darkness, is one of the most efficient forms of relaxation that exists. Moon Pod creators tried to emulate the sensation of being completely weightless, which is normally only found in space. Weighing in at barely 6 kilos, this beanbag is filled with thousands of little balls that have a very high friction capacity. This allows the beanbag to perfectly surround the contours of the person laying or sitting on it, and they will get the feeling they are floating. According to its founders, the Moon Pod is particularly useful for people suffering from stress, insomnia, post-traumatic stress disorder and circulation problems.

FUNDS RAISED	AVAILABLE
$1,271,724	NOVEMBER 2018

SCANS

food

STRUGGLING ARYZTA RESTRUCTURES

Zurich-based Aryzta isn't doing well. The frozen baked goods company saw sales drop 6.3% in the first half of 2018. The Swiss company, which notably provides buns for McDonald's, has already sold off its US brand Cloverhill, and Irish brand La Rousse Foods. It is also looking to sell off its 49% market share in French company Picard. But that may not be enough, according to Credit Suisse, which recently downgraded Aryzta shares and indicated that the company would have difficulty bouncing back. ARYN

"Harder, better, faster, stronger"

Daniel Ek, creator of Spotify, quotes Daft Punk the day before the company went public on the Nasdaq.

health

PHARMACIES THAT HEAL

THOMAS HAWK

Faced with poor results, US pharmacies must reinvent themselves. Walgreens Boots entered into a partnership with insurer Humana. The two companies will jointly manage a series of clinics offering basic healthcare services to seniors. The first two clinics will be located in Kansas City, Missouri. CVS, its competitor, has merged with another insurer, Aetna. It plans to offer medical consultations in the clinics. A similar service is already offered in approximately 15 Walgreens stores in collaboration with insurer UnitedHealth. WBA HUM

automobile

TOYOTA COURTING SENIORS

ISTOCK

Toyota is developing a smart car that can be safely driven by older people. With a slew of cameras and sensors, it is equipped with artificial intelligence sensors that collect and analyse data in order to correct errors that a driver, who is tired or whose reflexes are slower, might make. For example, the system will be able to spot a pedestrian crossing the road at the last minute or notice an involuntary lane change and correct the vehicle's trajectory. In Japan, Toyota's domestic market, one-quarter of the population is over the age of 65. TM

$1 BILLION

The amount Fujifilm is demanding from Xerox for pulling out of a merger between the two companies, according to a claim filed in New York. The Japanese group is accusing activist investors Carl Icahn and Darwin Deason of derailing the merger.

ISTOCK

crops

AGRICULTURE IN THE ERA OF BIG DATA

This spring, Syngenta acquired two start-ups: US-based FarmShots and Brazilian group Strider. These acquisitions will allow Syngenta to develop a complete crop management platform that includes taking aerial photos with drones, analysing them to spot areas that are not growing properly or do not have enough water and mapping the areas where herbicides and pesticides are used. Farmers can use the accompanying software to easily calculate what their crops cost and bring in each year. The Swiss group is competing with Monsanto, which offers a similar service. SYNN BAYN

IPO

XIAOMI, THE CHAMPION OF LOW-COST TECH

Chinese smartphone manufacturer Xiaomi went public on the Hong Kong exchange in late June, raising $4.7 billion. The company is now valued at $53.9 billion. Founded in Beijing in 2010, Xiaomi manufactures low-cost devices that sell extremely well in China and India. It also sells close to 300 smart products such as automatic rice cookers, toothbrushes and lamps. The goal is to create a complete ecosystem that can be controlled via a smartphone. But this diversification leads investors to fear that the company is scattering, especially since its margins are already low. Its smartphone margins are only 8.8%, compared with 64% for Apple's iPhone X. CEO Lei Jun announced in early 2018 that he would voluntarily keep margins under 5% to focus on the revenue generated from Xiaomi apps. 1810

£1.2 BILLION

The annual losses that Jaguar Land Rover, owned by Indian group Tata, is expecting to suffer in additional taxes alone if the UK adopts a strict version of Brexit. The auto group has also threatened to take back £80 billion in investments from the United Kingdom.

"Of course it has to be led by a man, because it is a very challenging position"

Akbar Al Baker, CEO of Qatar Airways, regarding his position.

the figure

RICHARD ALLISON

The new king of pizza

Title
CEO of Domino's Pizza

Age
51

Nationality
American

Salary in 2018
$865,000

Richard Allison took the helm of Domino's Pizza in early July. Since 2011, Allison has been responsible for the company's 9,000 international locations, first as executive vice president and then as president of its international division. The Michigan-based fast food chain has locations in 85 countries and international sales make up more than 50% of its revenue. Allison, who has an MBA from Kenan-Flagler Business School, previously worked for consulting firm Bain & Company for 11 years in its restaurant division. He is now the head of a brand that has just become the global leader in pizza, ahead of Pizza Hut, thanks to sales that reached $12.2 billion in 2017. Allison will introduce a series of innovations, such as deliveries made with self-driving cars. DPZ

the country

BRAZIL

The return of the behemoth

Population
209 million

GDP per capita
$15,483

Growth in 2017
+1%

Main economic sectors
agriculture, mining, automotive, aviation, biofuel

Brazil is making a comeback after a difficult recession in 2015 and 2016 that led to a loss of eight growth points. In the first quarter of 2018, the GDP of this immense South American country increased 0.4%. It is the fifth quarter of consecutive growth. Over the year, the GDP is expected to increase close to 2.5%. This recovery is driven by domestic spending, encouraged by historically low interest rates and inflation. Agricultural exports, which were up 1.4% in the first quarter, are also doing well. Soy is expected to take off in the coming months, as China – embroiled in a trade war with the United States – is looking to diversify its supply sources. But the economy of this country – with a population of 209 million – remains fragile. Unemployment is at 13%. Government debt is so high that the state has allocated one-fifth of the budget to pay interest only. Buying power for Brazilian consumers is also suffering due to the extremely high import tariffs imposed by the government. Some car models cost twice as much in Brazil as they would in the US.

STORA ENSO

Stora Enso will be able to produce 15,000 tonnes of green plastic a year.

innovation

DURASENSE

Company
Stora Enso

Launch
May 2018

Cost
€12 million invested in developing organic materials

Plastic made from wood

Approximately 8% of oil extracted around the world is used to make plastic, either as a direct ingredient or as fuel for production. This waste of resources led Finnish group Stora Enso, specialised in making pulp and paper, to develop a green plastic made of wood fibres. The material is known as DuraSense and the granules look a bit like popcorn. It is just as solid and durable as wood but can be shaped using an injection mould, just like plastic. It can also be combined with recycled polymers and other green materials. Some potential uses of this eco-friendly plastic include car interior panelling, kitchen utensils, garden furniture and PET bottle caps. Stora Enso will be able to produce 15,000 tonnes of DuraSense per year in its Swedish factory. At the end of its lifecycle, this material can be recycled up to seven times. STERV

Sika, solidifying its future

With exceptional growth year after year, the Zug-based firm has become the global leader in concrete admixtures and adhesive products for the construction and automotive industries, thanks to its ability to constantly innovate.

BY MARTIN LONGET

“Imagine dozens of drones flying around a construction site, like a hive of bees that never sleeps. They are patiently constructing a building, one stone at a time…” Enthusiastically discussing this futuristic method is Dominik Slappnig, head of Corporate Communications & Investor Relations and member of Sika’s senior management. This technology is still in the prototype stage and is currently being tested in partnership with EPFL. But it perfectly demonstrates Sika’s obsession with innovation; the company has filed 217 new patents since 2015 and half of its 19,000 employees have an engineering degree.

Sika was founded in 1910, when Austrian engineer Kaspar Winkler marketed “Sika-1”, an additive that made concrete waterproof for use in the Gotthard Tunnel. The Swiss company based in Baar quickly expanded to four continents to meet growing demand. Starting in the 1930s, it opened branches in Europe, the United States, South America and Japan. Now present in 101 countries, Sika continues to develop new solutions for gluing, waterproofing, reinforcing and sound-proofing. It now has over 20,000 different products used in all aspects of the construction industry, as well as in the automotive industry. ▷

SIKA

Sika supplied the adhesives and sealants for the construction of the Evolution Tower, the iconic twisted skyscraper inaugurated in 2015 in Moscow.

IN FIGURES

+9%

The increase in Sika’s revenue in 2017, up to 6.2 billion Swiss francs.

649,000,000

Sika’s 2017 net profit in Swiss francs.

905

The number of Sika employees dedicated solely to Research & Development.

101

The number of countries in which Sika does business.

"Sika has an excellent business model; it is both simple and effective," said Félix Brunotte, an analyst at AlphaValue. "The products it offers (e.g. to dry concrete much quicker while saving water), generate a very high added value for its clients at a very low total cost, representing less than 1% of the final product."

"A major trend in the auto industry is using adhesives instead of screws. And Sika is very well-positioned to benefit from this transition."

Félix Brunotte, analyst at AlphaValue

Paul Hälg, Chairman of Sika's Board of Directors, welcomed the agreement reached with French company Saint-Gobain in May this year, after three years of conflict.

FABRICE COFFRINI / AFP

These products are often patented and adapted to the local market, and therefore difficult to copy. "Sika's experience and long-standing presence, as well as the patents and low costs that protect some of their technologies, make it such that their products are practically indispensable and therefore not up against much competition," said Brunotte, who adds that the chemical products market for construction is still very fragmented (while Sika is the global leader, it has less than 10% of the market), and could likely head towards consolidation in the years to come.

Another one of Sika's advantages is that it offers a range of products covering all construction needs, regardless of the maturity and the technological level of the market in question. "It's a sort of assumed cannibalism, in a positive way. Sika first sells basic products and then moves up its range to offer more complex solutions that have more added value for Sika," said Brunotte. The Swiss group's product range is suited to very specific needs. Sikaflex, for example, is a maximum-strength glue used to construct boats and certain buildings. It can attach windows directly onto the structure of a building without screws. This solution was used in the London skyscraper 30 St Mary Axe, which is commonly known as the Gherkin.

The automotive sector also increasingly makes use of Sika products. This market already makes up one billion in revenue for the group, compared to 5.3 billion generated by the construction industry. Sika's adhesives are used by automakers to bond composite materials that cannot be soldered. Sika is the global leader in this market, with 40% of windscreens set with its products. The company expects that demand will continue to increase as this type of material becomes more widely used. "A major trend in the auto industry is using adhesives instead of screws, which allows for incredible productivity gains for the industry," said Brunotte. "And Sika is very well-positioned to benefit from this transition."

With annual revenue growth of 5% to 13% since 2011 (9% in 2017), Sika can confidently look to the future and continue its global expansion particularly through acquisitions (17 since 2015). The purchases are to acquire technology, of course, but especially contacts and access to emerging markets. "We're taking a very local approach when it comes to our development strategy. When we open up shop in a country, we hire, produce and sell locally. And we still have much room for improvement in emerging markets, where our penetration rate is currently only 30%," explained Slappnig, who said that Sika is planning to open 20 new factories around the world by 2020. "Sika has a very good capital allocation policy," declared Brunotte. "Until now, its growth was two-thirds organic and one-third external. We expect the proportion of external growth to increase soon."

But the speed of acquisitions has slowed down in recent years following the hostile takeover bid by French company Saint-Gobain, which was amicably settled in the spring of this year. Saint-Gobain gave up taking control of Sika and still made a profit from selling some of its shares in the Swiss company. As for Sika, a shareholder vote in June decided to create a single share class, getting rid of the registered share that offered six times more voting rights than regular shares.

"It's a solid company with extraordinary value creation for its industry," Brunotte assessed, seeing nothing in the near future that could harm Sika's positive results. "The only current concerns are associated with the prices of oil and derivative products that Sika depends on to make its products. But Sika brings so much added value to its clients that doing away with Sika as a supplier would be unlikely, even if prices go up or there is a serious crisis." ◢ SIKA

ANALYST OPINIONS

"CLEARLY AN INTERESTING COMPANY"

"With double-digit growth in earnings per share, Sika is clearly an interesting company for investors." Like most analysts, Bernd Pomrehn from Vontobel has a very favourable view of the cement giant. "Sika has a double-digit EBIT, very strong organic growth and excellent cashflow which is used to make very smart acquisitions." Pomrehn believes this situation will continue, as the 12-month target price for Sika shares is at 158 Swiss francs.

"One of the company's biggest threats, the court case with Saint-Gobain, ended this spring and all parties were satisfied. The management's conflict resolution plan was successful, despite the initial pushback." Furthermore, the recent split of Sika shares in June 2018 (60 against 1) should generate more interest among potential investors, as the share price has become more affordable. "Currently, the only factors that could disturb the company's growth plans are external, such as a rise in raw materials prices or restless emerging markets. But Sika's management is well aware of these difficulties," said Pomrehn.

In June 2018, Sika celebrated the 50th anniversary of its factory in Guin (Fribourg), where adhesives for construction are produced.

CHRISTIAN BEUTLER / KEYSTONE

ANALYSIS

THE VIEWPOINT OF SPECIALISTS

FOCUS

Medical imaging takes advantage of longer life expectancy

Four multinationals dominate 75% of medical scanner sales. But new products and challengers are now emerging in this promising industry.

BY DORIS BUGES-VIOLIER

The imaging sector has a bright future. Its prosperity seems to be a safe bet, given the necessity of renewing equipment as well as, most importantly, an ageing population seeking care. According to the World Health Organization (WHO), the sexagenarian population will increase from 12% to 22% by 2050.

While major industry players have much to be excited about, other companies are challenging them by developing less expensive or very innovative products. The market is currently dominated by three giants, whose business is not limited to medical imaging: US-based General Electric, Germany's Siemens and the Netherlands' Philips. A close fourth is Toshiba Medical, which was renamed Canon Medical Systems earlier this year following its acquisition by Canon in December 2016.

"In time, all doctors could have an echograph in their pocket next to their stethoscope"

Reto Meuli, head of the medical radiology department at Lausanne University Hospital (CHUV)

According to the latest outlooks, the industry as a whole is expected to generate at least $46 billion in revenue by 2023 and achieve average annual growth of 5.5%. In parallel, the growth for the software to read the images could be twice as high as the growth for the equipment itself, according to Frans van Houten, CEO of Philips, in an interview with French magazine *Les Échos*. Equipment maintenance also generates a significant portion of revenue for these large companies.

Groundbreaking innovations

In this attractive context, several small companies are trying to make a name for themselves in niche markets by developing groundbreaking innovations. One of them is Switzerland's Pristem, a spin-off of EPFL and HES-SO, which is developing a product for developing countries. The company, based at the Innovation Park in Ecublens, has developed a sustainable X-ray system that is easier to use and produces quality digital images. "According to the WHO, an X-ray machine can only

PHILIPS

A portable ultrasound device developed by Philips. This market has a bright future in developing countries.

function for up to five years in Southern countries. We're hoping to double that," said Director Bertrand Klaiber. "Our product isn't the least expensive for the initial purchase, but afterwards it doesn't require any consumables, unlike traditional devices with silver film, and it requires less maintenance."

Pierre-Louis Germain, editor-in-chief of the website *Biotechfinances*, gives a few examples of small yet disruptive companies based in France: "EOS Imaging is the only company developing 3D radiology with doses of ionising radiation that are five to 10 times less than traditional devices. Supersonic has a unique degree of precision in classifying tumour ultrasounds. And Mauna Kea is developing an endoscope-microscope, the first of its kind in the world, that can avoid biopsies in certain cases."

But these small companies still need to expand internationally, which is very expensive, or be acquired by other companies. This is because the global market is still largely dominated by multinationals that can financially weather the hardship of producing very costly devices.

IMAGING TECHNIQUES

Medical imaging includes all machines performing non-invasive internal medical examinations of the human body: X-rays, CT scans, positron emission tomography, MRIs, ultrasounds and scintigraphy.

Regarding innovative solutions, Reto Meuli, head of Lausanne University Hospital's medical radiology department, said that portability is ideal for ultrasounds in particular: "Now it's possible to attach a portable echograph to a smartphone to display images. This innovation has been used by American soldiers for the past 20 years. There will definitely be a boom in this field." "In time, all doctors could have an echograph in their pocket next to their stethoscope." Among the large companies, Philips in particular is ahead of the curve in this technology.

At Geneva University Hospital, Martin Walter, head of the nuclear medicine and molecular imaging department, sees innovation cropping up in a different domain: contrast agents and tracers – substances injected into patients before an exam to make the image clearer. "Imaging techniques are progressing but the benefit of patient care isn't increasing proportionally," said Walter. "So even if we are able to detect more metastases with a better machine, the treatment and chances for success are essentially unchanged." For Walter, the new tracers from pharma companies will make it possible to closely identify metastases that respond to treatment. The healthcare division of General Electric is currently allocating significant R&D efforts in this field, according to analyst Holley Lewis from IHS Markit.

"These imaging techniques will tell us the chances of success of a certain chemotherapy, which could then be chosen as a treatment," said Walter. "In my opinion, that's where the next paradigm shift is: making predictions using imaging and no longer just the diagnosis." Walter considers this an irrefutable argument as healthcare systems move increasingly towards reimbursing treatment based on effectiveness. ◢

FOCUS

Data protection: Europe's turning point

The European Union has one of the strictest regulations in the world regarding personal data protection. Thousands of companies are bearing the brunt.

BY MARTIN LONGET

It's everywhere: over the past few months, every internet user from a European Union country – and Switzerland – has been constantly bombarded by messages asking for consent to accept cookies or to use personal data.

This is due to the implementation, on 25 May 2018, of the General Data Protection Regulation, or GDPR. While the general public may still not understand all the details, the GDPR applies to all companies (or individuals) that host, gather or process data belonging to EU residents.

Personal data – such as a name, identification number, location data, online identifier, etc. – can now only be collected with the explicit consent of the data subject, who could require that their data be deleted at any time. This is the end of the infamous "opt-out", the biased practice that assumes an individual agrees to the data collection. Non-compliance penalties are severe: the regulation states that companies could be fined up to 4% of their global revenue.

"It's an unprecedented reinforcement of individual and data protection," said Christoph Bauer, founder and CEO of ePrivacy, a German company that specialises in data protection. "The entire online advertising industry, which until now gathered and stored massive amounts of data and sold them, has to now seriously rethink the way it operates in Europe."

AN ALIBI FOR FACEBOOK?

Facebook, which already lost one million active daily users in Europe, attributed this brutal drop to the implementation of the GDPR during the presentation of its Q2 2018 results. Twitter did the same. But subject experts aren't convinced: "Big American companies like Google, Apple, Facebook and Amazon were expecting this legislative change, which was announced in 2016; their considerable wealth made it possible for them to comply with the GDPR, both from a legal and technical standpoint, although they may have had to revise their terms and conditions," said Bauer.

In preparation, Facebook announced in April this year that its 1.5 billion non-European users were being placed under US jurisdiction (Facebook Inc), even though they were for the most part covered by Irish legislation, as the network is headquartered in Ireland. LinkedIn made a similar move in May. It was a way to free its users from the restrictions of the GDPR, as US laws on personal data use are much more lenient than those in Europe.

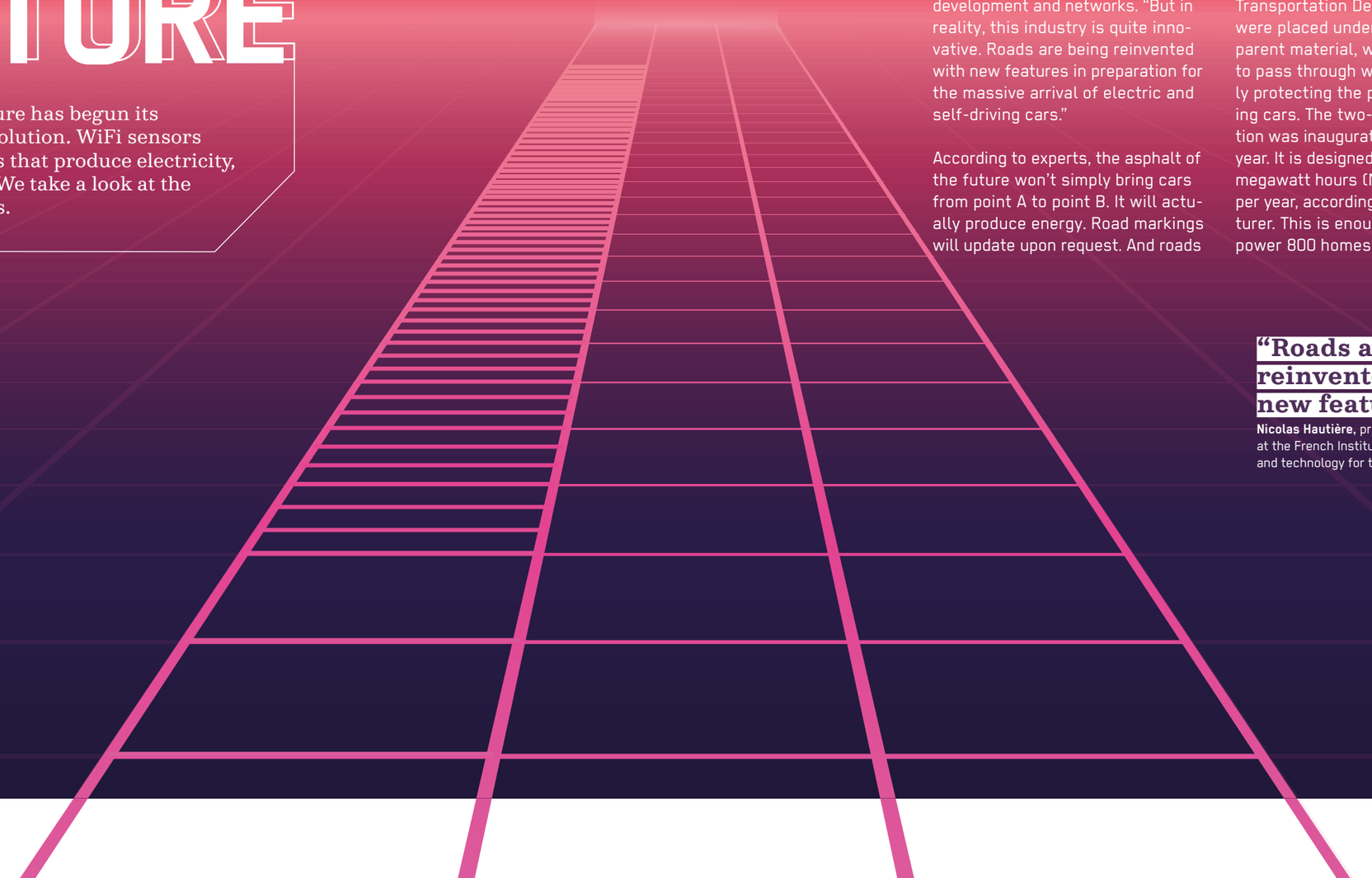
Other (often smaller) companies have even decided to stop working with personal data from the European Union. This was the case, for example, for many US media companies such as the *Los Angeles Times*, the *Chicago Tribune* and the *Baltimore Sun*, which block European visitors from accessing their website.

Despite the inconvenience it causes for companies, the GDPR is unlikely to turn into the predicted disaster. According to many experts, the regulation is a valuable update of the technology and ecosystem surrounding data collection, as well as an opportunity to clean up an industry left unregulated for far too long. The upcoming adoption of the ePrivacy law will regulate a few remaining grey areas, such as cookies, once and for all, since their interpretation still differs between EU members. ◢

ROADS OF THE FUTURE

Road infrastructure has begun its technological revolution. WiFi sensors in asphalt, pavers that produce electricity, heated tarmac... We take a look at the latest innovations.

BY BERTRAND BEAUTÉ



4G is over. It's time for 5G. No, this isn't another article on the next mobile telephone network. We're talking about 5G in terms of fifth-generation roads that all the companies in the industry are working on. "People think that road infrastructure isn't evolving, but that's because technological progress in this field is often invisible," said Nicolas Hautière, 5G road project manager at IFSTTAR, the French institute of science and technology for transport, spacial planning, development and networks. "But in reality, this industry is quite innovative. Roads are being reinvented with new features in preparation for the massive arrival of electric and self-driving cars."

According to experts, the asphalt of the future won't simply bring cars from point A to point B. It will actually produce energy. Road markings will update upon request. And roads will interact with cars via a communication protocol using WiFi radio waves and minuscule chips set in the asphalt. This isn't just a futuristic fantasy: these technologies have already been tested in various regions around the world.

Approximately 400 kilometres outside of Beijing in the Shandong province, cars drive on a portion of experimental motorway that produces electricity. How does it work? Photovoltaic pavers installed by Qilu Transportation Development Group were placed under a layer of transparent material, which allows light to pass through while simultaneously protecting the panels from passing cars. The two-kilometre installation was inaugurated in January this year. It is designed to produce 1,000 megawatt hours (MWh) of electricity per year, according to the manufacturer. This is enough electricity to power 800 homes in China. ▷

"Roads are being reinvented with new features"

Nicolas Hautière, project manager at the French Institute of science and technology for transport

It isn't the only experiment of this type. US company Solar Roadways has been working on a similar concept since 2014. But Colas, the global leader in road construction, is the most advanced company in this field. For more than two years, the French group has tested its photovoltaic roads, dubbed Wattway, in approximately 30 locations around the world.

"We've attained a certain technical maturity," said Étienne Gaudin, director of Wattway. "After two years of testing, 95% of our photovoltaic panels have withstood repeated shocks from passing cars and 85% of our electricity production goals were met." The electric current that the road generates can then be used to power road infrastructure (road lighting, traffic signals, etc.), neighbouring buildings and charging stations for electric vehicles.

"The rise of electric and self-driving cars will boost innovation"
Étienne Gaudin, director of Wattway

With these results in mind, Colas expects to market the Wattway system in 2019. But it won't be easy to sell this solution to regions. "These innovative systems are still very expensive for a limited amount of electricity," warned Hautière. "In the short term, the challenge is reducing costs." Another challenge is improving technologies: in Normandy, where the first section of Wattway was installed in 2017, the speed limit had to be reduced for that portion of the road because of the noise of cars driving over the panels.

"We still need to perfect our product," said Gaudin. "But I am confident. Prices will drop as volume increases. As for the noise, we're now targeting secondary roads, where speed limits aren't above 50 km/h, or use in car parks, which solves the speed problem."

In Japan, retail giant Seven & I Holdings installed Wattway in a car park in order to use the electricity to power one of its stores. According to Colas, a 100-sq. metre surface installed in a car park can generate between 10% and 20% of the electrical use of a convenience store.

HEAT STORAGE

"In niche markets, solar roads could be a profitable approach," said Hautière. "But we're still far from the day when all roads will be solar." In the meantime, other companies are working on more mature technologies. Eurovia, a subsidiary of the Vinci group, has been selling a system called Power Road since 2017. The principle is simple: since roads are black, they naturally retain heat. Via a thermosensitive fluid that runs through tubes under the roadway, the thermal energy is collected and stored in geothermal probes that are placed up to 80 metres under the roadway.

"The advantage of this technology is that we can stagger when we actually use the thermal energy," said Maxence Naouri, spokesperson for Eurovia. "So the heat can be collected in summer and then used in winter." This is what happens in France on the A10 motorway at the Saint-Arnoult-en-Yvelines toll gate, where 500 sq. metres of Power Road is used to heat a building. According to the Vinci subsidiary, a mere 25 sq. metres (the equivalent of two parking spaces) can provide enough thermal energy (heat and hot water) for a 70-sq. metre building.

Snow removal in public spaces is another avenue for this technology. In the French commune of Pontarlier, 50 kilometres from Yverdon-les-Bains, Eurovia installed 3,500 sq. metres of Power Road. Inaugurated in February 2018, the system removes snow naturally from a car park. "We're studying about 50 projects around the world. They should be up and running in a few years," said Naouri. Future clients include airports, which are interested in the technology to reduce the costs of de-icing runways. ▷

In March 2016, Ségolène Royal, then French Minister for the Environment, laid a solar road slab on the L2 ring road in Marseille.

JEAN-PAUL PELISSIER / REUTERS

WANG FENG / AFP

Built by Qilu Transportation Development Group, the world's first solar highway was inaugurated in January this year, in Shandong province (China).

R5G, WHAT'S THAT?

"Fifth-generation road", or R5G for those in the know. The term, invented in 2010, sounds like a marketing team is looking to spread information about one of its innovations. But what were the previous generations? In order: mule road, Roman road, tarmac, then motorway. Unlike its predecessors, the R5G must handle three challenges: the first is sustainable development. Companies such as Eiffage and Eurovia are working on designing roads that are built entirely from recycled materials. Secondly, preparing for the massive arrival of electric and self-driving cars by making the road "smart". Finally, the R5G has new features such as energy production from dynamic vehicle recharging.

UNIVERSITY OF MICHIGAN

In the United States, Mcity – a mock city – was built to test the latest highway technologies in near real-life conditions.

DYNAMIC BATTERY RECHARGING

As roads begin to produce energy, other players are already looking further ahead. "The rise of electric and self-driving cars will boost innovation," said Wattway Director, Étienne Gaudin. "For example, currently, a self-driving car at the entrance to a crowded roundabout cannot go anywhere. The goal is for the road to communicate with the car so as to provide help in tricky situations."

To develop this, the University of Michigan has built Mcity, a ghost city in which large companies such as Intel, Ford, GM, Microsoft and Honda work on protocols and standards that will allow self-driving cars to communicate with infrastructure safely. The chips embedded in the road will also allow infrastructure departments to monitor asphalt deterioration in order to better plan renovation work. Chips can also be used to detect passing cars in real time, in order to regulate traffic or announce alerts if there is an accident.

These prospects are quite interesting for governments. In March, a young company called Integrated Roadways signed a $2.75 million agreement with the state of Colorado to build 800 metres of smart roads that can detect accidents using pressure sensors and automatically call emergency services in the event of an accident.

US group Qualcomm has a more futuristic goal: as the company specialises in mobile technologies, it is working on recharging electric vehicles through induction. Concretely, coils placed under the road generate a magnetic field that can be picked up by cars passing through and then converted to electricity. Qualcomm, which sponsors Formula E races, has dubbed its system "Halo", which can charge a vehicle driving at 60 km/h. In time, this solution could help solve two problems electric vehicles currently have: autonomy and long recharging times. "Induction charging is interesting, but it's definitely not a mature technology," said Hautière of IFSTTAR. But that doesn't stop many companies from taking an interest. France's Alstom, acquired by Siemens, and Canada's Bombardier, for example, are working on dynamic recharging solutions, inspired by their respective tramways without overhead lines.

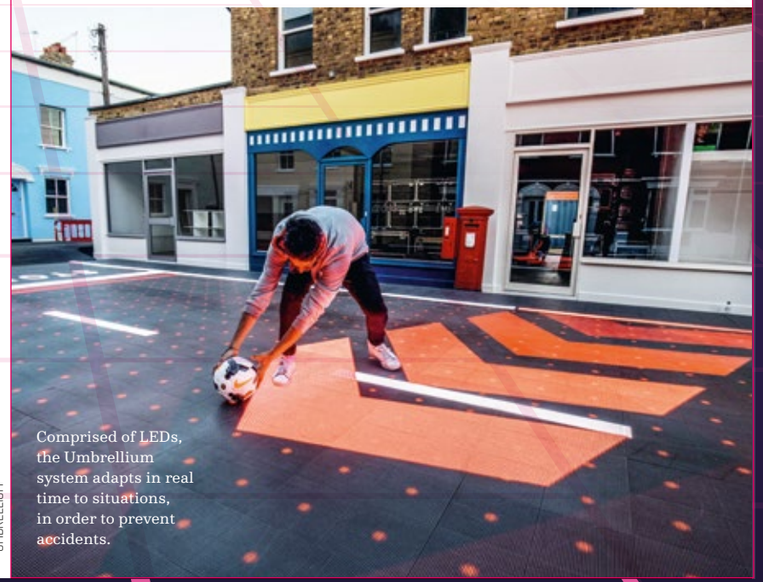
Less ambitious but more pragmatic, Scania, Siemens and Volvo have begun testing an eHighway system in Germany, the United States and Sweden. The eHighway provides electricity for hybrid lorries through pantographs – a tried and true solution that is already used in the railway industry. But regardless of the technology that is chosen, there is still an economic component to consider. According to a study conducted by the British government, constructing a roadway with an induction charging loop would cost €19 million per kilometre over 20 years (30% for construction and maintenance, the rest for the electricity supplier).

"For large-scale development of these new technologies, China will certainly pave the way, and other countries will follow in its wake," said Hautière. "The political will to develop fifth-generation roads is very real in China, while in Europe, governments are mainly thinking of limiting cost." ◢

ROAD MARKINGS ARE BECOMING SMART

In south London, UK software company Umbrellium, in partnership with insurance company Direct Line, is currently testing a pedestrian walkway that only appears when a person wants to walk in the area. The system has LEDs inserted into the asphalt that are controlled by a computer, as well as a network of cameras monitoring both people and vehicles. Consequently, the configuration of the path can be modified in real time.

Colas is also working on smart road markings that can be changed with just one click. "It's a variation on the solar road," said Gaudin, director of Wattway. "In this scenario, we replace some photovoltaic cells with yellow or white LEDs that can light up or turn off based on whoever is managing the infrastructure." For example, a solid line can become a dotted line depending on the circumstances, or illuminated arrows indicating a lane shift could blink in order to become more visible. Once deployed, this type of smart road markings can lead to better road safety.



UMBRELLIUM

Comprised of LEDs, the Umbrellium system adapts in real time to situations, in order to prevent accidents.

TWO COMPANIES TO FOLLOW

COLAS, THE GLOBAL LEADER

"We open the way". Colas' motto sums up its business well. With 80,000 roadwork sites each year around the world, the company makes 82% of its turnover from the roadway industry. The rest comes from railways and traffic signals. In 2016, Colas built the world's first solar road, in Tourouvre, France. But no analysts are following the company, as 96% of shares are held by Bouygues.

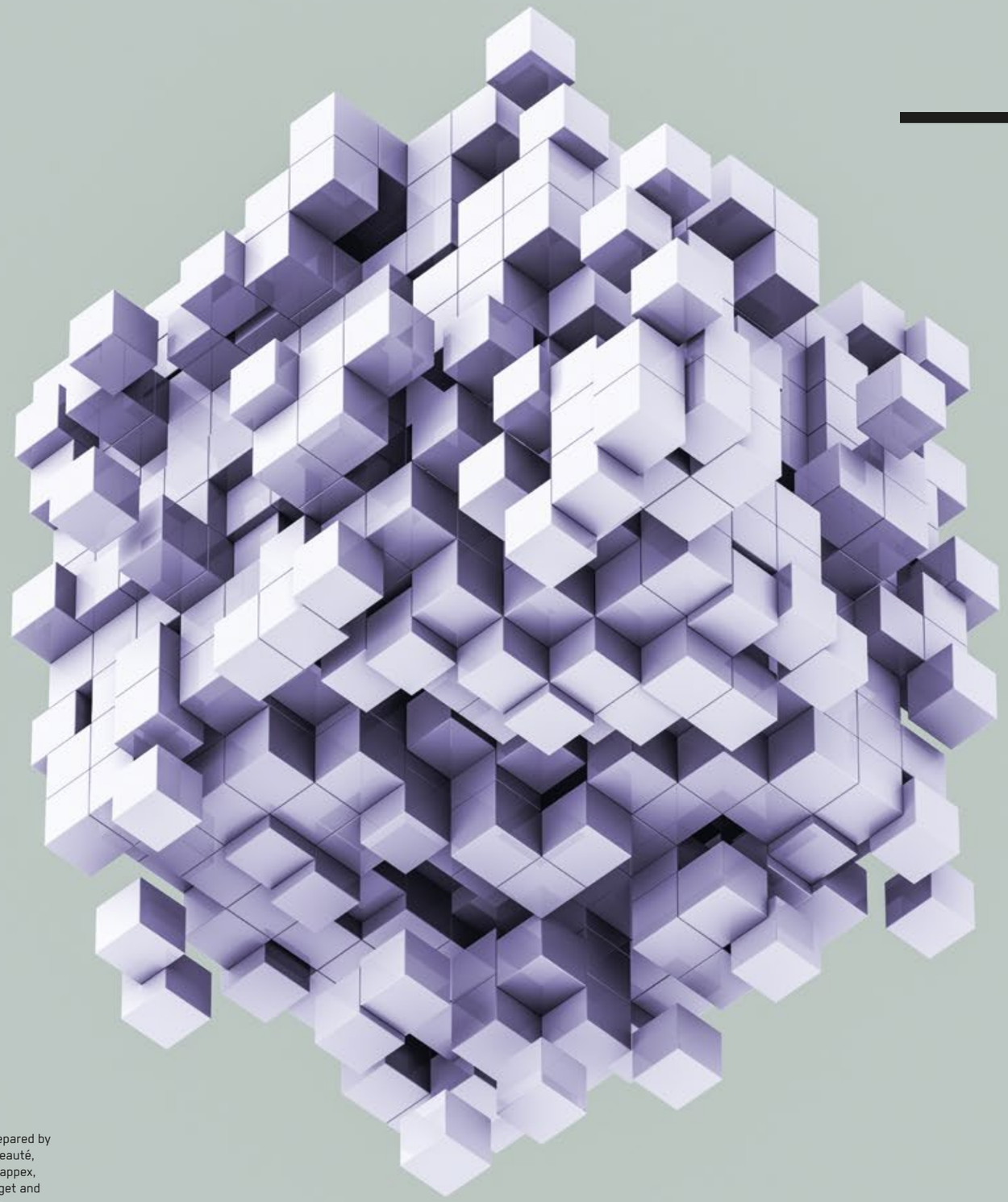
HEADQUARTERS: BOULOGNE-BILLANCOURT (FR)
EMPLOYEES: 55,000
2017 REVENUE: €11.7 BILLION
RE

EUROVIA, 100% RECYCLABLE

A subsidiary of the Vinci group, Eurovia generated a turnover of €8.1 billion in 2017. With 42,000 road sites completed each year, the company is one of the global leaders in the industry, with a presence in 15 countries. Eurovia's Power Road system can collect heat from a road and transfer it to a nearby building in order to heat a swimming pool, for example. Most analysts recommend "holding" or "purchasing" Vinci shares. Twenty per cent of its turnover comes from its subsidiary Eurovia.

HEADQUARTERS: RUEIL-MALMAISON (FR)
EMPLOYEES: 39,500
2017 REVENUE: €8.1 BILLION
DG (VINCI)

GETTY IMAGES



Dossier prepared by Bertrand Beauté, Ludovic Chappex, Martin Longet and Julie Zaugg.

DOSSIER

BLOCKCHAIN
INVESTOR'S DIGEST

Like the internet revolution, blockchain technology is capable of transforming all aspects of the economy. It's time to benefit from it.

BY LUDOVIC CHAPPEX

It was outrageous. Share prices skyrocketing, profits doubling, tripling, quadrupling in just a few weeks... The December 2017 enthusiasm for cryptocurrencies – and Bitcoin in particular – left quite an impact. But the subsequent fall was even more significant. Long weeks of agony, punctuated by a murderous month of August. As summer comes to a close, the market is more hesitant than ever. It has reached a point that even "day traders" no longer know which virtual currency to choose. Was this phenomenon just a flash in the pan?

Not quite. Bitcoin and altcoins have certainly generated lots of buzz recently due to their extreme volatility, but the underlying architecture – blockchain – is actually their most solid, promising characteristic. ▷

What is blockchain, you ask? In short, it is a technology that can store and transmit information in a transparent, secure and – last but not least – decentralised way.

"Imagine a very large notebook that anyone can read for free, whenever they want. Anyone can write in it, but it is impossible to erase what is already there and the notebook is indestructible," said French mathematician Jean-Paul Delahaye, whose metaphor is often used when teaching about blockchain.

Almost all industries can be affected by this technology, including public authorities

It's understandable, since blockchain is often described in many articles and reports as a revolution by those who can master its inner workings. It is still difficult for the general public to understand all the subtleties of this technology, but its practical applications are much easier to understand. And there are many of them, as described in this issue's dossier (see p. 48 to 59). Almost all industries can be affected by this technology, including public authorities in many countries that have begun to adopt blockchain. Switzerland is one of them.

THREE OBSTACLES TO OVERCOME

There is much to be excited about. But it's better to keep your feet on the ground, according to Claire Balva, CEO of French consulting firm Blockchain Partner: "Listening to certain speeches, it may seem that blockchain will disrupt all industries in the next six months. But the reality is more nuanced. It's an extremely promising technology but for the time being, we're still in the experimentation phase."

Indeed, the experts we contacted all believe that large-scale implementation will take time. William Mougayar, author of bestseller *The Business Blockchain*, agreed with this in an interview for this issue (p. 46). Christine Hennebert, blockchain expert at the French Alternative Energies and Atomic Energy Commission (CEA) also agrees: "We won't see large-scale blockchain adoption until 2025. It has immense potential but it's still lacking maturity, and appropriate regulations must be implemented."

Regulation is what everyone's talking about. "The lack of clear legislation is currently the main obstacle, which is keeping away professional investors and pension funds," said Demelza Hayes, fund manager at Incrementum, who also brings up a second issue – the platforms are not at all user-friendly: "The interfaces and user platforms, even just for investing in cryptocurrencies, are very complex and impede mass adoption. The technology needs to be accessible for all." Finally, a third and serious challenge for blockchain: successfully moving to a large scale, i.e. demonstrating its ability to increase in volume and manage millions of transactions quickly. This is what specialists call scalability. Currently the volumes invested with blockchain are still low and projects are small in scope.

BETTING ON THE RIGHT HORSE

Once scalability is achieved, the discussion over the short-term value of cryptocurrencies will be less significant. And the constant debate over choosing whether newer or older cryptocurrencies such as Bitcoin will become less fervent. The question is no longer simply whether or not the forefather of cryptocurrencies is a store of value (time will tell rather quickly, as Bitcoin-based ETFs are on the table in the United States, waiting for approval from the SEC. If the US regulator approves, money from institutional investors could flood in and settle the debate). No, the actual issue is anticipating which companies and cryptocurrencies will be the main players in this market over the next 10, 15 and 20 years.

If the SEC approves, money from institutional investors could flood in and settle the debate

Projects seeking to provide concrete solutions are naturally preferred. We have selected a few (p. 48 to 59). But it is hard to tell whether these players will be swept aside by future newcomers... From this perspective, the blockchain market is similar to the internet 20 years ago, when Facebook and Google didn't exist.

Currently, the first companies that are benefiting from the blockchain wave are often those that provide tools and infrastructure that are needed for development – like pick and shovel sellers during the Gold Rush. In this case, it is IT companies, online trading platforms and companies specialised in cryptocurrency mining. Some of these players, featured in our dossier, are publicly listed. It's time to place your bets. ◢

THE BLOCKCHAIN

explained in 60 seconds

Fundamentals

The blockchain is a technology that stores and transmits information. It is a transparent, secure process that functions with no central control body.

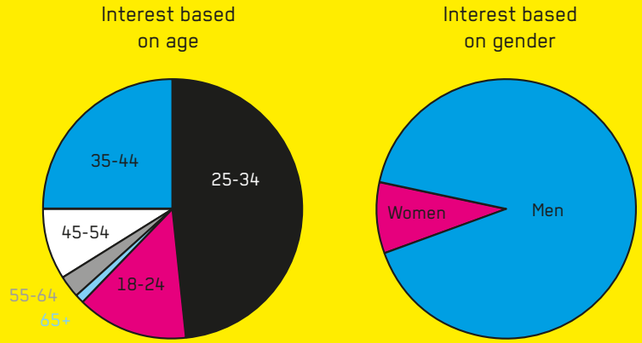
The first blockchain appeared in 2009 with the digital currency Bitcoin, developed by an individual going under the name of Satoshi Nakamoto, whose real identity is still unknown to this day.

All public blockchains use a programmable currency or token. Bitcoin is an example of programmable currency.

Potential

Economic and governmental players have started to use blockchain technology. The applications are virtually endless, covering a wide variety of uses such as food-product traceability, document certification and electronic voting.

Young men, the main users



Numbers

$193 bn

The market size of cryptocurrencies as of 15 August 2018, according to CoinMarketCap

$20,000 bn

The estimated potential for the global blockchain market by 2024

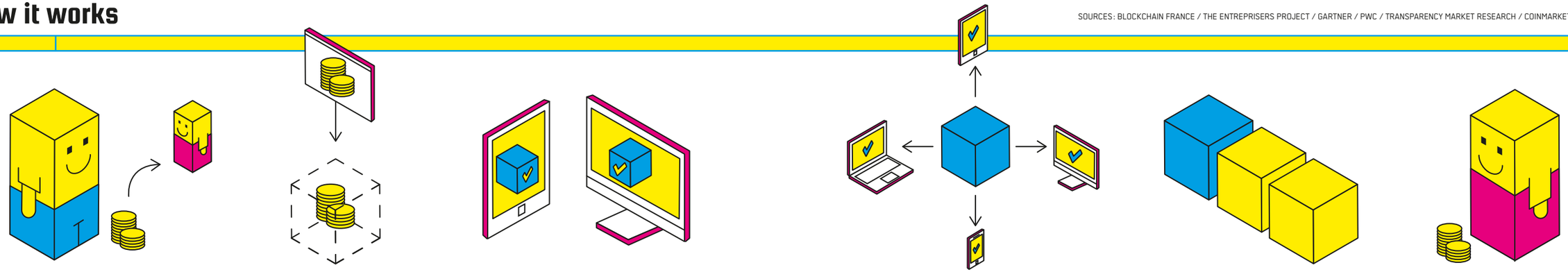
$4 bn

The record amount raised by the ICO of EOS.

+2,333%

Growth of corporate investments in the blockchain between 2012 and 2016.

How it works



1 Paul wants to send money to Jeanne.

2 A transaction is announced to the network and awaits approval in a new block.

3 Some members of the network, known as miners, create a new block that approves the pending transactions.

4 The block is sent to each member of the network.

5 The block is added to the chain, creating a transparent, permanent record of the transaction that cannot be falsified.

6 Jeanne receives the money from Paul.

SOURCES: BLOCKCHAIN FRANCE / THE ENTREPRISERS PROJECT / GARTNER / PWC / TRANSPARENCY MARKET RESEARCH / COINMARKETCAP

Flurin Hess and Ozan Polat, two of the five founders of Trust Square, expect blockchain technology to upset many markets.

Zurich: a hub for Swiss blockchain technology

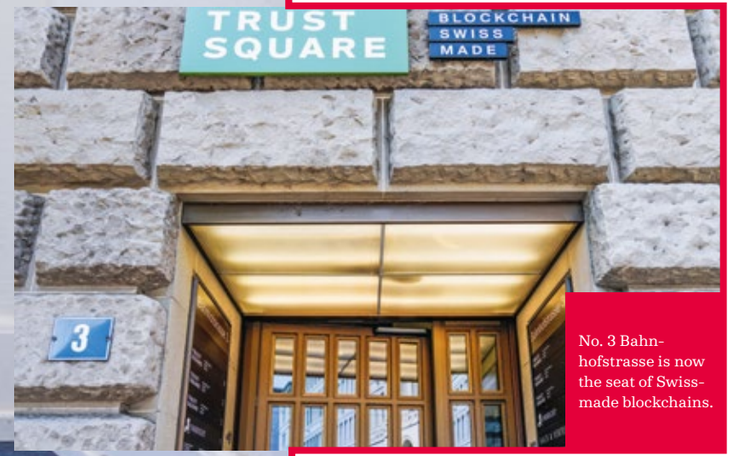
Trust Square has just opened on Bahnhofstrasse. The hub, which brings together start-ups, researchers and industry players, showcases Swiss-made blockchains. We take a look.

BY BERTRAND BEAUTÉ
PHOTOS: NICOLAS RIGHETTI

Bahnhofstrasse. The legendary Zurich street, often ranked among the top 10 most expensive streets in the world, is now home to a new tenant. In April, Trust Square – a non-profit hub dedicated to blockchains – opened at number 3, between Lake Zurich and the prestigious Paradeplatz. In total, the 2,300-square-metre space has 220 workspaces on three floors. “For us, it’s the best space we could possibly have,” smiles Daniel Gasteiger, one of the five founders of Trust Square. “We’re right in the heart of the Zurich financial district. Although our work isn’t solely focused on finance, it was important to be close to that industry.”

Inside, the Trust Square offices could be mistaken for a traditional bank. That’s because the former tenant was no other than Liechtenstein company VP Bank. Opposite the front desk is a strange digital sculpture symbolising a blockchain, the only décor that has been added to the former bank. Now, the technology that underlies Bitcoin is right in the middle of Bahnhofstrasse.

Currently, 40 start-ups that all specialise in blockchains have joined the hub, occupying the 220 available ▷



No. 3 Bahnhofstrasse is now the seat of Swiss-made blockchains.

desks. “It’s a great success, we’re at full capacity,” said Gasteiger. “But we’re already planning to expand by acquiring another floor, which will bring the number of workspaces to more than 300.” In the meantime, Trust Square is moving full steam ahead. In the minimalist corridors, employees move from one room to another, and in the open space office, others are busy at work in front of their screens. But while the location looks like a bank, there are very few suits and ties. Employees are young, wearing shorts, t-shirts and sandals. Ah, summertime in Zurich.

The concept for Trust Square began two years ago. “I decided to leave the banking world after working in it for 20 years. I started at Credit Suisse and then went to UBS before starting my own business,” said Gasteiger. “At the time, I had three ideas in mind: robot advisors (ed. note: automated wealth management), fintech and blockchain. It was right then that UBS opened its blockchain research lab in London. I said to myself: it’s crazy that this is happening on the other side of the Channel and there’s nothing in Switzerland!”

Beyond Swiss borders, the Zurich hub is attracting interest. "People from around the world come to see us"
Daniel Gasteiger, co-founder of Trust Square

So Gasteiger began talking with the Zurich canton government council to create a hub in Dübendorf dedicated to blockchain innovation. From the very start, the idea was to bring the industry’s best companies and researchers together in one place, and hopefully an ecosystem would flourish.

The project would eventually end up on Bahnhofstrasse. “When we had the opportunity to have this space when VP Bank left, we immediately took it,” said Gasteiger. “The Swiss government is becoming more and more aware of the importance of investing in blockchain.” While the canton and city aren’t directly sponsoring Trust Square, they are still supporting the community, which made it possible for the hub to take over this prestigious space. “We were able to reduce the cost for resident companies to 500 Swiss francs per desk per month, which is far below what workspaces on this street usually go for,” said the Zurich entrepreneur.

From the terrace on the top floor of the building, you can see trams passing left and right, heading from the lake to the main train station and passing in front of the headquarters of the Swiss National Bank (SNB). “I often say that with Trust Square here, the new world has settled in right across from the old world,” said Gasteiger. “It wasn’t planned that way, but it’s a wonderful coincidence.”

A PIONEER COUNTRY

Every blockchain expert in the world knows about Zug. The commune of 30,000 residents, where Ethereum was created, is home to a blockchain ecosystem called Crypto Valley that has welcomed dozens of start-ups since 2014. The city is also a testing environment for “e-government”: starting in 2018, it has been testing electronic voting powered by blockchain, the first of its kind in the world.

Furthermore, as of September 2017, Zug residents can obtain a digital identity using blockchain technology. Is the city competition for Zurich and Trust Square? “Absolutely not,” said Daniel Gasteiger, co-founder of Trust Square. “Zurich and Zug are so close that it’s essentially the same thing.” Moreover, the two hubs voluntarily swap offices in order to encourage knowledge sharing.

Geneva isn’t out of the loop either. The incubator Fusion received support from the canton of Geneva, another incubator Fongit and several private partners to launch the Swiss Blockchain Association and a blockchain lab in January 2018. In May 2018, the canton of Geneva was even the first administration to publish a guide to better handle initial coin offerings (ICOs) in the canton. On a federal level, the financial market supervisory authority FINMA has already created its own framework for ICOs, publishing its guidelines in February 2018 (see p. 44). On 6 July, the operator of the SIX Swiss Exchange introduced the SIX Digital Exchange, a trading infrastructure for digital assets. The platform, which is expected to launch in mid-2019, allows traders to exchange cryptocurrencies, as well as several other products that are currently non-marketable on the SIX, such as tokens.

Among the 40 start-ups in the Zurich hub, more than half are active in finance, such as Lykke Switzerland, which is creating a trading market for financial assets via blockchain. Others work in various industries. B3i, for example, is in insurance, Verum Capital works in ICO and blockchain advisory (see p. 44), and ScienceMatters is developing a new platform for scientific publications. The Chinese company Bitmain (see p. 64) also has a Swiss branch in the building.

CONFERENCES AND BARBECUES

In addition to start-ups, Trust Square also reserves workspaces for researchers from partner universities (ETHZ and the University of Zurich, in particular). “The idea is to concentrate all of Switzerland’s blockchain expertise in one place,” said Gasteiger. “To promote discussion and collaboration between start-ups and the academic world, we regularly organise events, conferences and even barbecues. And the more informal spaces, such as the terrace and cafeteria, make it possible for everyone to meet each other and talk.”

However, to “avoid conflicts of interest”, large and established companies won’t be granted residency at Trust Square, according to Gasteiger. “But of course, they are welcome to organise events or conferences with us.”

Beyond Swiss borders, the Zurich hub is attracting interest. “People from around the world come to see us. And we are happy to welcome them. We designed Trust Square to be an open house and anyone who is interested in blockchain technology can come visit. There is such a need for information. When the internet started in the 1990s, no one could predict that social networks were coming. Today, we’re in the same situation with blockchain. We need time to develop and explain this technology.”

Indeed, while the boom of cryptocurrencies in 2017 and the associated ▷

Co-founder of Trust Square, Daniel Gasteiger also launched nexussquared in 2016, a fintech that helps companies integrate the blockchain into their business model, as well as Procivis, a start-up specializing in digital identification.

"Switzerland is among the global leaders"

Author of *Crypto Nation Switzerland*, available at the end of the year, former banker Alexander Brunner wanted to understand how a small country such as Switzerland could become a global blockchain leader. Interview.

BY BERTRAND BEAUTÉ

"When I was a student, everyone wanted to work in finance. That's no longer the case today. Young people want to launch their blockchain start-ups. Banks are boring to them." Being a very versatile person, Alexander Brunner followed this path. After working for hedge funds, he left the finance world to pursue blockchain technology. With an office in Trust Square, Brunner is currently finishing his book on the subject. He is also a politician, as a member of parliament in the city of Zurich representing the FDP.The Liberals.

Switzerland is often seen as one of the top three countries in the world for blockchain. Is that correct?

There is no doubt that something significant is happening in our country. The larger public only recently started hearing about cryptocurrencies and blockchain technology, with the Bitcoin surge in late 2017. But the blockchain Ethereum, which is the basis for the cryptocurrency Ether, was started in Zug as early as 2014. Since then, we have seen the arrival of the Crypto Valley Association in the canton of Zug (a term practically branded since 2014), then Trust Square in Zurich. Together, they created an ecosystem conducive to blockchain development in Switzerland.

As a result, 40% of the 15 biggest ICOs overall, since 2016, took place in Switzerland. Given the size of our country, this is pretty remarkable. It puts us among the world leaders in blockchain. Now, experts from all over the world come here to see what we're doing. I believe politicians – and I am one as a member of parliament in the city of Zurich – have a good understanding of the challenges and the importance of blockchain, because they have supported and encouraged this phenomenon. In January 2018, for example, federal councillor Johann Schneider-Ammann declared he wanted to make Switzerland a "Crypto nation".

How do you explain Switzerland being at the forefront of this industry?

Luck! (Laughs.) One thing is certain: it's not a political initiative. At the beginning, pioneers such as the Dane Niklas Nikolajsen, founder of broker firm Bitcoin Suisse, decided to settle in the canton of Zug as early as 2013. They came here motivated by the political and fiscal stability of our country, as well as the presence of a strong financial centre. These pioneers then convinced Russian-Canadian genius Vitalik Buterin to also choose Zug as the place to launch his Ethereum project.

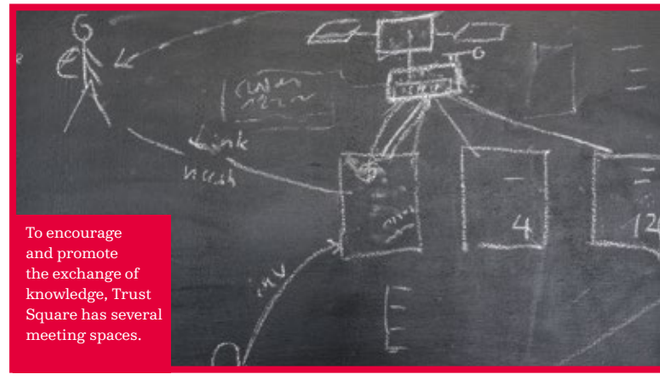
All of this created a first ecosystem: Crypto Valley. The city of Zug itself played a role. The local government encouraged this phenomenon by welcoming it from the very beginning. I think the fact that Switzerland is one of the global blockchain leaders is because chance led the right people to the same place at the right time.

Will Switzerland's advances last?

No one knows. Several countries such as Liechtenstein, Malta, Cyprus and Estonia are making a lot of progress. In comparison, Switzerland has many advantages, notably because it was one of the early adopters and has a strong economic community. Furthermore, the regulatory body became involved quite early. The financial market supervisory authority (FINMA) was the first in the world to publish guidelines to oversee ICOs in February 2018 (see p. 44). So we're in a very good position. But at the same time, we must remember that Switzerland is a small country. If giants such as the United States really make progress with blockchain, they will quickly outpace us.

It's also kind of a shame that the big Swiss banks aren't more interested in the technology. For the moment, they have a "wait-and-see" approach, as they are concerned by potential US reactions. Indeed, Switzerland is part of a global financial system that is dominated by the United States. The US has a very strict security law regarding all ICOs as security offerings. Therefore, for Swiss banks with a strong US presence, it could be risky to dabble in cryptocurrencies without an in-depth review of US law. Faced with this threat, Swiss banks prefer to wait. I think that's a shame.

speculation put blockchain in the spotlight, the media hype also had a negative effect. "The media turned everything into headlines. Speculation, Ponzi schemes, manipulation. People simplified and reduced blockchain technology to just cryptocurrencies," said Gasteiger. "These approximations could potentially have a negative impact, since they stall investments. Of course, there are people who abuse the system, especially when it comes to ICOs, but we mustn't view this technology solely through the negative cases. We need to make people understand this technology."



To encourage and promote the exchange of knowledge, Trust Square has several meeting spaces.

That is one of Trust Square's missions. The name, by the way, wasn't randomly chosen. No mention of cryptocurrencies or blockchain. Instead, the word "Trust", which brings to mind companies and business rather than speculation, was chosen. "We don't buy into the hype of the moment," said Gasteiger. "We want to construct business models that work over the long term."

But the founders are not naive, either. "We don't want to be seen as unconditional blockchain supporters," said Flurin Hess, co-founder of Trust Square and Dezentrum, a think tank dedicated to blockchain. "We believe that with this technology, the world will undergo a large-scale decentralisation that will disrupt several ▷

The think tank Dezentrum wants to popularise blockchain by using concrete examples like the one here – a satellite working with this technology.

markets. It is crucial for society to be aware of these challenges so that critical debate can be conducted."

"Many countries such as Cyprus, Malta and Liechtenstein are quickly picking up speed in the industry"

Daniel Gasteiger, co-founder of Trust Square

In front of a miniature satellite, Ozan Polat, another co-founder of Trust Square, tries to explain the questions that this technology will raise. "Let's imagine a self-driving taxicab that uses blockchain. Customers pay using cryptocurrency and the vehicle uses cryptocurrency for its electric recharging and repairs. It is completely self-sufficient and can even run its own business. But what happens if the vehicle acquires itself and becomes very rich? How will it be taxed? Who is responsible if there is an accident? We don't have a fixed position for these types of scenarios; instead, we allow people to think it over." To lead the discussion, Trust Square also calls upon philosophers, artists and freethinkers.

Beyond Zurich, the blockchain phenomenon is spreading in Switzerland. The industry pioneer region of Zug also has its own hub called Crypto Valley Lab, and in French-speaking Switzerland, an incubator known as Fusion launched the Swiss Blockchain Association in Geneva in January 2018, as well as a blockchain lab (see inset on p. 38).

So is Switzerland a world leader in the industry? "For the time being, we're in a great position," said Gasteiger. "Singapore and the United States are bigger markets for ICOs, but we're a close third. However, we need to pay close attention. Many countries such as Cyprus, Malta and Liechtenstein are quickly picking up speed in the industry."

The potential expansion of Trust Square in the coming months should reinforce Zurich's spot as an epicentre for blockchain innovation. "But we cannot stay on Bahnhofstrasse indefinitely," said Gasteiger. "It's a temporary solution, because the building will be renovated. The planning and building permissions are ongoing for now." By 2020, the hub is expected to have left the legendary avenue for its new location. Where, you may ask? "The future is wide open," said the former banker. "Blockchain is here for the long haul." ◢

ETHER: A STAR MADE IN ZUG

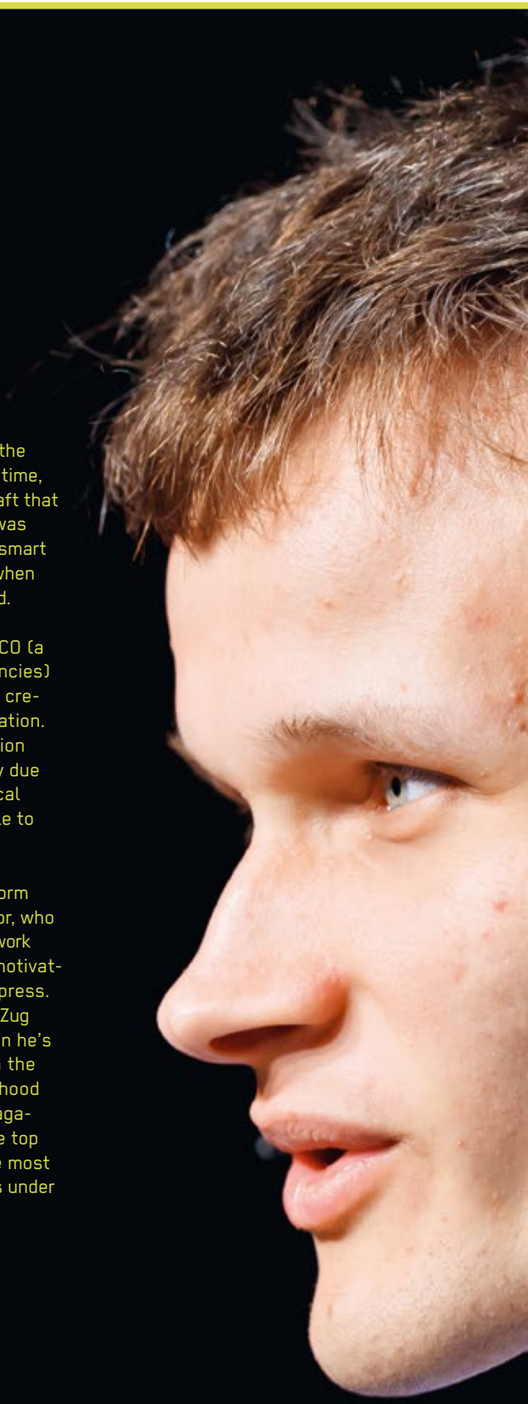
The second largest cryptocurrency in the world, created by prodigy Vitalik Buterin, was started in the Alemannic commune.

Switzerland's Crypto Valley is duly named, especially as it is home to Ether, one of the most promising digital currencies and second in the world in terms of capitalization. Zug is also home to the headquarters of the Ethereum Foundation, the non-profit company that promotes the Ethereum platform and Ether.

It all began in late 2013, when young Russian-Canadian prodigy Vitalik Buterin, frustrated by the limitations of Bitcoin, decided to create a new cryptocurrency. This computer science student at the University of Waterloo quit his studies and threw himself wholeheartedly into the idea. Only 19 years old at the time, he published a preliminary draft that resonated strongly. His goal was to make it possible to create smart contracts that self-execute when certain conditions are fulfilled.

Just a few months later, an ICO (a fundraiser using cryptocurrencies) was launched, leading to the creation of the Ethereum Foundation. Zug was chosen as the location for the headquarters, notably due to the legal, political and fiscal conditions that are favourable to cryptocurrencies.

And thus the Ethereum platform was born. Its eccentric creator, who is completely absorbed by his work and seems to be entirely unmotivated by money, is rarely in the press. Reports say that he visits the Zug Foundation on occasion, when he's not working with his team in the Monterey Heights neighbourhood of San Francisco. *Fortune* magazine ranked him as one of the top 40 Under 40, a ranking of the most influential people in business under the age of 40.



VALENTIN FLAURAUD / KEYSTONE

PARTY'S OVER FOR ICOs!

A new way for companies to raise funds, ICOs boomed in 2017. But the speculative bubble is about to close as the market starts to come under regulation.

BY BERTRAND BEAUTÉ

It is the latest chapter in a book that is still on everyone's lips. On Thursday, 26 July, the Swiss financial market supervisory authority (FINMA) announced that it had initiated proceedings against Envion. The young, Zug-based crypto mining company launched an initial coin offering (ICO) in late 2017. This new fundraising option, halfway between an initial public offering (IPO) and crowdfunding, landed the company nearly 100 million Swiss francs from 30,000 people in one month. This record-high amount surpassed all expectations and raised a lot of hopes.

Alas, in February 2018, the dream turned into a nightmare for investors. On the back of suspicions of fraudulent practices within the company, Envion's value came crashing down. FINMA has information indicating that Envion may have breached financial market law over the course of its ICO. The investigation by the financial markets authority has only just begun, but investors who believed in the project lost everything, or almost.

"A variety of unprofessional deals were conducted in 2017"

Matthias Weissl, co-founder and CEO of Verum Capital, a Zurich-based ICO and blockchain advisory firm

The case is hardly exceptional. For example, in Vietnam, the founders of the company Modern Tech vanished after pocketing more than $600 million via two ICOs. In the United States, Dominic Lacroix, the former CEO of PlexCoin, is behind bars following a fraudulent ICO ($15 million raised), while another $2.9 million vaporised with the start-up Opair and Ebitz.

SUPERVISORY AUTHORITIES CRACKING DOWN

"A variety of unprofessional deals were conducted in 2017, including in Switzerland", says Matthias Weissl, co-founder and CEO of Verum Capital, a Zurich-based ICO and blockchain advisory firm. "And many cases around the globe have raised millions, but turned out to be scams."

How could that be? To answer that question, we have to understand how capital is raised using cryptocurrencies and blockchain technology.

Basically, what happens is that a company in need of financing can launch an ICO. Interested investors take part by paying in cryptocurrencies (usually Bitcoin or Ether). And, exactly as with an IPO, the offering is public, so anyone can invest. One key difference is that, in exchange for their money, investors do not receive an interest in the company in the form of shares, but rather in tokens. Similar to crowdfunding, most of the time these tokens grant rights to use the company's products or services.

"A lot of people think of ICOs as regular fundraising," says Jonathan Llamas, co-founder of Verum Capital. "But they're much more than that. As with crowdfunding, you have to convince a community why they should invest in your project." Yet there is a slight difference, in that tokens can often be sold, hence the speculation. A Token Report study stated that only 10% of the tokens issued are used by buyers to enjoy the issuer's services. The other 90% are kept purely for speculation in a totally unregulated market, the perfect setting for deception.

SWITZERLAND PAVING THE WAY

The figures are dizzying. In 2017, nearly 350 ICOs took place worldwide, bringing in $5.5 billion, compared with $256 million raised by 43 companies the previous year, says the US website *Coindesk ICO Tracker*, a leading ICO resource. Even though these fundraising rounds often end up a failure – a Morgan Stanley report estimates that a third of ICOs never get anywhere – the trend is nowhere near dying down. Quite the opposite, in fact. More than 400 ICOs were completed over the first seven months of 2018, raising a grand total of $14 billion.

That rapid growth resulted in governments taking a closer look. China's central bank decided to flat out ban ICOs. Financial market supervisory authorities in the United States, United Kingdom and France have officially warned citizens of the risks involved in these deals and are working to introduce appropriate regulations.

"Having clear rules will reassure investors deterred by the many scandals in 2017"

Jonathan Llamas, co-founder of Verum Capital

But the swiftest to act were the market authorities in Switzerland, where one third of the biggest ICOs took place in 2017. In February 2018, FINMA published a guide explaining how it deals with ICOs, thus confirming that oversight and sanctions do apply to this nascent business (see inset).

"Things were totally chaotic in 2017. Little investor protection, hype-driven and risky, because it was too easy for companies to raise a lot of money through ICOs. And that means ICOs will be used by some in the wrong way." says Weissl. "Fortunately the bubble is over. The market is being cleaned up, in part thanks to FINMA's efforts. It's a very positive signal for the future. This year, we have noticed that the projects are more viable than before, and that lots of ideas are rejected in the first stages of ICOs."

However, could FINMA's regulations stifle the Swiss-made ICO before it really gets off the ground, sending deals to places that make less of a fuss, such as Malta or Gibraltar? "On the contrary," Llamas says. "Switzerland remains particularly attractive, and having clear rules will reassure investors deterred by the many scandals in 2017."

It would certainly be a pity if investors shied away from ICOs, as this system of financing seems to work. In June 2018, the US company Block.one raised a record $4 billion via an ICO, and investors are likely to reap the benefits.

But one should take heed. "ICOs are not currently designed for mainstream investors. People have to understand how blockchain technology and tokens work before getting started," warns Weissl. "The market is risky, and amateur investors could get swindled. People still have a lot to learn about these technologies." To prevent scams, thorough due diligence is required. ◢

UTILITY OR ASSET?

The Swiss financial market supervisory authority (FINMA) legally classifies ICOs into one of three categories based on the type of tokens issued. If the tokens qualify as a method of payment, meaning that they are accepted for purchase of goods, they are "payment tokens", also known as pure cryptocurrencies, such as Bitcoin and Ether. When the tokens only grant rights to use or access a service provided by the issuing company, they are called "utility tokens". In that case, FINMA focuses on whether the company actually meets its commitments. Lastly, investment or "asset tokens" grant rights on the future income of the business. The Swiss authority treats asset tokens like "transferable securities", i.e. shares. Accordingly, asset token offerings must comply with financial market laws, while utility and payment tokens come under legislation against money laundering, for the time being.

INTERVIEW

"WE NEED NEW REGULATIONS"

A globally respected leader, William Mougayar outlines the steps towards massive blockchain adoption.

BY LUDOVIC CHAPPEX

Blockchain will revolutionise the world, but not right away... This is the credo of William Mougayar, who readily compares blockchain's current state to that of the internet in the 1990s. We take a closer look.

Which economic sectors will be disrupted by blockchain technology first?

Since the blockchain is primarily and natively about the movement of digital money, it is first going to affect the financial services industry. Initially, the impact will be small, in relative terms, because the financial services industry is a huge market. But you can't just apply simple market share analysis to the blockchain's penetration record. You need to remember that the blockchain is creating a new parallel system that has no equivalent today. It's easier to create a new system than to attack the current one head-on.

Are there examples of big companies making large-scale use of blockchain technology?

We are still on the hunt for truly visible blockchain technology implementation. The reality is that large companies take a long time to conceive, approve, fund, test and roll-out big projects. Furthermore, they don't want to disrupt their business models, which the blockchain could easily do. So for the time being, they end up tinkering with the blockchain and clamping down on its real potential. If you want to look for real blockchain innovations in the short term, I expect it will instead come from the thousands of start-ups that are emerging in this space.

Which listed companies active in the blockchain industry are the most promising in terms of investment?

The most promising companies and projects in the blockchain space are the ones that are delivering on their promises, with actual users, and not just making promises.

I look for those that are exhibiting visible outcome metrics such as the number of active users, the number and value of transactions, the value of contracts, the way in which users are compensated, etc.

"Blockchain's influence will become significant between 2022 and 2025"

In terms of obstacles to blockchain development, the legal aspect is often discussed...

I've always said that the blockchain's full potential will only be realised when these three aspects meld together: business, technology and legal. On the business side, it depends on our ability to innovate and implement new business models. On the technology side, we are still developing the blockchain. On the legal side, we haven't yet come to terms with the fact that we need new regulations. Unfortunately, we are still trying to apply existing regulations, which is like trying to fit a square peg into a round hole.

How long do you think it will take before blockchain will really be at the core of the economy?

The blockchain economy will become more significant in the 2022–2025 time frame. There will be a long gestation period, just like the internet. Many of the blockchain technology pieces need to mature and evolve before widespread consumer adoption can set in. We are still in the early days of blockchain technology developments. We are probably 65% into the infrastructure build-out, 30% into middleware availability (ed. note: middleware is software that links two separate applications together) and at best 10% into applications.

Why are the share prices of various cryptocurrencies still tied up with Bitcoin's share price?

Today, most cryptocurrencies rise and fall together like a herd. The lack of discrimination between good and bad coins exists because there is too much dumb money in the system that is chasing momentum. People are not looking at real usage metrics for tokens. In theory, smart money will find the better coins, because their information signals are better. But when the majority of investors are from the dumb money category and generating a disproportionate amount of trade activity, the supply/demand dynamics are messed up.

The decoupling of altcoins' performance from Bitcoin will happen when two factors come into play: firstly, when smarter investors take an interest, and secondly, when visible metrics from these projects become available. ◢

BLOCKCHAIN MENTOR

A founder of various IT start-ups, William Mougayar immersed himself in blockchain technology starting in 2013. He is the author of best-selling book *The Business Blockchain*, published in 2016. As a blogger, conference speaker and advisor, he has an excellent international reputation in the industry. His expertise is also appreciated on Twitter, where he has more than 25,000 followers. Mougayar is currently based in Toronto, and planning to live in Geneva. He is the Managing Partner and Chief Investment Officer at JM3 Capital, part of a division of Jabre Capital Partners SA.

5 sectors under the microscope

Companies are increasing the number of advertisements of projects using blockchain technology. Industrial-scale deployment is expected by 2025.

BY BERTRAND BEAUTÉ AND LUDOVIC CHAPPEX

Kodak, Boeing, Telegram are among the growing number of companies that have announced – with great fanfare – that they will be starting to use blockchain technology. Since Bitcoin took off in December 2017, it does appear that the term is in fashion. Just mentioning it can send a stock price soaring. In January 2018, for example, the Kodak share price rose 300% following the announcement of the creation of the KodakCoin cryptocurrency. The phenomenon is affecting all sectors, from finance to food, music and healthcare.

According to the experts, the main markets concerned will certainly be finance and insurance, as blockchain will enable faster transactions.

If projects have been multiplying across all sectors, it is because companies are afraid to miss the bandwagon. The same thing happened with the internet revolution. "Industrial groups have not forgotten the 1990s," says Grégoire Revenu, managing partner at the investment bank Bryan, Garnier & Co. "The ones that missed the switch to digital are now finding themselves in a situation like Toys "R" Us. No one wants to take the risk of going through that. However, while blockchain will disrupt many areas of activity, not all applications will work. Some weeding out will have to be done."

"This technology has become a real ecosystem"

Claire Balva, CEO of Blockchain Partner

Less than one year after unveiling it, Kodak's project fell through and its share price fell back to its previous levels. In this context, investors are wondering how to find their way through the jungle of announcements, many of which are simply marketing actions. "Cases where there is real use need to be identified, where blockchain provides added value," is the answer provided by Christine Hennebert from the French Alternative Energies and Atomic Energy Commission (CEA).

SHUTTERSTOCK

This is proving to be an arduous task: "This technology has become a real ecosystem, with its aficionados and schools of thought. It is difficult for novices to form a clear-cut opinion, especially as a mainstream blockchain today could very well have disappeared in one year," highlights Claire Balva, CEO of Blockchain Partner. "Over time, dominant blockchains will emerge, but until then, I think that we shouldn't get attached to one particular chain."

To minimise the risks, Grégoire Revenu believes that investors should avoid betting on applications (see the companies to watch on p. 49 onwards):

"As in any gold rush, the ones making money are the ones selling the picks," underlines the analyst. "At the beginning of the internet, for example, Cisco experienced a huge success in selling routers. With blockchain it will be the same. Companies offering access to services, such as suppliers of microprocessors and wallets, and manufacturers of mining infrastructures, are good investments. I think that the Cisco of blockchain already exists." They could be companies that are not yet listed, such as Bitmain, CoinBase, Basis or Bitfury, and which are already generating significant revenue. Or players that are already publicly-traded, such as GMO Internet. ▷

PLAYERS TO WATCH

CRYPTOCURRENCIES
COMPANIES

BITCOIN

The granddaddy of cryptocurrencies. Created in 2009 by a person known as Satoshi Nakamoto, Bitcoin continues to rule over the digital currencies market, making up more than two-thirds of all cryptocurrencies traded. For the time being, the share prices of altcoins still fluctuate based on Bitcoin. Supporters see the currency as digital gold, whose value will only increase over time.

BTC

BITCOIN CASH

This token, created on 1 August 2017, is the result of a hard fork with Bitcoin. It is based on the same blockchain but is faster and allows for less expensive transactions than Bitcoin. Bitcoin Cash ranks comfortably among the top five cryptocurrencies.

BCH

BLOCK ONE CAPITAL

A PRE-ICO

The venture capitalist Block One Capital invests in start-ups operating in the blockchain field. Among its main investments are the start-up Finzat, which is developing a solution for mortgages, and the virtual store Shopin. Block One finances these companies right up to their ICO, in the hope of getting back 10 times its initial investment.

HEADQUARTERS: VANCOUVER (CA)
EMPLOYEES: NOT DISCLOSED
REVENUE (2017): $CA 60,500

BLOK

FINANCE

Banks brace for the challenge

Concerned by the possible uberisation of banking, the sector is preparing for an upcoming technological upheaval.

The experts are convinced: the blockchain will disrupt finance. And the industry is taking these predictions very seriously, with 90% of large banks in North America and Europe currently exploring blockchain solutions to prepare for the upcoming disruptions. "Bank of America alone has filed 43 patents relating to blockchain technology," says Demelza Hays, fund manager at Incrementum. "Central banks are also taking a strong interest in this technology, especially in the United States, the United Kingdom and Singapore."

While the entire financial industry is on the alert, it is transactions that will likely be affected first: "Tokens will prevail as a payment method," says Lewin Boehnke, head of research at Crypto Finance in Zug. The revolution seems inevitable, especially since the blockchain would drastically reduce both time and costs. Indeed, for banks and their clients, most of the current fees for transactions – and international wire transfers in particular – can be attributed to trusted third parties that are involved in the complex process. Hence the idea of cutting out these middlemen.

On that front, a company called Ripple and its XRP token have been quite the topic of conversation for the past few months. The Californian company is forming multiple partnerships with big names in the industry (see article on p. 57). The potential for reduced transfer costs has convinced potential clients. According to numerous studies, the banking industry as a whole could save between $8 billion and $12 billion annually by using the blockchain. And what about the time savings? An international payment can currently take up to several days, an anachronism of which Ripple is making a mockery, proposing the same transaction in just a few seconds. In May, the company trialled a money transfer from the United States to Mexico in a real-life situation using the XRP token. It took a grand total of two minutes.

But despite these impressive tech credentials, the road to success will be long and perhaps even risky for the US-based start-up. According to many crypto-enthusiasts, XRP is nothing more than a centralised token used in merchant transactions, which goes against the original libertarian and emancipatory spirit of the blockchain.

OFFICIAL LEWEB PHOTOS

Brad Garlinghouse, Ripple's charismatic CEO, has been on TV sets and conferences in recent months. The objective: upset the banking payments industry.

Currently, an international payment can take up to several days. Ripple is making a mockery of this anachronism, proposing the same transaction in just a few seconds

Purists will pass right over it. But that may not be the most pressing issue for Ripple and its clearly stated ambitions. According to William Mougayar, chief investment officer at JM3 Capital: "While Ripple's solution can accelerate transactions, it is up against an extremely conservative industry that has a strong risk aversion in terms of marginal gains. To be successful, XRP would have to be massively adopted, and I think the barriers to that are too high to overcome."

And banks are also on the war path, seeking to master these technologies by developing their own systems using private blockchains. For example, since 2015, the New York consortium R3, a group of some 100 companies including BNP Paribas, Credit Suisse and UBS, is working on a blockchain network that is "fully interoperable" for facilitating information exchanges between banks. The older SWIFT – the interbank transfer network founded in 1973 – is also trying to safeguard its hegemony. The door seems to be closed tight, for now.

At the end of the day, stock exchange platforms could be the Trojan horse for virtual currencies such as XRP, as they would contribute to their large-scale adoption.

And here once again, Switzerland is at the forefront. In June, the financial market operator SIX announced the launch of SIX Digital Exchange (SDX), an infrastructure dedicated entirely to digital asset trading, subject to supervision by FINMA and the Swiss National Bank. The first services are set for launch in mid 2019. ▷

BTL

USED BY OIL COMPANIES

Often cited as one of the most promising companies in the sector, this UK-Canadian-based company develops a private blockchain development platform called Interbit. Among its first users are the UK oil group BP, Italian company Eni and Austrian-based Wien Energie, which tested a beta version of Interbit over 12 weeks – a success. However, BTL Group is still accumulating losses and its share price yoyos on the Toronto stock exchange.

HEADQUARTERS: VANCOUVER (CA)
EMPLOYEES: 30
REVENUE (2017): $CA 370,000

BTL

CARDANO

Created by a former Ethereum employee, the Cardano token is also used for smart contracts but is faster and more reliable than its big sister. The token recently broke into the top 10 of the largest capitalisations.

ADA

EOS

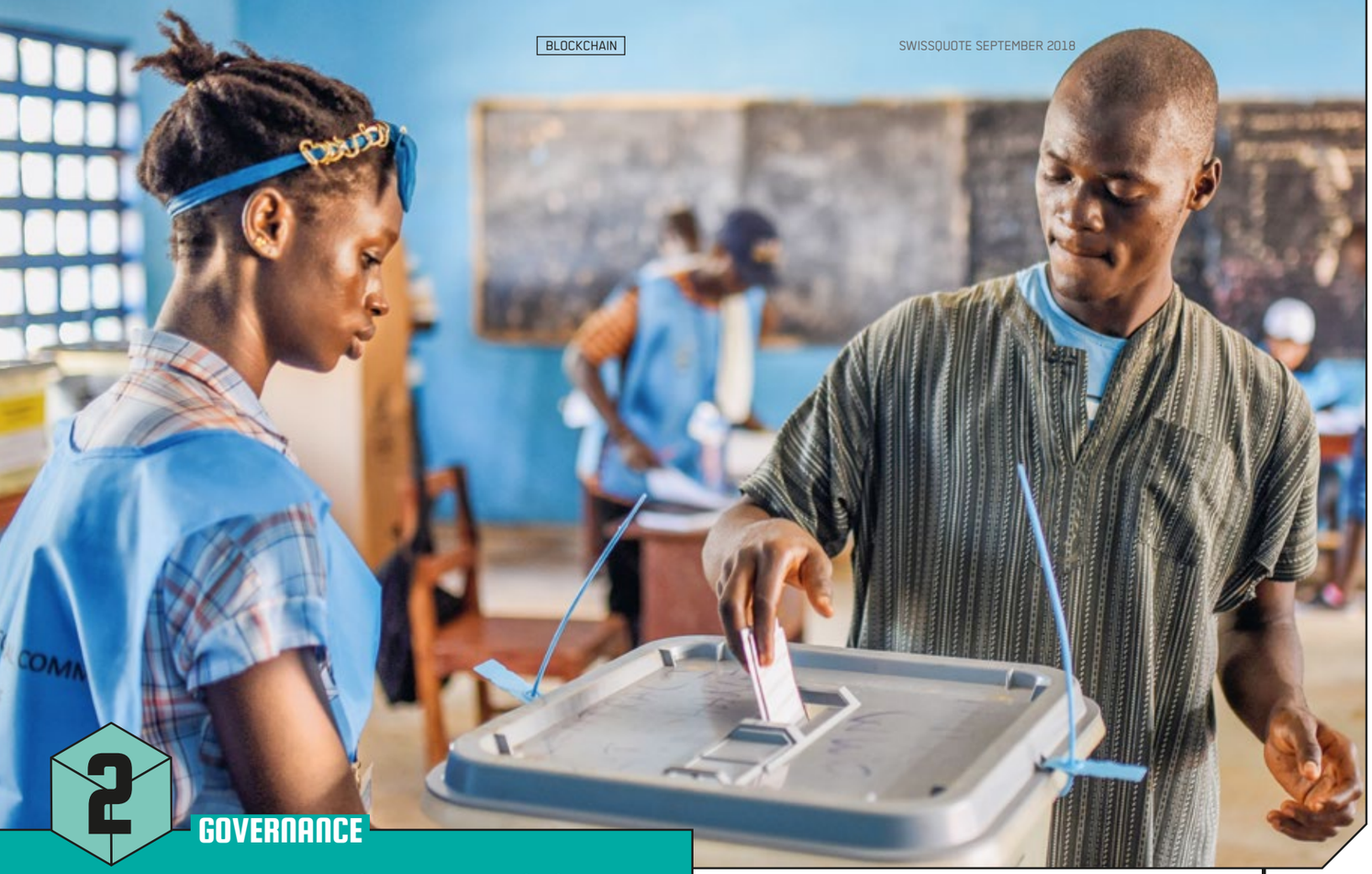
Like Ethereum, EOS allows for the development of decentralised applications. It stands out due to its more user-friendly interface.

EOS

ETHER

The brainchild of prodigy Vitalik Buterin (see p. 43), Ether has caused a big sensation since its launch in 2015. It is currently the number-two digital currency in terms of volume traded. It can be used to create smart contracts able to self-execute automatically, rendering third-party intervention unnecessary. A number of companies and developers are experimenting with this token.

ETH



OLIVIA ACLAND / REUTERS

2 GOVERNANCE

At the service of citizens

Blockchain will simplify many administrative services. A boon for developing countries.

When talking about the blockchain revolution, we immediately think of the economic sectors that could be disrupted by this new technology. But the impetus could come from the public sector, where there are a growing number of innovations. "Governments could move faster than businesses," says Vincent Pignon, CEO of WeCan.fund.

In Ghana, for example, the NGO Bitland is working with public authorities to record the country's land register on blockchain. "Seen from here, this type of application can seem trivial, but many countries do not have a reliable land register, which creates many problems," explains Grégoire Revenu. Often buyers do not know if the land really belongs to those who are selling it, which restricts investments. Not counting the fact that an unreliable government can change the register as it likes, or even lose it.

This issue is not merely theoretical. Following the earthquake that ravaged Haiti in 2010, all of the country's registers were destroyed. While several associations were doing their best to rebuild the country, a major obstacle arose: it was impossible to identify the legitimate owners of thousands of plots, which led to conflicts. Today, close to 10 years after the catastrophe, many reconstruction projects have come to a standstill due to ownership problems.

"In this context, blockchain represents a preferred, solution" says Revenu. "It constitutes an unforgeable general ledger, in which all transactions can be permanently recorded and consulted by everyone." In addition to Ghana, Honduras and India are notably working on creating virtual land registers.

But the applications do not end there. As blockchains can be used as a bulwark against fraud and corruption, several countries are currently testing this technology for voting processes. In March 2018, during the last presidential elections in Sierra Leone, the Agora blockchain was tested in some polling stations.

The canton of Geneva has linked its trade register to a blockchain

In Switzerland, the start-up Procivis is also working on an e-voting platform using blockchain and, more generally, digital identity technology. "Looking at the level of digitalisation of the Estonian public services, I was deeply impressed," says Daniel Gasteiger, co-founder and CEO of Procivis. "Blockchain can contribute hugely in this area, but this will take time, as voting and digital identity are extremely sensitive subjects for democracies."

Pending this, projects are multiplying on a local scale. Since 2018, the town of Zug has experimented with electronic voting based on blockchain technology. And in Geneva, the canton has linked its trade register to a blockchain. The decentralised listing is now accessible and can be used by anyone, at any time. Moreover, its data may not be altered. Once entered, it cannot be erased or modified. Ultimately, the objective of the canton of Geneva is to extend blockchain to other administrative services, notably taxation. ▷

Blockchain technology has been tested in recent presidential elections in Sierra Leone, with the aim of preventing fraud. Here, a traditional polling station in Freetown on 7 March.

GLOBAL BLOCKCHAIN TECHNOLOGIES

THE PARTNER

This investment fund has signed prestigious partnerships, such as the Hyperledger foundation, to be able to work with the major sector players such as Stellar, NEO, Ethereum or Graphene. Among Global Blockchain's main investments is Spectra7, a company that is achieving more and more success.

HEADQUARTERS: VANCOUVER (CA)
EMPLOYEES: NOT DISCLOSED
REVENUE (2017): $CA 46.5 M
BLKCK

GMO INTERNET

THE JAPANESE MINER

This internet services provider in Japan has recently got into cryptocurrency. For the time being, the group generates just 5% of its revenue thanks to mining, but this booming market is set to make it 11.7 billion yen (105 million Swiss francs) in 2018. A new machine containing a latest generation ASIC chip, the GMO Miner B3, was launched on the market in July, and should boost revenue.

HEADQUARTERS: TOKYO (JP)
EMPLOYEES: 5,670
REVENUE (2017): CHF 1.4 BN
TYO: 9449

HIVE BLOCKCHAIN

THE NEW MINER

The Canadian company Hive Blockchain Technologies linked up with Genesis Mining to operate two farms that mine Ethereum, Zcash and Monero. One is in Iceland and is powered by a low-cost geothermal current. The other is in Sweden. In September, it will set up a second farm in Sweden, dedicated to Bitcoin. This company has an impeccable balance sheet and no debt. It could experience strong growth.

HEADQUARTERS: VANCOUVER (CA)
EMPLOYEES: 5,454
REVENUE (2017): $13.08 M
TSX.V:HIVE

3

INSURANCE

The first offers are already operational

With the aim of automating their reimbursement services, insurers have begun to set up platforms using blockchains.

Banks do not have the monopoly on blockchain technology. Insurers could even be the first to implement it on an industrial level – with an epicentre in Zurich. Indeed, it is in the offices of Trust Square (see our article on p. 36) that one of the most promising companies in the area resides: B3i, which stands for Blockchain insurance industry initiative. "We plan to offer our first blockchain-based smart contracts in January 2019," Paul Meeusen, CEO of B3i, tells us proudly.

Everyone will have the same version of the truth

To understand the importance of this event, we need to go back to the origins of the company. Created in October 2016, B3i was initially a consortium grouping together 13 insurers, including Allianz, Munich Re, Swiss Re and Zurich Insurance Group, which joined forces to explore the potential of blockchain. In 2017, after the launch of the project, a first prototype was completed and underwent a market testing by 38 companies, including heavyweights such as the US company AIG. "Many blockchain initiatives have popped up in various sectors, but few have succeeded in bringing together such a large group," highlights Meeusen. "This does not guarantee its success, but it does maximise its chances."

B3i worked on developing a blockchain platform that would enable insurers to share their data in a secure and automated way. "We focused on B2B, and particularly the area of natural catastrophes. This is a sector that lends itself to experimenting, as it is significant in value with fairly low volumes of transactions and little data privacy concerns," continued Paul Meeusen. But what can blockchain contribute to this type of transaction? According to Meeusen, "This type of contract is renewed once a year, and data is often dispersed among the different players. Blockchain will give all participants access to the same information at the same time, and thus avoid unnecessary friction, thereby accelerate transaction settlement and increase contract certainty. In other words, everyone will have the same version of the truth."

The stakes are high. After the terrorist attacks of 11 September 2001, it took several years of legal battles before an agreement could be reached between seven insurance companies, including Swiss Re, and the developer of the buildings that were destroyed, Larry Silverstein. Improved contract certainty via a distributed digital platform could have helped prevent such anomaly.

Initially, B3i tested the Hyperledger blockchain technology, before setting its sights on Corda, which according to the company is better suited to its business, due to its strength in scalability, network and privacy management. After a year of successful tests, B3i changed status, becoming a company in its own right, in April 2018. "There were several possible options", says Meeusen. "B3i could have remained a consortium, or become a foundation. In the end we decided it would be best to operate as a commercial company, which measures its success by the adoption of its network, and generates its revenue from usage. This will fund ongoing maintenance and continued development of the network."

The platform will thus be operational from January 2019. "We will move forward step by step. At the start, the blockchain will coexist with paper versions of the contracts," explains Paul Meeusen. "Then, gradually we will cover different product areas from reinsurance to commercial to primary insurance. Ultimately, I think that blockchain platforms will gradually become available for end customers (B2C)."

With its platform "Fizzy", AXA made the opposite choice, by testing blockchain technology directly with individuals. In concrete terms, when a customer buys flight delay insurance on Fizzy, this transaction is recorded in the Ethereum chain. As this smart contract is also connected to the global airline databases, as soon as a flight is delayed by more than two hours, compensation is automatically triggered. In addition to eliminating intermediaries, customer reimbursement is accelerated. ▷

ISTOCK

Axa is currently testing the Ethereum blockchain for its delayed flight insurance. Customers are automatically and immediately compensated when the contract applies.

LITECOIN

This top 10 cryptocurrency is inspired by Bitcoin's technical foundations but offers faster transactions. With Litecoin, blocks are created every two minutes and thirty seconds, whereas Bitcoin creates a block every 10 minutes. Mining is also easier and transaction fees are substantially lower.

LTC

MGT CAPITAL

THE US MINER

With server farms in Sweden and in Washington, MGT Capital Investments looks set to become one of the most important Bitcoin miners in the United States. For the time being, the firm is concentrating on its development, which explains its losses ($50.4 million in 2017). When its factories are fully operational, MGT will run around 7,000 S9 Bitmain miners.

HEADQUARTERS: DURHAM (US)
EMPLOYEES: 6
REVENUE (2017): $3.1 M

MGTI

NEO

Often described as a Chinese Ethereum, NEO also allows for smart contracts and decentralised applications.

NEO

SPECTRA7

A SEMICONDUCTOR SPECIALIST

The chips of this California-based company are used in several virtual reality headsets, notably the HTC Vive and Oculus Rift. In November 2017, it unveiled a new product, the BCI-2500, dedicated to data centres that use blockchain technology. The announcement seduced the investment company Global Blockchain, which invested $CA 2 million in January 2018.

HEADQUARTERS: SAN JOSÉ (US)
EMPLOYEES: 120
REVENUE (2017): $10.6 M

SEV

WALMART

Since 2016, Walmart, in partnership with IBM, has tested blockchain technology to trace the transportation of products.

4 SUPPLY CHAIN

Guaranteeing product traceability

Food, luxury, pharmaceutical, automotive…almost every industry can use blockchain technology to better monitor and follow their products.

Since human intermediaries are fallible and corruptible, the traceability of commercial products is rarely 100% guaranteed. This lack of transparency is particularly striking in the food industry. The far-reaching horse meat scandal in 2013 and the Chinese contaminated milk catastrophe in 2008 are hard to forget. According to a study by PwC, agri-food fraud could cost as much as $40 billion per year.

According to the site *Blockchain France*, which published a dossier on the subject, blockchain technology can help counteract obscurity and provide clear diagnoses regarding sources of contamination. To do so, supply chain stakeholders would use a blockchain to encode all the steps involved in the production process, starting from the extraction or production site all the way to the point of sale.

Encoding these steps in the register can be done manually, for example by photographing documents using a smartphone, or automatically, via smart sensors attached to products. This is one of the most promising applications of the Internet of Things. With this technology, it is possible to know the location, temperature or humidity rate of any given product in real time.

Food giants have begun to experiment – successfully – with these technologies. US giant Walmart, in partnership with IBM, has tested blockchain technology in China since 2016 to monitor the transport of pork products. Now, product origins can be determined in a matter of minutes, rather than several days as was previously the case. It is remarkable progress. So much so that Walmart's head of food safety has declared this technology to be the "Holy Grail" of the supply chain. In Europe, Carrefour announced last month that its Auvergne chicken will now be traced using blockchain. If they wish, customers can access the entire supply chain and the animal's life cycle via a QR code.

For health reasons, the agri-food industry is a particularly convincing case study, but the use of blockchain in logistics can apply to other industries as well. In fact, almost all commercial sectors can benefit from the technology, particularly industries with complex supply chains such as automotive, aeronautics, sea transport and real estate. But it can also be useful for sectors extremely affected by fraud: "We're seeing blockchains being used more and more often in the luxury industry. Products are rare and expensive and there is rampant counterfeiting," said Vincent Pignon, CEO of WeCan.fund. "For example, Canadian parka retailer Goose provides a certificate with each jacket to prove its authenticity. In the watchmaking industry, several brands are implementing similar systems. We also see this in the fine art and diamond markets."

> **"We're seeing blockchains being used more and more often in the luxury industry"**
> **Vincent Pignon**, CEO of WeCan.fund

Lastly, blockchain could markedly improve the traceability of pharmaceuticals. According to the World Health Organization (WHO), between 10% and 30% of medicines used in developing countries are fake, which could lead to close to 700,000 deaths each year. ▷

STELLAR LUMENS

Stellar, a project initiated in 2014 by the co-founder of Ripple, is based on the same protocol. However, while Ripple and its XRP token are focused primarily on financial institutions, Stellar (XLM) targets the peer-to-peer payments market for transferring small sums of money. This token has grown considerably over the past few months and is a now a firm fixture in the top 10.

XLM

VICTORY SQUARE

THE INVESTOR

This Canadian investment company, specialised in blockchain, gaming and artificial intelligence, has been racking up acquisitions. It first bought a 49% stake in Flo Digital, a company that combines virtual reality and blockchain, and then 100% of the solutions provider Limitless Blockchain Technology. If these start-ups become market leaders, Victory's share could see strong growth.

HEADQUARTERS: VANCOUVER (CA)
EMPLOYEES: NOT COMMUNICATED
REVENUE (2017): $CA 740,000

6F6

XRP

This token, created in 2012 by the US company Ripple, is primarily used to accelerate international financial transactions and reduce costs. Dozens of banks and payment companies are currently piloting test trials, including Crédit Agricole, Santander, Western Union and MoneyGram. XRP boomed at the end of last year and now ranks third in the cryptocurrency world.

XRP

INNOGY

Sell the energy produced by your own solar panels to your neighbours? Such projects are emerging in different parts of the world. Here, employees of the company Innogy, on a roof at Bottrop, in the Ruhr (Germany).

5 ENERGY

Towards decentralised production

The development of new renewable energy is driving the sector towards blockchain technology, which is better suited to electricity trading.

As Romain Bonenfant of the firm Emerton, reminds us, "The energy sector is currently undergoing a profound transformation. We are switching from large and very powerful plants, such as nuclear reactors, to smaller generation units such as solar panels on the roofs of houses and wind turbines." Blockchain appears especially suited to supporting this decentralisation, an underlying trend that is changing the sector. "Up until now, the large groups in this sector have remained somewhat sceptical with respect to this technology, but many start-ups are working on innovative experiments."

As a result, pilot projects are emerging across the globe. The most emblematic are in the US. In 2016, Siemens and LO3 Energy set up "Microgrid" in a Brooklyn neighbourhood, a system by which inhabitants owning solar panels can sell their surplus energy to their neighbours, via peer-to-peer transactions made using blockchain. What is the point of this system? "Up until now, micro electricity producers could not resell their surplus, as it was not profitable due to the weak volumes," explains Bonenfant. "Blockchain enables all transactions to be automated, and thus, by eliminating intermediaries, makes trading more efficient and effective."

In concrete terms, the 150 housing units participating in the Brooklyn Microgrid can inject their surplus energy into the local grid. They receive tokens in exchange that they can use locally, as a sort of local money, that works in a similar way to Bitcoin.

The Brooklyn experience has since been replicated all over the world, notably with the Power Ledger projects in Australia and New Zealand, and Innogy and Co-Tricity in Germany. In France, Bouygues Immobilier is developing a similar experiment with Microsoft in the Confluence neighbourhood in Lyon.

The 150 housing units participating in the Brooklyn Microgrid can inject their surplus energy into the local grid

"These projects are promising, but numerous obstacles remain to be tackled before they can be extended more widely," adds Bonenfant, who is the author of a study on blockchain and energy. "Firstly, this technology remains highly energy intensive, which could curb its rise. If recording the transaction in the blockchain uses more energy than the transaction itself that it is meant to certify, the system is of no interest. Moreover, energy is a key sector for States, by which they ensure their sovereignty. Bearing in mind that Bitcoin is, for the most part, mined in China, I am not sure that many countries will accept that their electricity production be based on this technology."

But other energy sectors could be more rapidly revolutionised by blockchain, notably the recharging of electric vehicles. Users would be able to charge their vehicle using any plug, before being billed through a mobile contract attached to the blockchain. German company RWE tested the concept in 2017 and plans to create a private network on the 5,000 charging stations managed by its subsidiary Innogy. ◢

AND ALSO...

DASH
A portmanteau of "digital" and "cash", Dash is a completely decentralised alternative to cash. This token is based on Bitcoin's source code but is simpler, faster and anonymous.
DASH

ETHEREUM CLASSIC
This token is the result of a divide, known as a "hard fork", in the Ethereum community after a hacking incident.
ETC

FINLAB
This German firm builds and invests in the tech and financial services sectors. It invests in blockchain-related products.
A7A

IOTA
This cryptocurrency is designed to be used as a payment method between Internet of Things devices to monetise data.
MIOTA

MICRON TECHNOLOGY
The parent company of Lexar and Crucial, the US-based memory manufacturer is taking advantage of the blockchain boom. But there are complications in China, where a Fuzhou court banned 26 of its products from the market.
MU

MONERO
This cryptocurrency guarantees anonymity for its users through untraceable transactions. A favourite among criminals.
XMR

ZHONGAN ONLINE P&C INSURANCE
The first completely web-based insurer in China, Zhongan is using blockchain to ensure its growth.
6060

ENERGY: BLOCKCHAIN'S HIDDEN SECRET

Bitcoin, the first blockchain on the market in 2009, has a dirty secret: it uses a significant amount of energy. But other more environmentally-friendly blockchains exist.

BY BERTRAND BEAUTÉ

BLOCKCHAIN SWISSQUOTE SEPTEMBER 2018

"An environmental disaster", "a danger to the planet", "an energy-consuming monster"... Bitcoin is booming on the markets but it is also on the receiving end of criticism from environmental organisations. For more than a year, an increasing number of articles criticise the fact that the world's most well-known cryptocurrency uses an incredibly large amount of energy. According to the media, Bitcoin uses more electricity each year than countries such as Ireland, Morocco or Lebanon. Is the fuss true? "Well, there aren't any serious studies on the subject," said Claire Balva, CEO of Blockchain Partner. "The numbers vary significantly depending on the calculations."

The most well-known source on the subject is Digiconomist. According to the US-based platform that specialises in cryptocurrency, Bitcoin currently uses at least 70 Terawatt hours (TWh) per year, or the equivalent of the yearly electricity production of seven nuclear power plants as powerful as the Leibstadt plant (Aargau). The cause of this extreme usage? The blockchain algorithm behind Bitcoin.

As time goes by, the number of transactions increases, the number of miners increases and energy consumption spikes accordingly

This cryptocurrency uses a "proof-of-work" system. Concretely, to add blocks to the chain and verify their authenticity, miners must solve complex mathematical problems with the help of super-powered computers (see p. 64). While many miners tempted by the potential reward can participate, only the first miner to find the solution is rewarded and currently receives 12.5 Bitcoins per block mined.

The advantage of this protocol is that it makes Bitcoin essentially inviolable – one would need more than 50% of the total calculating power to hack the system. But competition among miners leads to significant energy use. As a result: "Since it was created in 2009, Bitcoin has proved to be secure. No one has been able to pirate it," said Daniel Gasteiger, co-founder of Trust Square. "But this security comes at a price: blockchain is absolutely not efficient."

And that won't change any time soon: as time goes by, the number of transactions increases, the number of miners increases and energy consumption spikes accordingly. According to Digiconomist, Bitcoin's electricity consumption reached 35 TWh yearly by the end of 2017, which is just half of its current energy use. "Today, energy is a major obstacle that hinders the implementation of this blockchain technology in other industries," said Romain Bonenfant from the firm Emerton. "That's why all the players are working to develop more energy-efficient systems."

For example, Ethereum, the blockchain used for cryptocurrency Ether, already consumes less energy than Bitcoin (10 TWh per year in 2017) while still using the same proof-of-work system. But in order to significantly reduce electricity consumption, the transaction verification protocol would have to be changed. "There are already many alternatives to proof-of-work," said Christine Hennebert, blockchain expert and cybersecurity researcher at the French Alternative Energies and Atomic Energy Commission (CEA). "With Ripple's XRP system, for example, all the tokens already exist; they are pre-mined, so to speak, which reduces energy use. But Ripple is a closed system that sort of goes against blockchain's decentralised philosophy."

Other economic systems are used, such as "proof-of-stake", by blockchains like Peercoin or Qora. In these cases, only users who have a certain amount of cryptocurrency can claim to validate additional blocks and therefore receive the reward. This drastically reduces the number of competing miners and, as a result, lowers energy consumption.

The idea piqued the interest of Ethereum developers, who are currently experimenting with a "proof of participation" consensus mechanism called Casper. But the problem is that this system goes back to a plutocracy, where only the richest have power. This is incompatible with the libertarian origins of cryptocurrency. Other variations exist, such as "proof of importance", which rewards the oldest miners, or "proof of activity", which rewards the most active members.

"Each of these systems has its own advantages and disadvantages. While they consume less energy than proof-of-work, they are seen as less secure," said Bonenfant. "That's not necessarily a problem, because based on the usage of the technology, companies would need either more or less security, which means it would consume more or less energy."

This is the key point: a blockchain's energy consumption must be adapted to its function and equal to the value it creates. "People can't stop criticising Bitcoin for its energy use. But it's a hypocritical argument, because absolutely everything consumes energy," said Balva. "Watching cat videos on YouTube uses an enormous amount of energy but no one complains about that. And one Google search uses as much electricity as if you leave a light on for one hour! At the end of the day, Bitcoin's impact isn't that high, given its price (approximately $8,000 currently). How much energy would it take to mine gold with the same value?"

"We will soon have chains whose energy efficiency will be adapted to their functionality"
Romain Bonenfant, from the firm Emerton

In any case, Bitcoin's energy impact could be lowered soon. Since 2014, US developers Joseph Poon and Thaddeus Dryja have been working on a project called Lightning Network. It adds an overlay to the Bitcoin blockchain. Concretely, only some information is written in the chain and the rest is accounted for elsewhere. For example, a shop accepting Bitcoin could send its total revenue at the end of the week instead of after every transaction. This would reduce the number of transactions to record on the chain and as a result reduce energy consumption.

Blockstream, one of the biggest companies in the industry, has been testing this technology since 2015 and has successfully routed its first transactions via Lightning in 2017 on the Bitcoin blockchain. Ethereum also has its own project, the Raiden Network, and other blockchains are planning to implement Lightning, such as Litecoin, Ripple and Zcash. The first launches are expected in 2019. "Energy consumption of blockchains remains a key issue, but it's only a matter of time," said Bonenfant, from the firm Emerton. "We will soon have chains whose energy efficiency will be adapted to their functionality." ◢

DIGGING FOR BITCOINS

Technicians from the Chinese firm Bitmain face a wall riddled with processors in the company's mining site (Inner Mongolia).

BLOOMBERG / GETTY IMAGES

A handful of companies and groups of individuals are experts at mining virtual currency. It is particularly popular in northern countries where electricity is cheap and abundant.

BY JULIE ZAUGG

They are miners. But they don't have headlamps or pickaxes, and they don't work several hundreds of metres underground. Instead, these miners work on gigantic farms filled with servers.

They spend their days solving complex mathematical problems, which requires significant computing power. The goal? Be the first to find the solution, so as to mine a new "block" that will validate new transactions in virtual currencies and add them to the blockchain, the register of every past transaction.

For their efforts, miners collect a commission on the transactions they validate and receive the coins that they mined. With Bitcoin, for example, each block created is worth 12.5 Bitcoins. "Commission varies based on supply and demand for miners' services," said Charles Hayter, co-founder of analytics firm CryptoCompare. Since about 144 blocks are added to the blockchain each day, mining generates nearly $11 million per day. Almost all currencies can be mined, but the ones that are the most popular are Bitcoin, Ethereum and, to a lesser extent, Litecoin and Monero.

In 2009, when only a few connoisseurs were interested in cryptocurrencies, mining was done by individuals using their personal computers to extract new Bitcoins. It was easy work. But not anymore. Since only the first person to solve the equation is compensated, miners quickly began a technological race to have the fastest, most powerful computer.

"The material becomes obsolete very quickly, sometimes within just a few months"

Charles Hayter, co-founder of the analytics firm CryptoCompare

Hardware manufacturers rose to the occasion, developing specific chips optimized for mining called ASICs (Application-Specific Integrated Circuits). These quickly surpassed individuals' efforts and devices, which could no longer handle extracting cryptocurrency. So Bitmain, a Chinese company founded in 2013, created its range of chips called AntMiner. It dominates this segment with a 70% to 80% market share, according to Bernstein Bank. But other companies are also active on the market, such as China's Ebang Communication and Canaan Creative (which are preparing to go public on the Hong Kong stock exchange), as well as Japan's GMO Internet, Taiwan's TSMC, the Netherlands' BitFury and the US' Nvidia. And the South Korean giant Samsung has confirmed it will soon market its first ASIC chips.

"The material becomes obsolete very quickly, sometimes within just a few months," said Charles Hayter. "New generations of machines and chips keep coming out." Given that each machine costs between $800 and $1,100 and an average-sized farm has approximately 1,000 machines, it becomes very expensive rather quickly.

Mining therefore becomes the business of large companies that are able to make colossal investments. Once again, Chinese company Bitmain (currently not listed) is a global leader. Genesis Mining, a company founded in 2014 and based in Hong Kong and Iceland, is another big player, along with Canada's Hive Blockchain.

Currently, the vast majority of Bitcoin mining (more than 70%) is occurring in China. "Certain provinces such as Sichuan and Inner Mongolia, which have lots of hydroelectric power, are home to gigantic mining farms in abandoned industrial hangars," said Emin Gün Sirer, Bitcoin expert and professor at Cornell University.

China's Bitmain would monopolise nearly 45% of Bitcoin's mining power

For miners, location is quite important. The amount of energy needed to run the powerful machines is the main cost. As a result, countries with cheap electricity or cold weather – which reduces the need to keep servers cool – are ideal spots. In addition to China, other places such as Iceland, Sweden, Estonia and Quebec are also top mining locations.

Individuals have found that mining is no longer profitable, now that they are competing with large companies. The financial aspect is even more problematic given that mining profitability decreases as the number of miners – and therefore competition – increases. "To fight against the exclusive stronghold of companies, individuals have started to come together to gather enough computing power and share costs," said Campbell Harvey, a cryptocurrency expert at Duke University. But the two largest mining sites, BTC.com and AntPool, are nevertheless owned by Bitmain.

"Surviving in such a difficult climate is not for the faint-hearted," said Campbell. "The current context is favourable to big players and is leading to a concentration of the industry." Some estimates say China's Bitmain would monopolise nearly 45% of Bitcoin's mining power or "hashrate". This is rather ironic, since the idea behind cryptocurrencies was an ideal decentralisation of society.

"It is not a good idea for one single player to hold more than 25% of all resources," said Sirer. "That player could decide to mine some blocks and not others, which would lead to the death of certain links in the blockchain, or even of the entire currency altogether." Furthermore, if a player holds more than 51% of the hashrate of a blockchain, the blockchain's security is no longer guaranteed – for example, this player may force the network to accept fraudulent transactions.

With this risk in mind, certain blockchains have modified their protocol. Monero, for example, has a mining algorithm that is open to all types of processors and ASIC-resistant, in order to encourage as many miners to participate as possible. ◢

A view of the Svartsengi geothermal power plant in Iceland. The Genesis Mining company operates a Bitcoin and Ethereum mining farm nearby.

HANNA ANDRESDOTTIR / KEYSTONE

BLOCKCHAIN PORTFOLIO:
THE ALL-IN-ONE CERTIFICATE

Invest in blockchain technology – it's easy and accessible.

SWISSQUOTE.COM/BLOCKCHAIN

It is indeed possible to take advantage of the advent of blockchain without directly investing in cryptocurrencies. Many public companies decided to take the next step and adapt their business models to this new technology.

The "Blockchain Portfolio" certificate, created by Swissquote and traded on the SIX Swiss Exchange, is made up of international companies that have taken this strategic approach. The portfolio focuses on companies whose potential success is strongly tied to the boom of the blockchain economy. But it also includes some large companies – which are underweighted – that have more diversified revenue and have decided to participate in the crypto adventure, such as Intel and Nvidia.

Given that the industry is relatively young and therefore highly volatile, the portfolio is reallocated quarterly in order to capture the industry's latest developments.

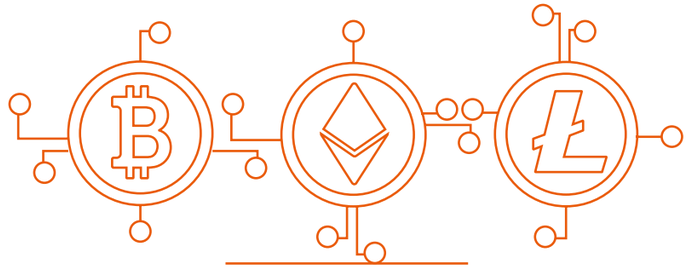
ISIN: CH0410022617 SYMBOL: BLOCHU

PROFILE OF SELECTED FIRMS

- → Business model associated with blockchain
- → Significant correlation with the cryptocurrencies market

ADVANTAGES OF THE BLOCKCHAIN PORTFOLIO

- → Increased growth potential
- → Risk diversification (but high exposure to cryptocurrency evolutions)
- → Traded on the SIX Swiss Exchange
- → 9 CHF flat transaction fee



A CRYPTOCURRENCY
WALLET IN JUST ONE CLICK

Invest in Bitcoin, Bitcoin Cash, Ethereum or Litecoin while minimising risk and controlling volatility.

SWISSQUOTE.COM/CRYPTOS

Many investors are tempted by cryptocurrency trading but are hesitant to actually participate due to fear or lack of time. For these investors, Swissquote has created a multi-cryptocurrency certificate. This product includes four cryptocurrencies: Bitcoin, Bitcoin Cash, Ethereum and Litecoin. Our teams developed an algorithm that automatically manages the portfolio by ensuring an optimal diversification of the funds invested based on market fluctuations. Fund reallocation occurs once a week. The objective is to limit risk for the investor, notably by reducing the probability of major losses. The algorithm is based on statistical models and is powered by machine learning technologies.

Please note that investors do not need to open an account solely for cryptocurrencies in order to invest in this certificate.

ISIN: CH0372704095 SYMBOL: SQCRTQ

PROFILE OF SELECTED CRYPTOCURRENCIES

- → 100% decentralised cryptocurrencies
- → Available on the Swissquote portal
- → In the top 10 largest capitalisations

ADVANTAGES OF THE MULTI-CRYPTO ACTIVE CERTIFICATE

- → Weekly reallocation of funds
- → Automatic management via algorithm
- → Minimised risk
- → 9 CHF flat transaction fee

“Options and Futures aren’t just for speculators”

Jürg Schwab, Head of Trading at Swissquote, describes the advantages of these derivative products for portfolio management.

swissquote.com/options-futures

What are Options and Futures?
They are leveraged derivative products that make it possible to manage investments in a more active and timely manner. An “Option” is a contract that gives the holder the right to purchase or sell an underlying product at a given price and a maturity date set beforehand. A “Future” is a forward contract that constitutes a commitment to purchase or sell an underlying asset. All products available on Eurex and the US market can be traded online via our platform. On these markets, Swissquote has the only offer of this kind in the Swiss banking sector.

Who are these products for?
They can be for anyone, not just speculators. They have multiple functions based on individual needs. That is why they can be used both by wealth managers and institutional investors, as well as by private clients.

What are the possible uses for Options and Futures?
There are three main uses. These products can be used to optimise a portfolio, for hedging, and most commonly for speculation.

How can investors optimise their portfolios with these products?
Investors can obtain an additional yield on shares held in trust with no risk involved via what we call a covered call. For example, if you have 200 Nestlé shares in your portfolio, you could sell two calls against these shares – as each option has a leverage of 100 – by choosing a maturity and a strike price.

The other strategy is the sale of a put in order to purchase a security at a lower price than its current value or in order to cash in a premium. In these two examples, clients improve the performance of their investment portfolios.

What about speculation?
There are two ways to go about it. First: clients can purchase a call or put option, expecting that the market will rise or fall significantly. In this situation, the only risk is losing the premium paid for purchasing the option.

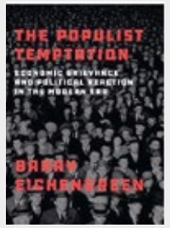
Second: clients can sell options. This approach is also very advantageous and popular among many speculators, big and small, but it is imperative that clients understand the implied high risks that go along with it. Sellers could lose an unlimited amount if market fluctuations run counter to their expectations. That’s why in this case, the bank requires clients to have a certain amount available in their account. And a margin is held by the bank. If the market goes against the client’s expectations, the required margin increases. As such, the bank does what we call a margin call, following the rules of the exchanges, and asks the client to provide additional funds to guarantee their position.

And what about the hedging method?
If for example the market is strongly bullish and there are fears surrounding a geopolitical event that could lower prices, a Future lets you hedge your risk. In such a short-term context, investors would generally prefer to hedge their potential losses for the given period rather than sell off their portfolio. A portfolio with European equities worth €100,000 could, for example, be hedged by selling three Eurostoxx Futures, since one Eurostoxx Future is worth approximately 3,400 Swiss francs, with a leverage of 10.

How to take advantage of this offer?
As a rule, all Swissquote clients can trade Options & Futures. However, they must first accept the conditions on the risks related to these products and answer an online questionnaire. ◢

JÜRG SCHWAB
HEAD TRADING
SWISSQUOTE BANK

TO READ, TO DOWNLOAD



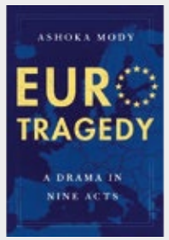
From CHF 20.-

THE POPULIST TEMPTATION

ECONOMIC GRIEVANCE AND POLITICAL REACTION IN THE MODERN ERA

By Barry Eichengreen
(Oxford University Press, 2018)

Trump's election as president is the result of a populist wave spreading across the Western world, according to Barry Eichengreen, professor of economics and political science at the University of California, Berkeley. Retracing the history of this political movement and its characteristics, *The Populist Temptation* unveils the constants that encourage populism: a divergence of interests between the people and elites, and particularly a government bailing out elites during financial crises. Without providing a definitive answer to this modern-day challenge, the author argues that the lack of an effective social safety net and government's abandonment of the masses affected by crises systematically lead to the rise of populism and even its ascendancy to power.



From CHF 30.-

EUROTRAGEDY

A DRAMA IN NINE ACTS

By Ashoka Mody
(Oxford University Press, 2018)

What if the origins of the euro crisis could be found in the very idea of the creation of the euro? This is the intriguing theory from Ashoka Mody, professor of international political economics at Princeton University. In describing this currency project from its beginnings to its fruition, Mody seeks to demonstrate that the pursuit of the euro was jeopardised from the very start by ideals and biases that ruined its effectiveness – and led to the economic crises of today. Instead of uniting all Europeans, the adoption of the euro has widened the gap between rich and poor nations while simultaneously and permanently mortgaging younger generations.

Free
App Store,
Google Play

CHATTERBABY

BABY CRIES DECIPHERED

Here's an app to solve one of the oldest mysteries of all time: what are babies trying to tell us when they cry, yell or whine? At least, that's what ChatterBaby, the app developed by researchers at the University of California, Los Angeles, tries to do. By recording the sounds of your baby and comparing it to thousands of other examples in the database, ChatterBaby claims to be able to decipher the meaning and cause of the baby's cries with 90% precision.

CHF 5.-
App Store,
Google Play

COACH'S EYE

FOR THE LOVE OF THE GAME

Posture, force, quick execution: in every sport, there are certain technical movements that are particularly difficult to master. Especially when athletes have learned bad habits in the past. This app makes it possible for athletes to film themselves and watch a slowed-down video of the movement in order to compare and improve, to finally achieve the perfect swing or ace.

Free
App Store,
Google Play

TRIP

TRAVELLING ON A WHIM

Trip is the essential app for travellers without a set plan, whether they find themselves at the tip of Bolivia or hiking around Lake Lucerne. It is like a pocket *Routard* guide, but with less filler content and more interactivity. Trip suggests nearby activities based on user interests, as well as restaurants, hotels, bars and nightclubs. All recommendations include comments and reviews from other Trip users.

Free
App Store,
Google Play

WICKR ME

COMMUNICATION UNDER TIGHT SECURITY

Designed for security buffs and all sorts of paranoids, this app can be used to share content and make phone calls in a completely secure way. A self-destruct function deletes messages and calls automatically after a period of time set by the user. Communication is encrypted end-to-end and uses perfect forward secrecy.

TRAVEL

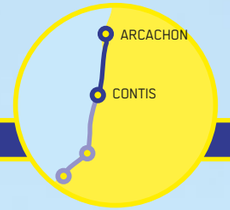
Vélodyssée: see Basque country by bicycle

For riders of all levels, the bike path from Arcachon to Hendaye is a wonderful way to discover gems on the Atlantic coast.

BY SALOMÉ KINER

The Vélodyssée definitely lives up to its name. Connecting Roscoff in Brittany to Hendaye on the Spanish border, this 1,200-km cycle route is a magnificent trek along the Atlantic Ocean by bicycle. The route winds through forests in Brittany, pines in the Landes, salt flats and sandy beaches. Unfortunately, we didn't have enough time for the entire trek, so we decided to focus on the last beautiful stretch from Arcachon to Hendaye. This three-part trip takes cyclists between the swaying peaks of stone pines along the magnetic blue-grey of the ocean. Here's our travel guide.

The unmissable Dune of Pilat, the highest dune in Europe, located in the Arcachon basin.



Arcachon to Contis — 98 km

Might as well start with the most difficult part! With a length of 98 km, the first bit is the longest of the three and likely the most difficult as well. This is because the route from Arcachon to Contis passes through the Dune of Pilat. After climbing Europe's tallest dune at 110 m high, you are rewarded with an exceptional panoramic view. This maritime landscape shimmers with the tides, shadows and changing seasons. It is an excellent way to experience the region before heading to the Landes.

When going around the Sainte-Eulalie-en-Born lake headed towards Biscarosse – the military base is a must – you may see grey herons perched on branches. The route goes past the marshy regions and heads to the Landes forest. The dedicated cycling routes are extremely safe and cyclists can appreciate the quiet beauty of the maritime pines.

The last leg from Mimizan – the gem of the Silver Coast – to Contis, its best kept secret, is a fairytale voyage over sandy paths covered with bronze prickles and tousled ferns. The scenery is straight out of a children's storybook; you almost expect to see friendly creatures peering at you from behind silver rocks.

Arriving in Contis is a relief, especially for your calves. Get a massage for your tired legs at Maeva (www.maeva-spa.fr), before celebrating the day's achievements at Chez Dan with a pint of craft beer and some fried smelt. ▷

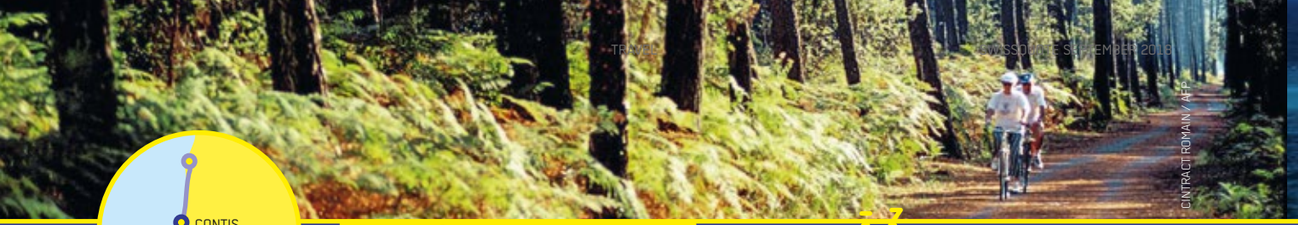
WHERE TO STAY

L'Hôtel de la Plage

With its bike storage, adorable alcove balconies to watch the waves and complimentary breakfast, Hôtel de la Plage is an ideal spot to rest before getting back in the saddle.

From 145 Swiss francs per night for two people.

DR



CINTRACT ROMAIN / AFP

ISTOCK

Contis to Bayonne 93 km

Far from boring, the Landes forest shows off its impressive colours and density as you make your way to Hossegor. Known worldwide for its "wave" (the biggest in Europe), this posh town is teeming with surfers. Boards and shorts dry on every balcony and restaurant patios are brimming with festive summer sport energy. With their large spacious beaches, scenic lookout points and bars and surf shops, Capbreton, Vieux Boucau and Seignosse are very reminiscent of California.

The last 20 kilometres before Bayonne are along the Adour river. Sunday fishermen, joggers and dogs share the riverway. When you arrive in Bayonne, the ramparts, bridges and citadel are an exhilarating sight after the long forested trek through the Landes. Bicycles come in handy to wander the streets of the original city centre and stop at Sainte-Marie cathedral to experience the quiet cloister before an aperitif at the outdoor market.

Along the Nive river, admire how the sunset blankets the nearby buildings. Make dinner reservations at La Table de Pottoka. Refined but not over-the-top, the cuisine has a heavy local influence with inventive new flavours. With its rare liquors, friendly service and delectable desserts, this is an invigorating spot.

The centre of Bayonne.

ISTOCK

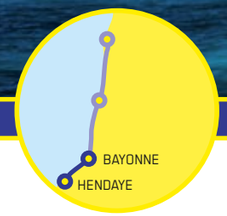
Bicycles come in handy to wander the streets of the original city centre

WHERE TO STAY

Hôtel des Basses Pyrénées

We love the Gallo-Roman architecture of Hôtel des Basses Pyrénées, located on the Vauban ramparts in the heart of Bayonne. The suites, nestled in a stone tower, are a true indulgence for people who love beautiful rooms.

From 125 Swiss francs per night for two people.



Bayonne to Hendaye 51 km

Leaving Bayonne, head towards the Spanish border along the beaches of Anglet and the craggy coastline. The route is not flat; steep uphills are followed by enjoyable downhills. Stop for cool drinks as you pass through pretty Biarritz, close-knit bourgeois Guéthary and Bidart's central square.

Hendaye is the best place on the Basque coast to try surfing, as the waves are reasonable and there is reduced wind exposure. In the off-season, the city reminds us of a deserted Patrick Modiano novel, as if Hendaye is haunted by its own ghosts. Tapas – or we should say pintxo – lovers should take the ferry for lunch at Hondarribia. Only seven minutes away by boat, the Spanish coast is a true change of scenery.

But you must spend the night in Saint-Jean-de-Luz. Unfortunately, the coastal road isn't specifically tailored to bicycles (it is not part of the official Vélodyssée route). But several lookout points provide the opportunity to stop and stare in amazement at the sharp cliffs jutting into the sea.

While Saint-Jean-de-Luz has beautiful beaches, a casino, espadrille stops and Basque gastronomy perfect for tourists, the popular Cibourne village offers a more authentic experience. The aperitif takes place on large wooden tables. But don't spoil your appetite, because no trip would be complete without a dinner at Chez Mattin. This no-frills family restaurant has been around for 50 years. Try the ttoro, a local bouillabaisse, or order the chef's specialities, which are bold but remain faithful to regional traditions. Make sure to make a reservation. ◢

Ttoro, a local bouillabaisse specialty.

LA CARAVELLE

WHERE TO STAY

L'Hôtel La Caravelle

In Ciboure, Hôtel La Caravelle's retro façade looks out onto the ocean and Saint-Jean-de-Luz bay.

From 115 Swiss francs per night for two people.

PREPARE FOR TAKEOFF

From Arcachon to Hendaye, the Vélodyssée route isn't difficult and doesn't require any special equipment. An all-terrain bicycle and two 20-litre panniers are all you need to cycle comfortably. If you want to pack lightly, the easiest thing to do is to fly to Bordeaux, rent your equipment and then take the train to Arcachon. Camping isn't mandatory at all, because many bike-friendly hotels can be found along the route. What to pack? Cycling shorts, sports t-shirt, helmet, water bottle, waterproof clothing and comfortable shoes.

Rent a bicycle and panniers:

COOL BIKE, 77 Quai des Chartrons, Bordeaux.
Reservations recommended; call +33 5 33 48 13 86.
From 70 Swiss francs per person per week.

Information about the route:

www.lavelodyssee.com

Getting there:

Flights to Bordeaux from Zurich and Geneva.
From around 150 Swiss francs per person.

Regional TER train from Bordeaux to Arcachon.
From €8.50 per person.

ENGINE: 2L TURBO, 247 HP
0 TO 100 KM/H: 6.5 seconds
PRICE: CHF 70,800.- (tested model)

CARS

City SUV

The bestselling sport utility vehicle is getting a makeover.

BY BLAISE DUVAL

WE TEST DRIVE THE VOLVO XC40, THE CAR OF THE YEAR

Volvo seems to have found its perfect style. With each new model, the Swedish auto manufacturer's image gets a facelift. This is particularly true for the XC40, which received much critical acclaim and was just ranked the car of the year. Last year, we test drove its big brother, the XC60. This year's model has similar design elements, technical solutions and interior layout. It is more compact (4m 42 in length) and only slightly less luxurious.

Our fully-equipped test model comes in at just over 70,000 Swiss francs. At that price, the vehicle better have some advantages over German premium models.

To win a place in the big leagues, Volvo decided – and rightly so, we believe – to refine its traditional strengths, rather than try at all costs to challenge leading brands at what they do best. In other words, the brand focused once again on ride comfort and safety, particularly with a wide range of driving aids. The XC40 seems perfectly designed to give urban and highway trips a sense of tranquillity, but at a fast pace. The silence in the interior is quite remarkable for its class. Of course, drivers who prefer speeding through switchbacks will probably prefer sportier brands. BMW, Alfa Romero and Porsche offer many good alternatives.

Volvo's "small" SUV also stands out due to its many practical aspects, such as its customisable boot, in which drivers can hang shopping bags. It's a simple but very clever feature. Excellence is also in the details.

BMW X1, THE SAFE BET

Generation after generation, the German brand continues to be the gold standard. It's hard to find any weaknesses in the recently revamped X1. Vitality, workmanship, comfort, versatility: it has it all.
From CHF 38,800.-

AUDI Q3, THE NEWCOMER

It's about time. In late July, Audi unveiled its new compact SUV, which replaces its older, ageing model. The goal? To become the leading model in its category. What sets it apart: avant-garde technology with legendary Audi workmanship.
Price not set

BOUTIQUE

BIRD DRONE

The Bionic Bird is more than just a bird-shaped drone: using biomimetics, it flaps its wings and effortlessly changes direction in the air. Developed by Marseille-based start-up XTIM, the lightweight drone (weighing in at 9 grams) can reach altitudes of up to 100 metres and fly at speeds close to 20 km/h. With a battery life of 8 minutes, it is controlled via a smartphone and can be recharged up to 10 times remotely using its powerbank egg.

www.bionicbird.com

From CHF 90.-

MECHANICAL SMARTWATCH

You no longer have to choose between a smartwatch and a mechanical watch: Frédérique Constant's new Hybrid model brings together smart features and mechanical movement in one timepiece. With a 42-hour power reserve, adjustable date and second time zone feature, the two-in-one watch uses Bluetooth to connect to an app and even offers precise monitoring of the wearer's activity and sleep.

www.frederiqueconstant.com

From CHF 3,250.-

POCKET PROJECTOR

Thanks to its light weight (700 g), you can take the new ViewSonic M1 projector everywhere you go. Its integrated battery lasts up to six hours, which makes it ideal for giving PowerPoint presentations on a business trip. The only downside is its limited light (only 250 Lumens) which means the room has to be completely dark.

www.viewsonic.com

CHF 330.-

SWISSQUOTE SEPTEMBER 2018

APARTMENT VEGETABLE GARDEN

A garden in the middle of your living room – Quebec start-up Ogarden has designed a chic, simple indoor vegetable garden. Indoor gardeners can grow up to 90 vegetables or herbs at the same time, including kale, lettuce, coriander and Swiss chard. The garden is easy to use and equipped with a growing wheel that has an automatic lighting and watering system that can hold 10 days' worth of water.

www.ogarden.org

CHF 760.-

FOLDABLE ELECTRIC SCOOTER

Five seconds is all it takes to fold and unfold the Immotor Go. Its dashboard-like handlebars display the time, battery charge, speed and mileage. Connected via Bluetooth, the three-wheeled scooter has an integrated GPS and external speakers for riders to listen to music or take calls. There are three speeds to choose from: 6 km/h, 20 km/h and 25 km/h with a 350-watt hub motor.

www.immotor.com

CHF 1,489.-

A SMART AUDIO HELMET

Not just another pair of headphones for cyclists, the Coros Omni uses open-ear bone conduction technology so that riders can be better aware of noises around them. With two LED lights that automatically turn on at night and a handlebar remote, this smart helmet has an internal collision sensor and automatically sends a text message to emergency services in the event of a crash.

www.coros.com

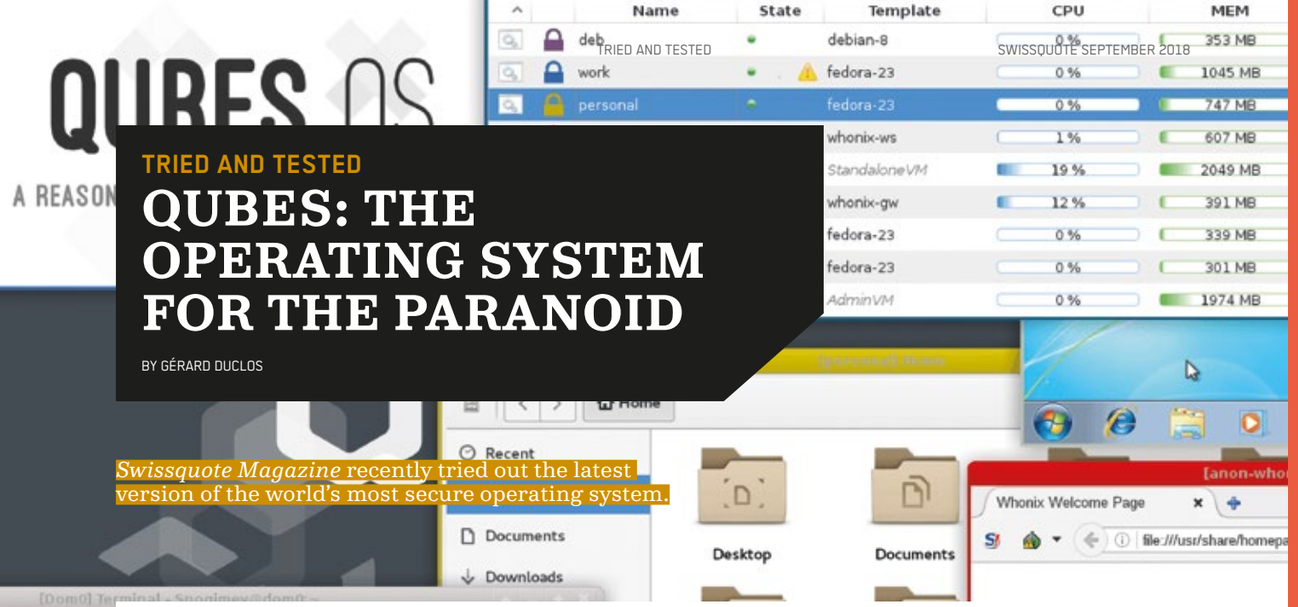
CHF 199.-

ENDLESS WINE

With its chic design similar to a Nespresso machine, the Plum Wine Preserver will win over legions of wine lovers. This gadget can store two open bottles of wine for several weeks until they are ready to be served, all at an ideal temperature. How does it work? The device pierces the cork with a fine needle, then injects argon into the bottle to stop the precious nectar from oxidizing. A touchscreen provides information about the varieties, including tasting notes, and even offers a virtual visit of certain wine cellars.

www.plum.wine

CHF 1,990.-



TRIED AND TESTED

QUBES: THE OPERATING SYSTEM FOR THE PARANOID

BY GÉRARD DUCLOS

Swissquote Magazine recently tried out the latest version of the world's most secure operating system.

Our computers are sieves. Whether you use Windows, macOS or even Linux, new vulnerabilities are uncovered almost every day. Not to mention the "spying" in which commercial operating systems openly engage. While many of us are content to simply install anti-virus software – which is sometimes worse than the viruses themselves – and cross our fingers every time we bank online, the most paranoid users are seeking alternative solutions. The most radical of these is undoubtedly Qubes.

"If you are seriously interested in security, QubesOS is the best operating system on the market today." As publicity goes, it's hard to top this tweet from Edward Snowden himself, who has also confirmed on several occasions that he uses Qubes for his regular IT needs. Taking up his recommendation, I downloaded the OS (which is completely free and open source) and began the installation process. Let's begin by saying that users do need some minimal IT knowledge to successfully complete the process, which consists of copying the image on a USB drive, starting the computer using this device, and then installing the operating system on a dedicated hard drive (or a USB drive) that is completely encrypted, of course. It took me several attempts to install owing to various technical problems.

Once installed, the OS doesn't have any baffling features for average users, with a virtual dashboard and a few drop-down menus. But there are no applications for an internet browser, text editor or multimedia player. In fact, all useful functions are launched via dedicated virtual machines that are specific to their particular function. This is the fundamental principle of Qubes: security via compartmentalisation. Rather than try to fix the vulnerabilities of traditional operating systems, the developers of Qubes (the majority of whom came from the Polish company The Invisible Things Lab and are led by the famous IT security researcher Joanna Rutkowska) designed a system in which users separate their activities in dedicated domains that are completely independent from one another. Therefore, potential vulnerability from one virtual machine does not affect any other activities. The base domain, "dom0", which manages all the other frameworks, doesn't even have access to the internet. Users access the web through a virtual firewall!

So that's how it works in theory. In reality, I open "Qubes Manager" and create my first domain for internet browsing through a Linux "template". After that, I can finally launch Firefox, which opens in a window framed by the colour of my choice. I repeat the same process for each specific function: one domain for e-banking, another for social media, and even a virtual domain with no internet access to store sensitive information. It is also possible to use templates that route all internet traffic via Tor. Advanced users could also try installing domains under Windows.

Obviously, using Qubes for daily computing isn't extremely intuitive and requires a certain level of organisation in order to not get confused with all the domains. In the end, Qubes reminds us that security always comes at a price. In this case, it is usability. This is decidedly not an OS to spontaneously install on your mother-in-law's computer, but the most paranoid among us will certainly find it useful.

TO BREAK THE RULES, YOU MUST FIRST MASTER THEM.

THE VALLÉE DE JOUX. FOR MILLENNIA A HARSH, UNYIELDING ENVIRONMENT; AND SINCE 1875 THE HOME OF AUDEMARS PIGUET, IN THE VILLAGE OF LE BRASSUS. THE EARLY WATCHMAKERS WERE SHAPED HERE, IN AWE OF THE FORCE OF NATURE YET DRIVEN TO MASTER ITS MYSTERIES THROUGH THE COMPLEX MECHANICS OF THEIR CRAFT. STILL TODAY THIS PIONEERING SPIRIT INSPIRES US TO CONSTANTLY CHALLENGE THE CONVENTIONS OF FINE WATCHMAKING.

ROYAL OAK
PERPETUAL
CALENDAR
IN PINK GOLD

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