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Bulletin

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**"I believe in horses.
Automobiles are only
a passing fad."
Wilhelm II (1859 – 1941)**



075360E

Innovation

Things Turn Out Differently, Because We Think

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Contributors to this issue include:

1 Helene Laube

Journalist Helene Laube was a founding member of Financial Times Deutschland. Today she is a correspondent in San Francisco for German, Swiss and American newspapers. In this issue she tells the story of thousands of new start-ups, the so-called Fintechs, which view themselves as meteorites threatening today's financial dinosaurs – the banks. *Page 42*

2 Lars Jensen

Born in Hamburg, Lars Jensen has lived in New York for almost 15 years and writes for prominent German-language magazines. Interested in writing a profile, he got in touch with former hacker Kevin Mitnick, a man described by the FBI as capable of starting a nuclear war from a prison cell. The authorities were probably listening in on their conversation – according to Mitnick. *Page 24*

3 Bettina Rutschi

An economist and Chartered Financial Analyst, Bettina Rutschi works in the Economic Research unit at Credit Suisse. She previously held a position in the SECO Promotion Activities Directorate, among others. In this issue, she takes a look at Switzerland. How can a small country that lacks raw materials remain innovative? *Page 20*

4 Mathias Plüss

A prizewinning journalist, Mathias Plüss writes regularly for the publications *Annabelle* and *Das Magazin*. Plüss seeks to answer the critical question of how people come up with good ideas. What is the secret of people like Darwin and Einstein? Answer: Sleep, taking walks and darkness are all helpful. *Page 34*

Big Mistakes/Great Ideas

“I believe in horses. Automobiles are only a passing fad.” This famous quotation, date unknown, is from Kaiser Wilhelm II (1859–1941), Germany's last emperor and King of Prussia. It is often cited as an amusing story of a long-ago monarch who failed to recognize the fact that times were changing. But Wilhelm was anything but a technophobe. On the contrary, he was interested in new trends, and he eventually acquired an impressive fleet of cars, a number of them custom-made.

The quotation on the cover reminds us how mysterious and fleeting innovation can be – and that our first reaction to what is new tends to be skepticism or even hostility. This is true even when we know a great deal about the subject in question – or perhaps particularly then. There is often a surprisingly fine line between big mistakes and great ideas. “Radio has no future,” said Lord Kelvin, a mathematician and physicist (1897). “We don't like their sound, and guitar music is on the way out,” wrote a record company about the Beatles, declining to record their music (1962). “The wall will still be standing in 50 and even in 100 years,” said East Germany's longtime leader Erich Honecker in 1989, shortly before the Berlin Wall came down. And: “There's no chance that the iPhone is going to get any significant market share. No chance,” said Steve Ballmer, head of Microsoft at the time, in 2007. If things turn out differently because we think, as the subtitle on the cover of this issue would have it, what can we really say about innovation? A great deal, as it happens.

In this issue, we describe what researchers have learned about how and where innovation takes place (hint: in most cases it's not in an office); see page 34. We speak with Soumitra Dutta, the author of two global innovation reports, who issues an annual report card on the innovative capability of countries around the world. He tells us which countries have done their homework and which have not (page 14). In a comprehensive report, we also look at how the financial industry is changing because of the so-called Fintech revolution (page 42) and explain why Switzerland has no choice but to continue reinventing itself (page 20). Finally, you can test yourself (page 38): How creative are you?

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Are human workers in danger of being replaced by robots?
Two researchers at MIT think we're safe.

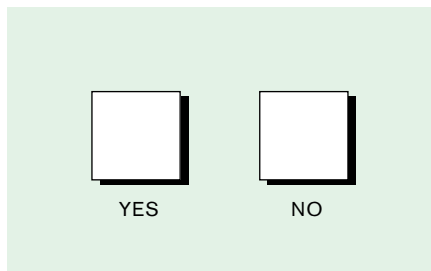
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“The High-Rise Building,”
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High Compliment

I'd like to give you a skyscraper-sized compliment on your “The High-Rise Building” issue. Your magazine is of genuine value, for experts and laymen alike. I happily share it around the office. Keep it up!

Alice Baumann, Director

*(Strategic Marketing and Innovation,
Losinger Marazzi AG)*

Wonderful Overview

You've managed to put out a yet another fantastic issue of Bulletin. We were especially impressed with the article on Mayor Futoshi Toba and Dr. Roland Kunz's “If Only I Had...”

Wädi and Maria Kuster, Hinteregg

Relevant and High-Quality

I wanted to let you know how much I appreciate Bulletin. You manage to address important issues catering to a broad range of interests in articles that are simultaneously relevant and high-quality.

Marianne Roth, Rifferswil

Grade: Worth Reading

I'd like to offer my hearty congratulations to the editors of Bulletin. I just finished reading issue 4/2015 cover-to-cover, something I actually never do with print media otherwise. All the articles are worth reading, put together well and presented attractively. I'm already looking forward to the next issue ...

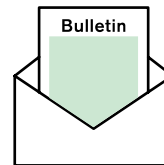
Bruno Beyeler, Gümligen

Quality to Share

I've been a reader of your excellent magazine for years. I look forward to the new issue of Bulletin every month and want to thank you for the regular mailings. I almost always pass my copy on to interested friends and business partners.

Till Neuner, Neckargemünd, Germany

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Ahead of the Curve

Persistence often pays off: These ten innovations came too early. Some of them were considered failures before they finally became a success – but not always for their actual inventors.

Compiled by Daniel Ammann



Tires

He is considered “Scotland’s forgotten inventor.” Robert William Thomson was just 23 years old when he patented an invention that he called “aerial wheels” in 1845: the tire. First, Thomson experimented with inflated intestines that he wrapped around carriage wheels, but because these quickly burst, he started using rubber for the hoses. The idea was forgotten. Neither the bicycle nor the car had been invented yet. With the emergence of the automobile 40 years later, rubber tires became a business worth millions – reinvented by Thomson’s fellow countryman John Boyd Dunlop.



Video phone

Perhaps the idea came from the popular animated series, “The Jetsons,” in the early 1960s. The Jetson family, who live in the year 2062, interact every day with Rosie, the robot maid, and own a Visiphone. After initial experiments in 1964 (photo), the AT&T phone company launched its Picturephone, the first video phone for home use, in 1970. Development cost 500 million US dollars, but the Picturephone was a flop. Not until decades later did the PC and internet make video telephony a success – and added the verb “to skype” to the dictionary.



Electric car

Electric bicycles and cars have conquered urban streets in recent years. However, this supposedly avant-garde invention has much older predecessors. Back in April 1881, Frenchman Gustave Trouvé rode around Paris on an electric tricycle.

A few months later, Englishmen William Ayrton and John Perry presented the world's first electric car (photo). Most people don't know that as automobiles rose to popularity in the 20th century, the electric engine almost prevailed. But because the batteries could barely store any energy and gasoline was cheaper, manufacturers switched to the fossil fuel.





Snow cannon

He was a ski manufacturer and desperate: The winter of 1949/50 saw extremely little snowfall in the US. Wayne Pierce was stuck with his skis. One frosty day he had a crazy idea. He hooked up a garden hose with a nozzle to a compressor out in front of his factory. Then he ran water through the hose at high pressure. Sure enough, the cloud of mist froze into “snow.” The snow cannon had been invented. It took a few decades until the idea caught on. However, today nine out of ten ski slopes in the US are artificially covered with snow; in Switzerland, it’s every other piste.



Digital camera

“They were convinced,” Steven Sasson later recalled a bit wistfully, “that no one would want to look at photos on a screen.” “They” were his bosses at Kodak, the most important photography company in the world at the time. Sasson invented the digital camera in 1975. Kodak banned him from publicly discussing it. The company was not interested in his invention because they feared it would undermine their highly profitable business in film rolls and cameras. These days around 140 million digital cameras are sold per year – and Kodak had to shutter its film business.



Free bicycles

Today, almost every major city relies heavily on bike-share, or bicycles that you can borrow free of charge (at least for a certain period of time). They are practical, fast and they don't cause traffic jams or make noise. The original idea dates back to 1965 and comes from Dutch engineer Luud Schimmelpennink who was active in the anarchist Provo movement. He proposed closing Amsterdam to cars and instead distributing thousands of bicycles painted white that were free for anyone to use. The pilot project failed spectacularly. Most of the bicycles were stolen or broken within a month.



Fax

Its shrill beeping echoed through offices of the late 1980s and '90s. It was almost impossible to do anything without a fax (from fac simile, Latin for "make alike"). Before the rise of the internet and emails, people sent documents and graphics with the fax machine. Surprisingly, the origins of faxing date clear back to the year 1843. That was the year that Alexander Bain, a Scottish watchmaker, applied for a patent for a copying telegraph. It enabled the electrical transmission of black-and-white images. The first actual fax machine debuted on the market in 1964.

Penicillin

It was fortunate that Alexander Fleming was a bit forgetful in the summer of 1928. The Scottish microbiologist left his laboratory window open while he was on vacation, which allowed mold spores to infest a bacteria culture. After his return Fleming discovered that where the mold proliferated, the pathogens had died. He called the as-yet unknown substance “penicillin,” but did not attempt to use it as a medicinal remedy. German-English biochemist Ernst Boris Chain picked up Fleming’s work again in 1939 – and succeeded in isolating the substance as an antibiotic.



Smartphone

No, it wasn't handy: "Simon" weighed over half a kilo and was 20 centimeters long. IBM introduced it in the US in 1993. Although the term was only invented in 1997, "Simon" is now considered to have been the world's first smartphone. It had a touch-sensitive screen and allowed people to manage appointments as well as send fax and email messages. The device cost 1,099 dollars. Just 50,000 units were sold. "Simon" disappeared from the market after only six months. The world wasn't yet ready for a mobile phone where making phone calls was just a minor feature. These days more than 1 billion smartphones are sold every year.



Nespresso

If there was ever a prime example of long-term thinking paying off, the Nespresso coffee capsule system is it. First it had to be championed by a small team against internal skepticism, then it failed in its initial attempts and needed more than 20 years to become a success worth billions. Swiss food manufacturer Nestlé purchased the initial patent in 1974 and tried it out first in restaurants and then in offices with Nespresso, before finally testing it in private households in the late 1980s. The rest is business history.

“It’s about creating something unusual”

Every year, economist Soumitra Dutta publishes a report card on the innovative capacity of countries around the world. He explains why Switzerland has been at the top of the list for the past five years, how Japan differs from China, how Africa’s rise should be interpreted and why it’s a good idea to have children.

Interview: Daniel Ammann, Simon Brunner and Bill Schulz (illustration)

Professor Dutta, how would you define innovation?

The traditional answer goes something like this: “Innovation is the generation of new products or services that have a market and that people are willing to spend money on.” But this definition is somewhat limited, in my opinion. A broader definition describes innovation more as a mindset; a way of looking at the world. An approach that questions the usual and helps create the unusual.

Your Global Innovation Index (GII) publishes an annual report card on the innovative capability of 141 countries.

How do you measure that capability?

There are several ways to measure innovation, but I think we have made

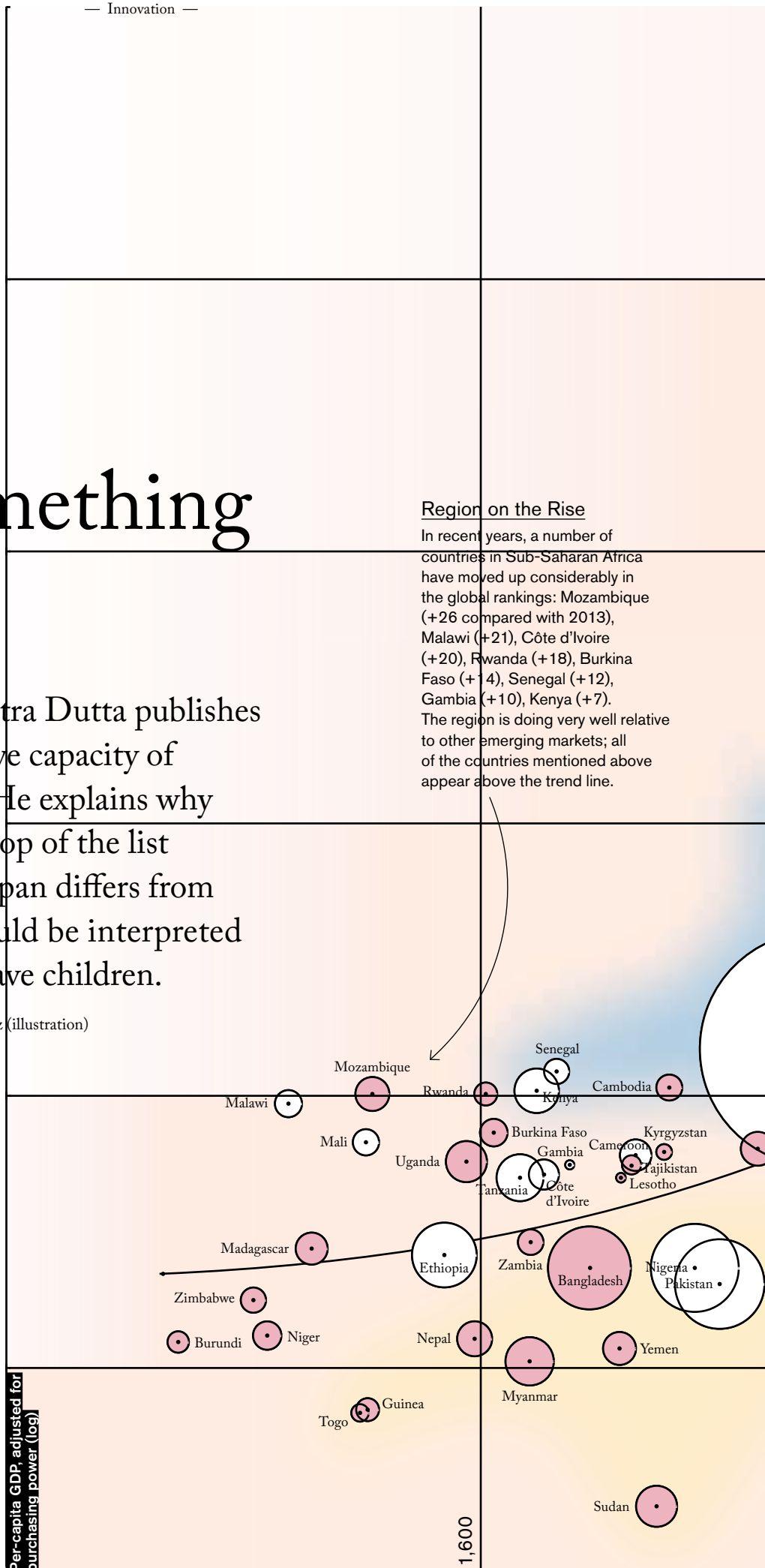
Region on the Rise

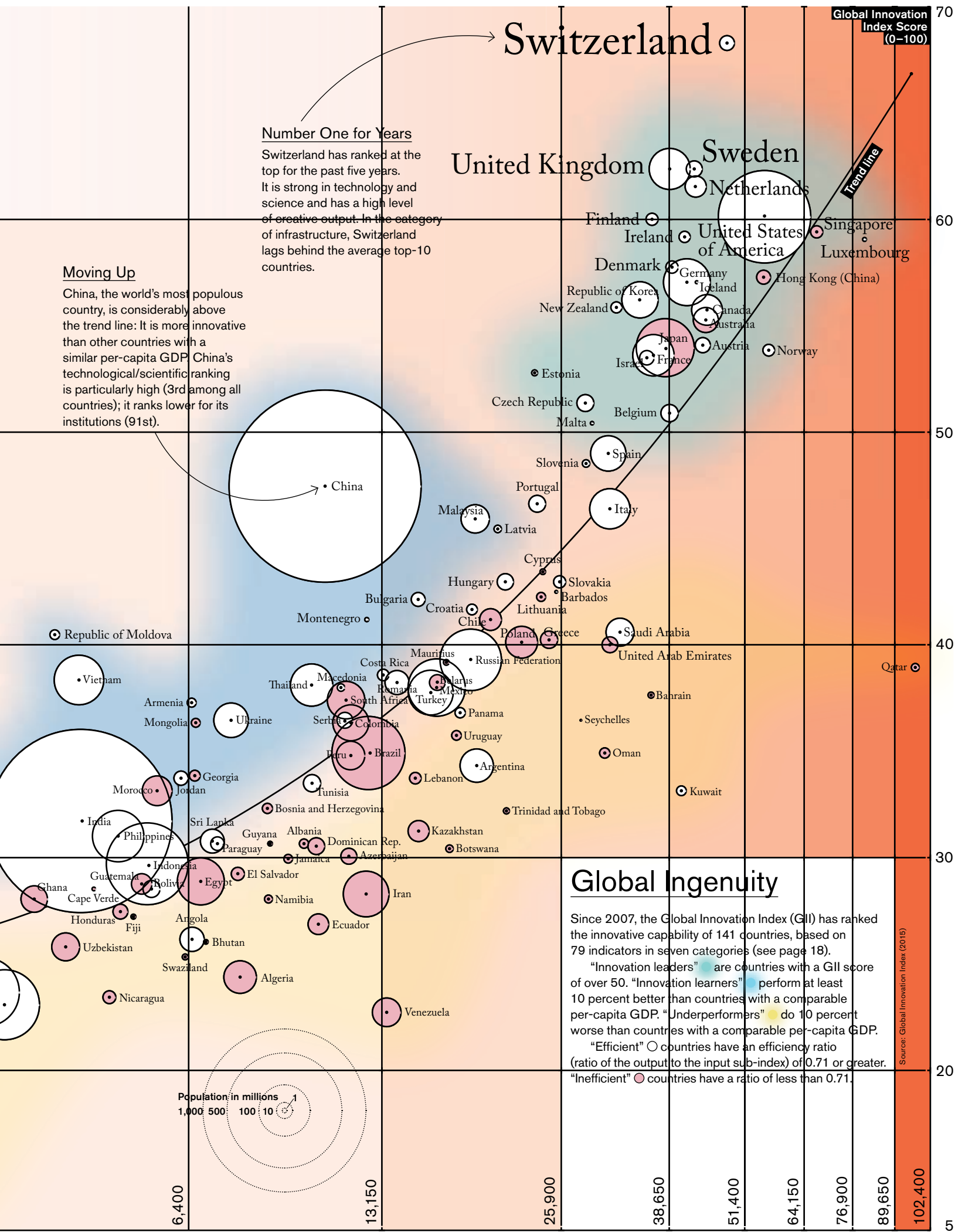
In recent years, a number of countries in Sub-Saharan Africa have moved up considerably in the global rankings: Mozambique (+26 compared with 2013), Malawi (+21), Côte d'Ivoire (+20), Rwanda (+18), Burkina Faso (+14), Senegal (+12), Gambia (+10), Kenya (+7). The region is doing very well relative to other emerging markets; all of the countries mentioned above appear above the trend line.

Per-capita GDP, adjusted for purchasing power (log)

400

1,600





our model very robust over the last eight years. We record 79 indicators that we pool in five input and two output categories [see table on p. 18]. We therefore measure both the factors that enable innovation and the actual outputs of innovation. Input and output are equally weighted, which ultimately results in an overall innovation score.

That sounds abstract. Could you give some specific examples of what innovation means to you?

Product innovations are, of course, the obvious answer. The steam engine revolutionized the economy and society. And on a smaller scale, so, too, does a lighter-weight cell phone, a faster car, a more efficient airplane. But that is only a small part. A 100-year-old company can reorganize itself dramatically – this is innovation in the organizational form. There can be innovation in a business model itself, for example, when a product like a computer program is offered as a new service. There is innovation in creative industries; just look at Peru. The country has become the center of South American haute cuisine, thanks to a handful of top chefs – or, more specifically, a married couple named Gaston Acurio and Astrid Gutsche. They not only launched a new restaurant concept, but also revived the national pride of Peruvians [editor's note: see Bulletin No. 2/15]. The same could be said of the telenovelas in Latin America or Bollywood in India. Online blogs have also created a form of creativity that did not exist previously, albeit often without a direct economic goal.

Creativity is not the same as innovation.

Correct! You need not only creativity, but also the drive to implement it. Nevertheless, creativity is not weighted enough in the traditional literature on innovation metrics. Our Innovation Index also has a sub-category called “Online Creativity” in the second output column. This also allows us to document the creativity of a country's citizens, independently from the government or the economy, as in the blogs I mentioned.

The short
answer:
Innovation
increases
productivity
and helps
create greater
wealth and
prosperity in
a country.

If we might ask a rather mundane question: Why is innovation important?

The short answer is that innovation increases productivity and helps create greater wealth and prosperity in a country.

That sounds like a fortune-cookie message for economists. But is it really true?

Yes. There are essentially three ways for a country to become competitive. One, it has natural resources, like the oil-rich countries in the Middle East. Second, it specializes in transforming raw materials into products and services that are in demand. China is a good example of this. Third, it innovates, it generates new ideas and successfully launches them on the market. In this third category, creativity and knowledge drive competitiveness, which is what most European economies excel at. Innovation is the best way for them to maintain their high level of competitiveness.

Innovation is not only important for the national economy...

...That's right, it also has social significance. Innovation creates jobs. This is particularly important nowadays – especially in Europe, where youth unemployment is high. Traditionally, it was the government and large companies that created new jobs. But many Western countries simply don't

Soumitra Dutta, 52,

is dean of the Samuel Curtis Johnson Graduate School of Management at Cornell University. Born in India, he is the co-author and co-editor, respectively, of two influential reports on innovation, the Global Innovation Index (in cooperation with the World Intellectual Property Organization) and the Global Information Technology Report (in cooperation with the World Economic Forum). Soumitra Dutta is a member of the Davos Circle, an association of long-time participants in the annual Davos meeting of the World Economic Forum. He is married to Lourdes Casanova, a Spanish-born lecturer at the Samuel Curtis Johnson Graduate School of Management, and they have one child.



Topping the List

The top-10 lists show the countries that perform particularly well relative to other countries with a similar income level. Income is measured in terms of per-capita GDP. The Global Innovation Index score is given in parentheses.

Income: low	lower middle	upper middle	high
1 Cambodia (30.35)	1 Moldova, Republic of (40.53)	1 China (47.47)	1 Switzerland (68.30)
2 Kenya (30.19)	2 Vietnam (38.35)	2 Malaysia (45.98)	2 United Kingdom (62.42)
3 Rwanda (30.09)	3 Armenia (37.31)	3 Hungary (43.00)	3 Sweden (62.40)
4 Mozambique (30.07)	4 Ukraine (36.45)	4 Bulgaria (42.16)	4 Netherlands (61.58)
5 Malawi (29.71)	5 Mongolia (36.41)	5 Montenegro (41.23)	5 USA (60.10)
6 Burkina Faso (28.68)	6 Georgia (33.83)	6 Mauritius (39.23)	6 Finland (59.97)
7 Mali (28.37)	7 Morocco (33.19)	7 Costa Rica (38.59)	7 Singapore (59.36)
8 Uganda (27.65)	8 India (31.74)	8 Belarus (38.23)	8 Ireland (59.13)
9 Gambia (27.49)	9 Philippines (31.05)	9 Romania (38.20)	9 Luxembourg (59.02)
10 Tajikistan (27.46)	10 Senegal (30.95)	10 Thailand (38.10)	10 Denmark (57.70)

have the money to create jobs because tax revenues have gone down, and companies are under pressure to reduce costs and become more competitive. What can be done? The best solution is to make it possible for young people to create their own jobs. An entrepreneurial spirit and the opportunity to create small companies and help them grow quickly are extremely important and should be supported.

You have lived and worked in many places: India, Japan, France, the US. Do you think there are cultural differences when it comes to ingenuity?

Innovation requires a certain kind of mindset, you have to question existing systems and structures and think about whether you could try a different approach. The biggest difference that I've experienced is the difference in the drive to want to shift these limitations: Who is "hungry" and who isn't? I am most familiar with the United States and Europe because I have lived, studied and worked there, and headed up various university institutions.

Let us guess: The Americans are hungry and the Europeans are satisfied? The old cliché.

This is not just a cliché, it is really true. I don't think young Europeans are less smart than their US peers. But people in the US always want to try something new, emulate role models, take risks, and even – pardon the expression – fall on their faces. It is very difficult to imitate this culture. Of course, Europe is no monolithic block, but in many places young people

are less willing to take risks. They are too satisfied. Life is good there and people are happy with what they have.

Do you see these differences elsewhere?

I love Japan, I began my career there. But in Japan today, you meet many young people who lack the necessary drive. People are satisfied with what they have. Even though Japan's economy has been struggling for some years, the quality of life is still very high. China, on the other hand, has a hunger to move up, gain recognition, wealth. Perhaps because the country was underdeveloped for so long? In my country India, there is also this hunger, even if it is a bit less pronounced than in China.

How can we nurture this drive, especially in wealthy countries?

Role models are needed more than anything. In the US, India and China, there is a generation of entrepreneurs who are emulated by young people. They want to imitate them and surpass their successes. Now, after decades, India once again has a government that is openly business-friendly. This certainly also helps.

And yet European countries take the top four spots in the innovation ranking.

The countries you are so enthusiastic about are much farther down the list:

The US is ranked 5th, China 29th and India is way down in 81st place.

There is a major legacy effect.

The legacy and the development work

of past generations play an important role. Wealthy countries, such as Switzerland, the UK and Sweden, did many things right in the past and can build on what they have already achieved. For other countries, this means that they have to work hard to catch up.

What are the most effective measures to take for a country to move forward?

A country's greatest potential is represented in the first two columns: institutions and human capital. Countries have to invest in their citizens if they want to achieve something; this should come as no surprise. The institutional aspect is more interesting. By that, we mean political, regulatory and economic factors. Institutions are the heart of a country and determine everything else. If a country performs poorly in this area, it is at a major disadvantage. Factors like legal certainty, political and social stability, level of taxation or how efficient public administrative offices are, for example, how fast a person can set up a business or conclude a contract, all affect a country's success in innovation.

Switzerland has led the innovation ranking for five years – what makes it better than all the other countries?

Switzerland is impressive because it ranks well in all categories of the Global Innovation Index. I am fairly familiar with the country, so we do not have to discuss the quality of its institutions. After all, Switzerland is one of the most stable

countries and one that is most trusted. But I also repeatedly find that its investment in human capital is very high. Its schools are incredibly good, not only the Swiss Federal Institute of Technology (ETH), École Polytechnique Fédérale de Lausanne (EPFL) and the International Institute for Management Development (IMD) business school. It also has a fantastic infrastructure, its trains are on time, more so than in Germany, for example.

Those were the first three input columns. The next ones look similar. Some of the most innovative companies in the world are in Switzerland. Perhaps not as visible and trendy as Facebook and Google, but Switzerland is at the top when it comes to the world of finance, the pharmaceutical and food industries. I once spoke with the CEO of Nestlé. He told me that while 98 percent of the company's revenue comes from overseas, more than a third of its research and development (R&D) takes place in Switzerland. He didn't mention it because of national pride, but rather to illustrate that Switzerland is one of the most interesting countries in the world for R&D. The country is unbelievably attractive for foreign talent. In certain areas, the proportion of skilled foreign workers is well over 50 percent.

After so much praise – what do we need to do in order to maintain our position?

It's obvious: If you are number one, you can only consolidate or fall back. But let

me reassure you: Even if Switzerland were to drop to third or fourth place, it would not be a tragedy. It's not so important what ranking a country achieves; rather, the important thing is to be among the most innovative nations globally.

To put it another way: What are Switzerland's weaknesses?

I still see a great deal of potential in branding the country. Switzerland is not seen as an innovation champion. The global Switzerland brand does not focus enough on innovation. It could and should do more in this area. Wherever I go, people are surprised that Switzerland is at the top of our rankings list and not the US, as an example, even though the countries have some similar strengths.

What is Switzerland's image?

People think that this small country isolates itself and is not very open to immigration. They are surprised when they hear that there are more skilled foreigners living and working in Switzerland than in almost any other industrialized country. Also, the Swiss are rather low-key. They are reserved, do not want to stand out or appear better than they are. And when they are the best, they do not want to discuss that fact. But the world has become a noisy place and one has to be heard!

What would you do?

Let me try to explain by way of an anecdote. Many years ago, I went through pass-

port control in Switzerland. The border official asked me: "Are you a software programmer?" I had to smile. His question came as no surprise, given the stereotype of India as a high-tech, software-programming country.

So what would you do?

We all know that India does much more than just software programming. The country has thousands of other things to offer and many other problems. Yet the outside world sees us as a software nation. Why? Nasscom [editor's note: National Association of Software and Services Companies], an organization made up of the major Indian computer corporations, has invested a great deal in positioning the country as an IT stronghold. In other sectors, too, India has invested heavily in its own brand – in fact, our brand reputation is often better than the reality. The India Brand Equity Foundation, a semi-public institution that promotes Indian products and services around the world, has made a substantial contribution in this regard. I remember how, a few years ago, it flooded Zurich's Kloten airport with advertising for India when India was the main topic at the World Economic Forum (WEF). This makes brand India really stand out.

What does all this mean for Switzerland?

This example shows that it is possible to position a country. All the players have to work as a team: the government, private entrepreneurs, major global companies.

What is innovation?

The Global Innovation Index records 79 indicators that are divided into seven categories, each with three sub-categories. Five of those categories are on the input side, two on the output side. Input and output are weighted equally when calculating the final innovation score, which ranges from 1 to 100.

Input					Output	
Institutions	Human capital and research	Infrastructure	Market development level	Economic development level	Technology/science performance	Creative achievement
Political environment	General education	IT and communication technologies	Credit	Knowledge workers	Knowledge creation	Intangible assets
Regulatory environment	Higher education	General infrastructure	Investment	Innovation environment	Knowledge impact	Creative goods and services
Economic environment	Research and development	Environmental sustainability	Trade and competition	Knowledge imports	Knowledge dissemination	Online creativity

It's not so important what ranking a country achieves; rather, the important thing is to be among the most innovative nations globally.

That's how you create a positive image. Switzerland is the global center of innovation and should be perceived as such.

From a global perspective, what interesting things are happening in the innovation landscape?

In the current report, we asked precisely this question. Which countries stand out in their reference group? If you look at the level of development, the following countries stand out in their respective groups: Armenia, China, Georgia, India, Jordan, Kenya, Malaysia, Moldova, Mongolia, Uganda and Vietnam.

What is striking is that an above-average number of African countries have improved: Malawi, Rwanda, Burkina Faso, Kenya, Uganda.

The good news is that Africa is making progress, there is no doubt about that. But the gap is still considerable. In some countries, government leaders have improved and there is a certain awareness that innovation is essential if you want to be more competitive. In many African countries, technology has become a major driver in development, making it possible simply to skip some development steps.

Technology, digitalization, globalization – are they creating equal opportunities when it comes to competitiveness?

Twenty-five years ago, computers, the internet, cell phones and other technologies were luxuries for the wealthy. Today, these things have become more affordable and more democratic. Last year, I helped a minister in Colombia address innovation questions. I was impressed by the fact that they offer courses of study for app programming even in remote areas. Even from there, you can reach the entire world at very little expense. Developers can load the app to the App store, and it is immediately available to a global market. This is good for the people!

But competition is intense, especially in the digital world. Successfully launching an app requires huge marketing efforts.

That's true. Yet being connected to the world allows people to dream, it provides

inspiration and hope. For a long time, these countries were isolated and there was no incentive to do anything at all.

You mention Colombia as a positive example, yet compared with Africa, South America is doing rather poorly.

Many South American countries are not doing enough. Some of the reasons are well known: poor political leadership. Little focus on innovation. Look at Brazil. It had ten wonderful years during which it fully savored its raw materials boom. But now, with the low prices in the global markets, the country is suffering. One reason for this is that it did not invest enough in sustainable development when things were going well.

On a final note: What was the best idea you ever had?

It was having a child. But you don't realize it until after the fact. But that was the high point.

Was it your idea?

(Laughs) Difficult to say.

But I recommend it to everyone. □

Hard Work, Dedication, Education

As a small, Alpine country that lacks raw materials, Switzerland has no choice but to continually reinvent itself. Having perfected the art of reinvention over the centuries, today it is considered the most innovative country in the world. But how can it remain innovative?

By Bettina Rutschi



A country without natural resources. (Pictured: The EPFL's Rolex Learning Center in Lausanne.)

Well into the 18th century, Switzerland was known primarily for the Alps, cows and sheep. “O learn to know this shepherd people, boy!” wrote Friedrich Schiller in his play “William Tell,” referring to Switzerland. Today, 200 years later, Switzerland is known for its innovative capacity and strong economy. It tops the major international rankings for innovation.*

Patents are another indicator for measuring innovative success. Between 1985 and 2014, the number of patent applications worldwide nearly tripled, to just under 2.7 million annually. Over 43,000 applications were submitted in Switzerland in 2014. In absolute terms, Switzerland ranks eighth in the world; on a per-capita basis, it is number one (source: WIPO).

Lacking natural resources, Switzerland has always been forced to innovate and develop other sources of income, such as agriculture, tourism, industry and the service sector.

Given Switzerland's small and highly fragmented internal market, early on Swiss companies also had to look for foreign markets for their goods, and they had to be productive enough to compete internationally.

Since the country was largely spared the ravages of the Second World War, it was in an excellent position, with intact, export-oriented production facilities, to benefit from Europe's post-war reconstruction. Also helpful were Switzerland's liberal, stability-oriented economic policy and traditionally keen emphasis on hard work, dedication and education.

The Contributions of Foreigners

Another factor, finally, has played an important role throughout Swiss history: immigration. From the 16th to 18th centuries, there were waves of immigration as Protestant Huguenots from France sought at least temporary refuge in Geneva. Many of them were wealthy or highly skilled in a trade. One of their contributions was to bring the manufacture of portable timepieces to Geneva, which was a stroke of luck for the members of Geneva's venerable goldsmith trade, whose source of income had been eliminated by Calvin's strict ban on jewelry. The ban did not apply to watches, which were not considered jewelry. This marked the beginning of the Swiss watch industry.

After Switzerland was established as a liberal, federal state in 1848, political refugees fleeing the absolute monarchies of Europe arrived in Switzerland. Among them were professors from Germany, who helped to build up the new Swiss universities. As the pace of industrialization accelerated in the second half of the 19th century, Switzerland ultimately became one of the classic immigration countries, a development driven primarily by the high demand for labor.

Throughout the centuries, Switzerland has also been able to attract highly qualified workers who have played a crucial role in its economic development. Today, more than 60 percent of annual expenditures on research and development, totaling approximately 18 billion Swiss francs, are financed directly by the private sector. About a quarter of the funds come from the government, the rest from foreign investors. Switzerland ranks about average, compared with other countries, for the level of public financing relative to its gross domestic product (GDP). The driving force behind Switzerland's impressive success at achieving innovation is the

business sector, particularly large companies. ABB, Roche, Nestlé and Novartis applied for between 400 and 600 patents each in 2014. According to data from the European Patent Office, this puts them among the top 50 patent applicants in Europe. Switzerland's small and medium-sized businesses, too, are international leaders in taking advantage of the latest knowledge for their own innovation processes and manufacturing high-quality, specialized products for international niche markets. In a survey of companies conducted by Credit Suisse in 2014, ten percent of all

**ABB, Roche,
Nestlé and Novartis
are among the
top 50 companies
in Europe in terms of
patent applications.**

industrial SMEs reported that they were global market leaders for at least one of their core products. Thirty percent were market leaders for at least one core product in at least one country.

Starting Point: Strong Universities

Along with private industry, the higher education sector plays an important role in Switzerland's innovative capacity – for example, the Swiss Federal Institute of Technology Zurich (ETHZ) and EPFL in Lausanne. Those two universities are in the top 20 worldwide. The central mandate of Switzerland's institutes of technology is to promote innovation. Each year, more than 2,000 graduates of master's degree programs and more than 1,000 PhDs leave ETHZ and EPFL to join the private sector. The two institutes also conduct basic research and partner with the private sector and public agencies to produce successful, market-ready innovations through the transfer of knowledge and technology.

They apply for approximately 200 patents every year, and reported 49 spin-offs in 2014 alone.

What We Need

If Switzerland is to maintain its top position internationally, it must ensure that the necessary conditions for innovation remain in place. These include, for example, business-friendly regulations and a moderate level of domestic taxation, as well as free access to foreign markets. In addition, it should be made as easy as possible for Swiss companies and Swiss universities to recruit skilled workers from abroad, including from non-EU/EFTA countries. Finally, Switzerland must ensure that its education system remains strong. If these basic conditions worsen, it will have a hard time competing in the international marketplace. One thing is certain: International competitors, too, are larger and faster than ever before. □

* Switzerland tops the WEF's Global Competitiveness Report, the EU's Innovation Union Scoreboard, the Global Innovation Index compiled by Cornell University, INSEAD and the World Intellectual Property Organization (WIPO) – see page 14.

Bettina Rutschi works for Credit Suisse Economic Research.

Who invented that?

Even in the 19th century, Switzerland was a poor country. To attain prosperity, the Swiss had to become inventive.

Compiled by Daniel Ammann, illustrations by Magda Antoniuk



Everyone's heard of the knife developed by cutlery maker Karl Elsener, who founded Victorinox and made the Swiss Army Knife an iconic brand; the fine chocolate bar created by François-Louis Cailler; and a long list of pharmaceuticals, from laudanum (Paracelsus) to Voltaren (Ciba-Geigy) and Sandimmun (Sandoz) to synthetic interferon (Charles Weissmann). Many Swiss inventions are known around the world. But many other familiar items likewise have their origins in Switzerland. Could you have named these six?

1B Cellophane

His first thought was to invent a coating that would protect clothing from liquids. What resulted, however, was the first packaging film that could come in direct contact with

food: cellophane. In 1908, Jacques Edwin Brandenberger, a chemist in Zurich, developed the first machine for the manufacture of these flexible sheets, which kept out liquids but were not moisture-proof. He coined the name from the French word *cellulose* (the raw material for his film) and the Greek word *diaphanes* (transparent). To this day, flowers or *zeltli* (the Swiss German word for candies) are wrapped in crackling cellophane.

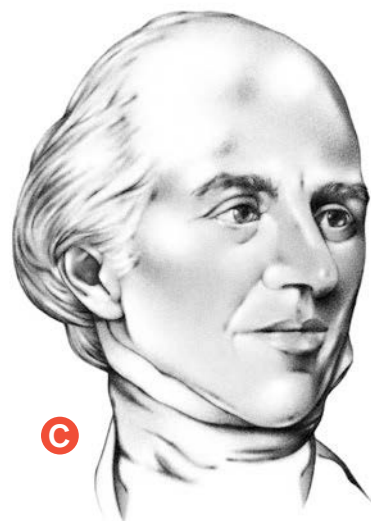
2C Soft drinks

Coca-Cola arrived on the market in 1886. But the soft drink was invented 100 years before that, in Switzerland. In 1780, after ten years of research, Geneva clockmaker Johann Jacob Schweppe invented an industrial method for bottling artificially carbon-

ated water. His beverage was an immediate success; physicians recommended it as a remedy for indigestion and gout. In 1783, Schweppe founded the company that still bears his name: Schweppes. Some years later, he expanded his business to London, where he soon became an official supplier to the royal family.

3E Sugar cubes

Why, complained Juliane Rad at the dinner table one day, can't someone invent an easier way to serve sugar? Once again, she had cut her finger while hacking lumps off the large solid cone in which sugar was molded and sold. Her husband, Jakob Christoph Rad, born in 1799 in Rheinfelden, was the director of a sugar refinery in Dačice, Moravia, which was then part of the Austrian mon-





archy. He soon came up with a solution. He finely grated a cone of sugar, moistened the granules, and poured them into a sheet metal form divided into small cubes, which were then pressed and dried. Rad patented his sugar cube press in 1843.

4D DDT

High-school dropout becomes Nobel Prize winner – that’s the short version of Paul Hermann Müller’s story. Here’s the longer version: When Müller was 17 years old, getting bad grades at the Freie Evangelische Volksschule in Basel, he left school. At first, he worked as a laboratory assistant. But later he returned to school, graduated, and went on to study chemistry. In 1939, while working at J.R. Geigy AG (now Novartis), he discovered that DDT (dichloro-diphe-

nyl-trichloroethane) was a powerful insecticide. In 1948, he was awarded the Nobel Prize in Physiology or Medicine for this discovery, the first person to receive the prize who was not a physician.

5A Velcro fastener

Georges de Mestral’s invention was so far ahead of its time that he inspired a science fiction story: The engineer from Colombier figured in an episode of the television series *Star Trek*. In the “Carbon Creek” episode of the show’s second season, a Vulcan named Mestral brings the hook-and-loop closure to an Earth human in the 1950s. What a tribute! Naturally, the reality was a different story. George de Mestral patented his new fastener system in 1951 under the

name Velcro, from the French words “velours” (velvet) and “crochet” (hook).

6F Pascal

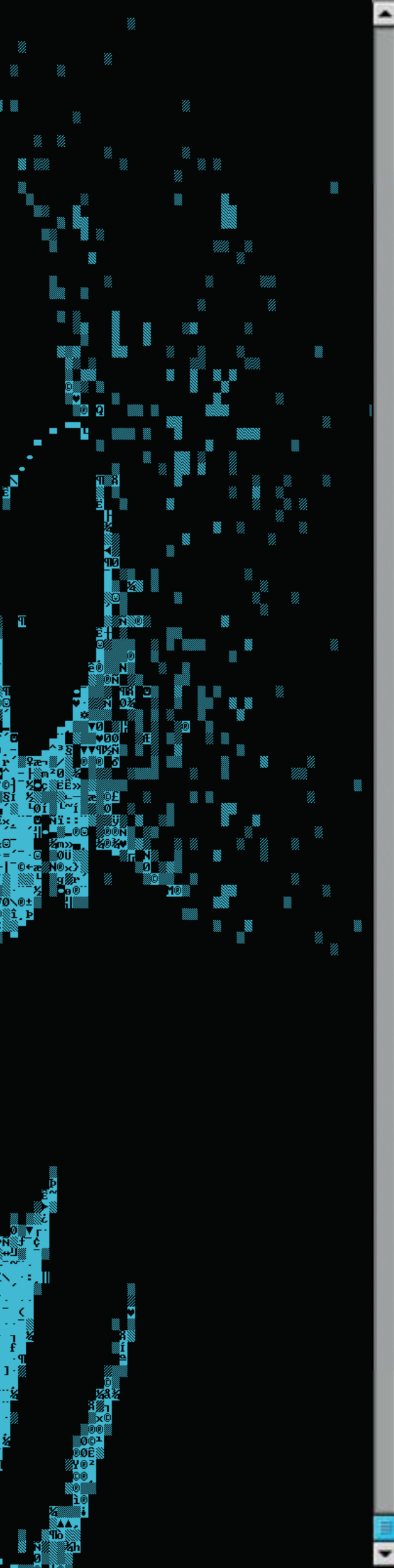
A generation of computer scientists learned to program using Pascal, the programming language developed in 1968 by Professor Niklaus Wirth at the Swiss Federal Institute of Technology in Zurich. He named it in honor of the French mathematician and philosopher Blaise Pascal (1623–1662), who had invented one of the first mechanical calculators. Wirth had encountered his first computer in Canada in 1960: a main-frame computer the size of a wardrobe. “It had to be monitored day and night by a technician, and whenever I needed it for a calculation, it seemed to be in the process of being repaired,” Wirth later recounted. □



A Golden Age for (Good and Bad) Hackers

The FBI once said that Kevin Mitnick could start a nuclear war from his prison cell by whistling into a payphone. Today, he helps companies protect themselves from hackers. Mitnick reveals the only secure way to use a computer.

By Lars Jensen



We're on the phone with the man who dubs himself the world's most famous hacker. We've reached him at his office in Las Vegas, where he's trying to answer a few questions. "Hello, Mr. Mitnick, can you hear me?" The connection breaks up. Mitnick calls back. "Is this better?" he asks. "No, I can barely hear you. What's wrong?" He doesn't want to give away any details, but he's taken security precautions – after all, you never know who might be listening. "You have to assume that every telephone conversation is being monitored. We've learned that the NSA stops at nothing," says the hacker, who once specialized in telephone eavesdropping himself. He thinks it's foolish to make calls on a landline or mobile phone. "If you want to speak freely, the only way to do it is over an internet connection with end-to-end encryption."

No one can blame Kevin Mitnick for being paranoid about his communication security. The FBI hunted him across America for three years before finally apprehending him in 1995, and he was sentenced in 1999. Mitnick served five years in prison – four and a half years pre-trial and eight months in solitary confinement. "The federal prosecutor was able to convince the judge that I could start a nuclear war from prison by whistling into a payphone," Mitnick says. "Of course it wasn't true. My draconian sentence was supposed to send a message." Now, sixteen years after his release, Mitnick runs Mitnick Security – a company that is thriving, he reports, by consulting with large corporations and government authorities on security matters. Judging by his calendar, he travels almost nonstop, giving presentations and leading training sessions all over the world. His Facebook page reveals that he enjoys sampling exotic cocktails on his countless trips. His books are bestsellers, and his hacker ca-

reer was the basis of a Hollywood film ("Takedown") as well as numerous documentaries.

Not Just Criminals Anymore

Just a few years ago, most security managers would never have considered inviting in a convicted hacker to secure their computer systems from attack. But hackers – or "security investigators," as they prefer to call themselves – are living in a golden age. They are cashing in as software and hardware manufacturers search for ways to defend against ever bolder attacks. Merijn Terheggen, CEO of the agency HackerOne, which acts as an intermediary between hackers and

**The performance of
the chips in our
devices doubles every
two years.**

companies seeking their services, says, "The performance of the chips in our devices doubles every two years. The complexity of the applications on those devices doubles every few months. Together, this means that the number of security vulnerabilities is growing exponentially. No one can contain them anymore." His conclusion: "In 18 to 24 months, all of the world's large companies will have programs to harness the creativity of hackers for their own protection."

Kevin Mitnick is 52 years old – about 35 years older than the typical hacker sitting in front of a screen somewhere in Pakistan or Bolivia, browsing the internet for security vulnerabilities. Mitnick is enjoying the new era: "The greatest difference from when I was young is that hackers aren't inherently seen as criminals anymore. If these opportunities had existed back then, >

I would have had a legal outlet for my curiosity and desire to experiment.”

His career began with harmless pranks when he was 13 or 14 years old. Later on he broke into the systems of all the large telecommunications companies in the US, eavesdropped on conversations, and stole source codes – a company’s digital DNA. He even outwitted the FBI. Mitnick found the investigators’ mobile phone numbers and developed a warning system that alerted him whenever an agent was coming close. Mitnick kept up this game of cat and mouse across North America for nearly three years. It helped that nature had provided him with a thoroughly average face. His glasses, hair, voice – two minutes after meeting him, you’d be pressed to remember anything about how he looks.

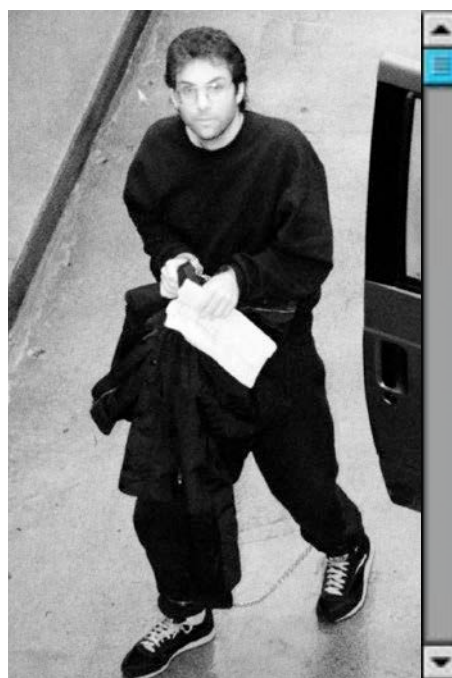
He insists that the authorities mercilessly exaggerated his crimes. His favorite hack was breaking in to the intercom system at a local McDonald’s drive-thru. “A police car drove up, and the officers were about to order. I hacked into the speaker and yelled, ‘Get rid of the cocaine! Get rid of the cocaine!’ The employees panicked. The cops just looked confused.” Mitnick still laughs today when he tells anecdotes from his youth.

Back then, no one could imagine a world where everything is digitally connected – banking, dating, buying and selling weapons. The film “Hackers” recently celebrated its 20th anniversary, but its romantic image of the hacker has little in common with hackers today. “What we’re seeing more and more are small groups and individual criminals who are developing capabilities that were previously accessible only to government institutions,” says Michael V. Hayden, former director of the National Security Agency. “It’s obvious what kinds of problems arise from this.”

The Internet as the Next Battleground

In October, the Washington Post reported that a group of Albanian hackers called Kosova Hackers Security (KHS) stole personal data from 100,000 customers, including 1,351 military and other government personnel, in a cyberattack on an American online retailer. KHS then sold this data to the highest bidder – Islamic State (ISIL).

Junaid Hussain, a British citizen of Pakistani descent who was a member of ISIL, shared the information, including addresses and telephone numbers, on Twitter, threatening that “our soldiers will strike at your necks in your own lands.” The FBI arrested the KHS leader in Malaysia, and Hussain was killed by a drone strike in Syria.



Kevin Mitnick before his arraignment in Raleigh, North Carolina on February 17, 1995.

A world war is raging online on invisible battlefields. All systems are under attack at all times. Every network is constantly being tested. But the victims only usually notice the attacks when it’s too late. The retail giant Target discovered the security breach in its internet-connected heating, ventilation, and air conditioning (HVAC) systems only after hackers had stolen data from forty million customers. Sony and the US Department of Defense, the American subsidiary of Deutsche Telekom and Fiat Chrysler – all have fallen victim to spectacular hacks. Companies find themselves in a constant state of siege, but they don’t know where the attacks are coming from or how

serious they might be. The telecommunications group Verizon analyzed 2,122 hacks from the past year and determined that in almost two-thirds of these attacks, the damage occurred within just minutes. Are the attacks coming from North Korea or the NSA? From the competition or a co-worker? Or just from a teenager in South Africa?

Technological progress appears to be giving hackers a huge step up. Have companies, unwilling to give up their internet connections, lost the innovation race from the start?

18 Million Active Hackers

Kevin Mitnick advises his clients to work together with hackers even during software

**Technological
progress
appears to be giving
hackers a huge
step up.**

development, allowing them to look for vulnerabilities throughout the process. “Many companies, especially in the tech sector, are already doing this,” he says. He also calls for more digital security training for employees.

Mitnick doesn’t think much of the “bug bounty” programs, popular right now, which reward hackers for each bug they find. “It might work in the majority of cases. But there’s a risk that a criminal can blend in with well-intentioned hackers and then sell what he discovers on the black market.” Eighteen million hackers are active worldwide, according to HackerOne, which links companies with hackers’ services. How can we monitor them? Even Mitnick operates an exchange on his website for potential “zero-day exploits,” i.e. vulnerabilities that haven’t yet been fixed. But participation in his exchange is by invitation only.

Discovering and selling a security vulnerability isn’t illegal in itself. Only the people who use the information maliciously can be prosecuted. The global trade

Online Burglary

How can you protect yourself from digital thieves when banking online? Four secure tips.

in security vulnerabilities, the so-called “vulnerability economy,” is booming.

On the defensive side of the market, there are agents who purchase system errors in order to offer them to affected companies. These can be brokers who acquire certain market information and work on the companies’ behalf. Bug bounty programs also fall into this category. Payment is usually between 500 and 20,000 dollars per hack. In exceptional cases, Microsoft and Facebook have paid more than 100,000 dollars.

The offensive market primarily involves states and organized crime. Mitnick says that here the prices for a bug can reach seven figures. Participants are interested in keeping system errors away from the defensive market as long as possible, so that they can profit from these errors for longer.

Spectacular hacks – involving government authorities, corporations, and schools – are constantly being exposed. Can Mitnick imagine a system that guarantees total security? “Of course,” he says. “You have to hide the really important data behind a so-called air gap.” In other words, the only way to be 100% secure is to unplug from the internet. □



Tip 1: Password

The password is one of the security features of online banking, therefore never write it down. Use a long combination (at least 8 characters) that cannot be found in a dictionary as well as different kinds of characters (upper- and lower-case letters, special characters and numbers). Since a strong password like “Ap!45%_0” is difficult to remember, create one from the first letters of each word in a sentence: “Ronaldo is the greatest. Go number 7!” becomes “Ritg.G#7!”

Tip 2: Anti-virus Software

Install an anti-virus program on your computer and keep it up-to-date. Even new PCs do not usually come with anti-virus software, or they only have a trial version that is valid for a limited time. Your anti-virus program needs to always be kept up-to-date so that it can detect the latest threats. Well-known providers offering paid subscriptions include McAfee, Kaspersky and Norton. A good no-cost option is Avira Free Antivirus.

Tip 3: Phishing Emails

Phishing is the theft of login data, primarily through fraudulent websites. One well-known tactic is an urgent email request to log in to your account within seven days to prevent your online

banking access from being blocked. Or you might be asked, under false pretenses, to review your contact information. You then click on a link that brings you to a website that looks deceptively similar to the website of your bank. After you enter in your login data, you receive an error message, such as “Due to online maintenance, website access isn’t possible at this time. Please try again later.” In the meantime, the criminals are logging into your account with the information you just provided. Never click on links in suspicious emails. Banks never ask their customers to take any kind of actions via email.

Tip 4: Malware

Hackers can gain access to login data directly, or through harmful programs known as malware, which include worms, viruses, Trojan horses and root-kits. This kind of spyware allows your PC to be tracked, for example by logging your keystrokes. Malware can spread through the internet independently, or it can be downloaded to your PC via email attachments, downloads or data storage devices like CD-ROMs and USB sticks. So pay close attention to the programs you install on your computer, particularly those downloaded from internet!

Lars Jensen lives in New York and writes for the Frankfurter Allgemeine Zeitung, Die Zeit, Süddeutsche Zeitung, Spiegel, and other publications.

Compiled by **Uwe Neumann**, analyst with Credit Suisse.

“The Dawn of the Second Machine Age”

Will there be any jobs for human beings in the future? A conversation with Erik Brynjolfsson and Andrew McAfee, faculty members at the Sloan School of Management at the Massachusetts Institute of Technology (MIT) who have studied the impact of technology on economies for years.

By Amy Bernstein and Anand Raman

Machines, it seems, can do almost anything human beings can. What does that mean for business and employment? Will any jobs be left for people? Will machines take over not just low-skilled tasks but high-skilled ones too? If a man and a machine work side by side, which one will make the decisions? These are some of the questions facing companies, industries and economies as digital technologies transform business.

Technological progress makes the world better but also brings new challenges, say Erik Brynjolfsson and Andrew McAfee, faculty members at the MIT Sloan School of Management, who have studied the impact of technology on economies for years. Their most recent book, “The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies,” took an upbeat view of the high-tech future.

Your recent work has focused on the progress that digital technologies have enabled. But lately you’ve expressed concern that problems related to them are emerging quickly. What are you so worried about?

McAfee: Digital technologies are doing for human brainpower what the steam engine and related technologies did for

human muscle power during the Industrial Revolution. They’re allowing us to overcome many limitations rapidly and to open up new frontiers with unprecedented speed. But how exactly it will play out is uncertain. Just as it took decades to improve the steam engine to the point that it could fuel the Industrial Revolution, it’s taking time to refine digital technologies. Computers and robots will keep evolving and will learn to do new things at

Industrial Revolution created vast wealth but also brought us pollution and disease and the exploitation of child labor. Digitization is creating new types of economic disruption. In part, this reflects the fact that as computers get more powerful, companies have less need for some kinds of workers. Even as it races ahead, technological progress may leave some people – perhaps even a lot – behind. For other people, however, the outlook is

It’s not a great time
to have only ordinary skills.

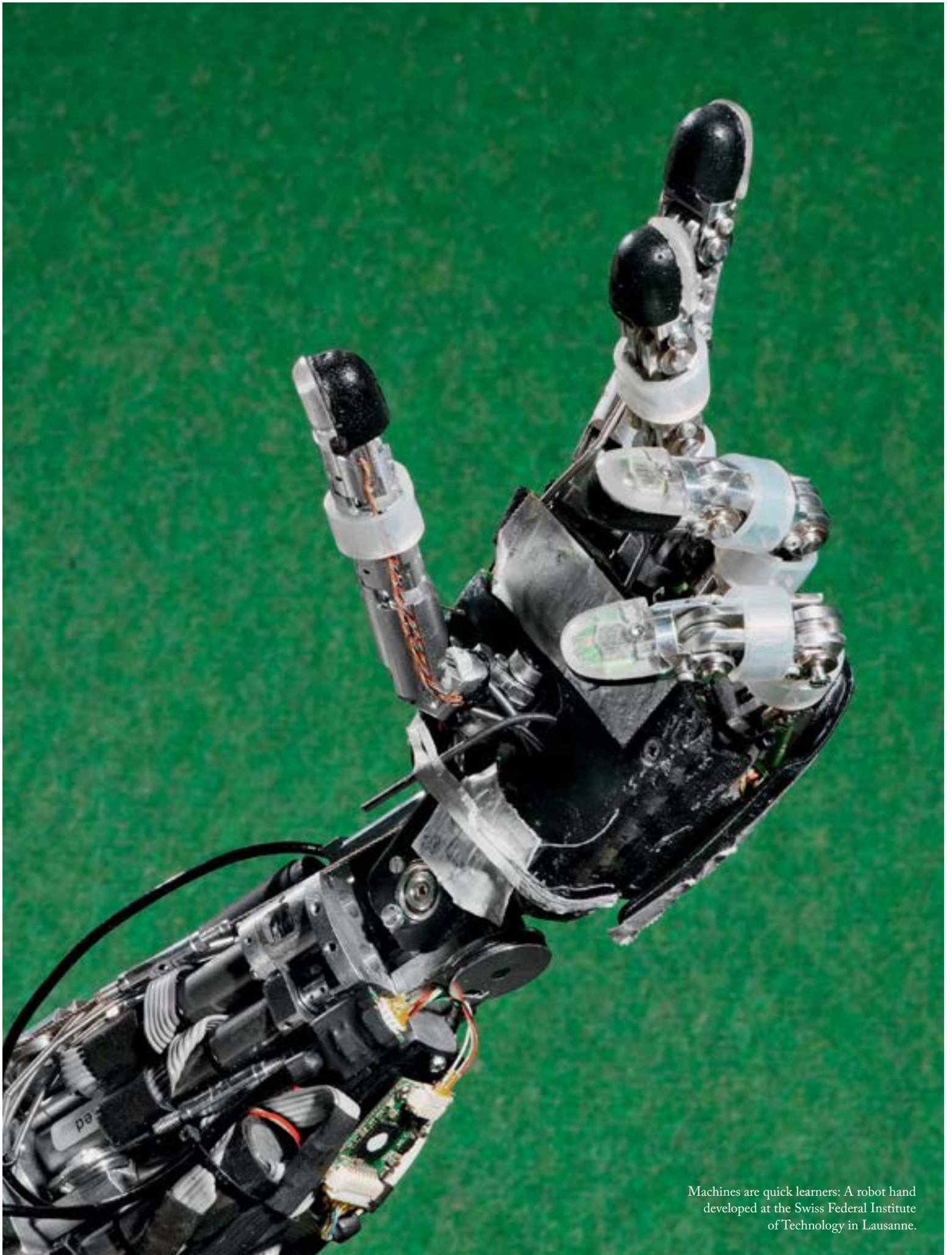
an amazing pace. That’s why we’re at an inflection point today, at the dawn of what we call the Second Machine Age. This era will be better for the simple reason that, thanks to digital technologies, we’ll be able to produce more: more health care, more education, more entertainment, and more of all the other material goods and services we value. And we’ll be able to extend this bounty to more and more people around the world while treading lightly on the planet’s resources.

Brynjolfsson: For instance, the first

bright. There’s never been a better time to be a worker with special technological skills or education. Those people can create and capture value. However, it’s not a great time to have only ordinary skills. Computers and robots are learning many basic skills at an extraordinary pace.

According to the data, productivity is rising, but many Americans’ incomes are stagnant or even falling. What do you make of that?

Brynjolfsson: Let’s look at the four key measures of an economy’s health: per >



Machines are quick learners: A robot hand developed at the Swiss Federal Institute of Technology in Lausanne.

capita GDP, labor productivity, the number of jobs and median household income. For more than three decades after World War II, all four went up steadily and in almost perfect lockstep. Job growth and wage growth, in other words, kept pace with gains in output and productivity. American workers not only created more wealth but also captured a proportional share of the gains. In the 1980s, however, the growth in median income began to sputter. In the past 15 years it's turned negative; once you adjust for inflation, an American household at the 50th percentile of income distribution earns less today than it did in 1998, even after accounting for changes in household size. Job gains were anemic throughout the 2000s, even when the economy was expanding. This phenomenon is what we call the Great Decoupling. The two halves of the cycle of prosperity are no longer married: Economic abundance, as exemplified by GDP and productivity, has remained on an upward trajectory, but the income and job prospects for typical workers have faltered. Even though machines did more and more work and the population grew rapidly for almost 200 years, the value of human labor actually

rose. You could see this in the steady increase in the average worker's wages. That fueled the notion that technology helps everyone. However, that kind of success is not automatic or inevitable. It depends on the nature of the technology, and on the way individuals, organizations and policies adapt. We're facing a huge challenge.

Is the Great Decoupling happening only in the United States?

Brynjolfsson: No, similar trends are appearing in most developed countries. In Sweden, Finland and Germany, for instance, income inequality has grown. There seems to be a common underlying force that's affecting all these countries. We think that force is technology.

McAfee: One gauge of workers' prospects is how much of GDP is paid as wages every year. Labor's share of GDP held steady for many decades in America, but since 2000 it has fallen sharply. Meanwhile, corporate profits were rising quickly before the Great Recession and recovered with remarkable speed afterward; now they're at their highest point since World War II. Workers' prospects are deteriorating in the developing world, too.

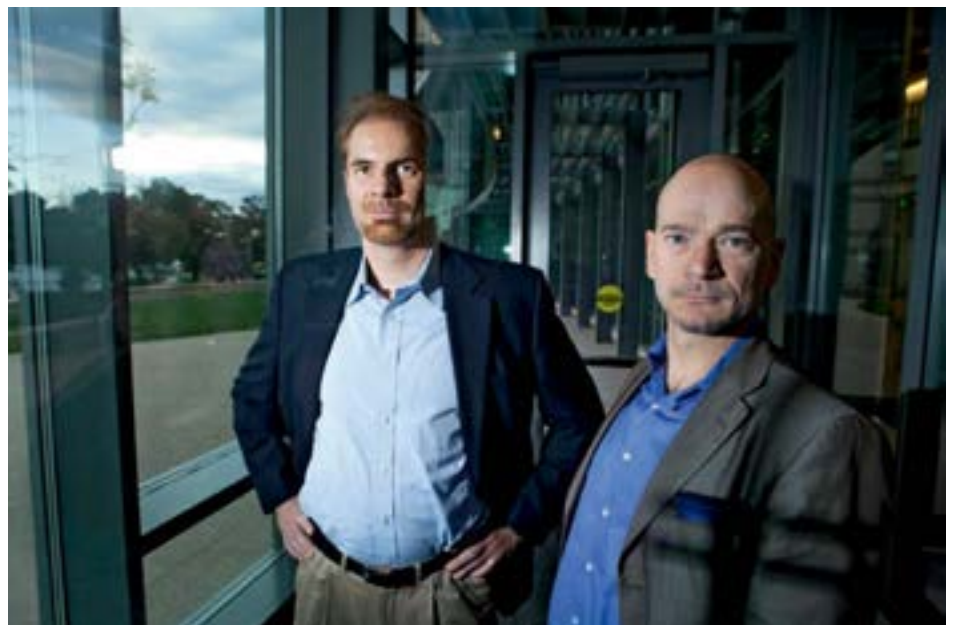
Brynjolfsson: Over the past 30 years,

as American companies moved production overseas to lower costs, manufacturing employment in the United States fell. Our MIT colleague David Autor and his co-researchers David Dorn and Gordon Hanson estimate that competition from China can explain about a quarter of the decline in manufacturing employment in the United States. But both American and Chinese workers are being made more efficient by automation.

Not all types of jobs are disappearing, are they? Why are some affected more than others?

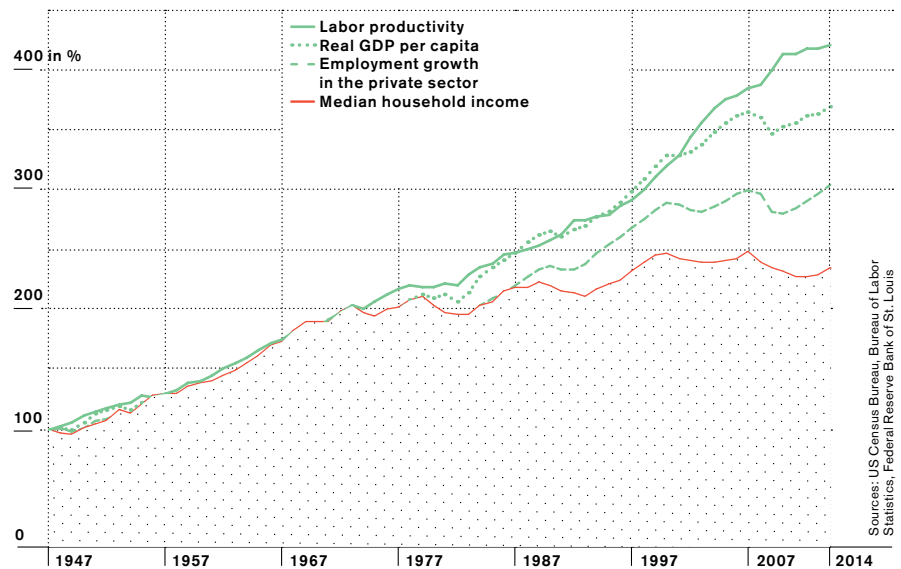
McAfee: Technologies such as payroll-processing and inventory-control software, factory automation, computer-controlled machining centers and scheduling tools have replaced workers on the shop floor and in clerical tasks and rote information processing. By contrast, big data, analytics and high-speed communications have enhanced the output of people with engineering, creative and design skills and made them more valuable. The net effect has been to decrease the demand for low-skilled information workers while increasing the demand for highly skilled ones.

Erik Brynjolfsson (left) and **Andrew McAfee** run the Center for Digital Business at the Massachusetts Institute of Technology (MIT) in Cambridge. Their most recent book is "The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies".



The great decoupling

Until the 1980s, the US had largely parallel increases in labor productivity, real gross domestic product per capita, employment growth in the private sector and the median-income of private households. Productivity and the GDP have continued this upward trend. Median-income is lagging behind, and job growth fell to its 2000 levels before rebounding recently.



Do digital technologies create winner-take-all economies?

Brynjolfsson: Digital technologies allow you to make copies at almost zero cost. Each copy is a perfect replica, and each copy can be transmitted almost anywhere on the planet nearly instantaneously. Those were not characteristics of the First Machine Age, but they are standard for digital goods, and that leads to some unusual outcomes, such as winner-take-most markets.

What would you say to economists who are skeptical about the ability of digital technologies to boost productivity?

McAfee: We haven't yet seen what the latest crop of technological breakthroughs can do. Let's keep in mind that products like the iPhone are just eight years old.

ity growth will climb. In fact, we're both confident that digital technologies are going to produce greater prosperity than the engines of the First Machine Age did.

Brynjolfsson: You could break the Second Machine Age into stages. In stage II-A, humans teach machines what we know painstakingly, step-by-step. That's how traditional software programming works. Stage II-B is when machines learn on their own, developing knowledge and skills that we can't even explain. Machine learning techniques have had some success doing that in areas as diverse as understanding speech, detecting fraud and playing video games.

Is there a third stage?

Brynjolfsson: Maybe. It might be when machines understand emotions and

end creativity that generates things like great new business ideas, scientific breakthroughs, novels that grip you and so on. Technology will only amplify the abilities of people who are good at these things. The second category is emotion, interpersonal relations, caring, nurturing, coaching, motivating, leading and so on. Through millions of years of evolution, we've gotten good at deciphering other people's body language ...

Brynjolfsson: ...and signals, and finishing people's sentences. The third is dexterity, mobility. It's unbelievably hard to get a robot to walk across a crowded restaurant, bus a table, take the dishes back into the kitchen, put them in the sink without breaking them, and do it all without terrifying the restaurant's patrons. Sensing and manipulation are hard for robots. None of those is sacrosanct, though; machines are beginning to make inroads into each of them.

McAfee: We'll continue to see the middle class hollowed out and will see growth at the low and high ends. Really good executives, entrepreneurs, investors and novelists – they will all reap rewards. Yo-Yo Ma won't be replaced by a robot anytime soon, but financially, I wouldn't want to be the world's 100th-best cellist.

How well do you think business is coping with these rapid advances in technology?

Brynjolfsson: The technologies continue to race ahead, but there has unfortunately been a drop in business dynamism. This is an opportunity for entrepreneurs to think of ways of using humans in new

Digital technologies allow you to make copies at almost zero cost.

Autonomous cars first drove on American highways five years ago. And only recently, artificial intelligence systems showed that they could master unfamiliar tasks – such as categorizing images or playing video games – without programmers' teaching them any rules. All of these are significant advances, but none of them will spread through the economy on its own. Instead, they'll all combine and recombine with each other and with previous generations of technology. As that happens, productiv-

interpersonal reactions, an area where humans still have the edge. If you visit the folks at the MIT Media Lab, though, you'll find that they're working on robots that can pick up on emotions, in some cases analyzing facial expressions better than you and I can.

As the Second Machine Age progresses, will there be any jobs for human beings?

McAfee: Yes, because humans are still far superior in three skill areas. One is high-

applications, combining them with technology. We call that racing with machines as opposed to racing against them. For some reason, business hasn't been creating new jobs as effectively as in the past.

McAfee: The best way to respond to change is with flexibility, fluidity – to roll with the punches. Instead, we're seeing this decrease in business dynamism and in labor fluidity. That's a dire trend, and it will keep us from responding properly to the coming technological surge.

Brynjolfsson: On average, rates of entrepreneurship, despite what we see in Silicon Valley, are going down in the US. The intellectually easy thing to do is to look at an existing process and say, how can I have a machine do part of that job? It does take a certain amount of creativity and a

the world's most talented people come to America to build lives and careers, and there's clear evidence that immigrant-founded companies have been great job-creation engines. The current policies in this area are far too restrictive, and our procedures are nightmarishly bureaucratic. The fifth thing is basic research. Companies tend to concentrate on applied research, which means that the government has a role to play in supporting original early-stage research. Most of today's tech marvels, from the internet to the smartphone, have a government program somewhere in their family tree.

Brynjolfsson: Digital technologies will bring the world into an era of more wealth and abundance and less drudgery and toil. But there's no guarantee that

“The best way to respond to change is with flexibility, fluidity.”

little bit of work to do that, and it does create value. However, it takes a lot more creativity to say: How can I have this machine and this human work together to do something never done before and create something that will be more valuable in the marketplace?

What kind of economic environment would make the best use of the new digital technologies?

McAfee: To create it, we need to focus on five things: The first is education. Primary and secondary education systems should be teaching relevant and valuable skills, which means things computers are not good at. These include creativity, interpersonal skills and problem solving. The second is infrastructure. World-class roads, airports and networks are investments in the future and the foundations of growth. Third, we need more entrepreneurship. Young businesses, especially fast-growing ones, are a prime source of new jobs. But most industries and regions are seeing fewer new companies than they did three decades ago. A fourth focus is immigration. Many of

everyone will share in the bounty. The outcome will be determined not by technologies but by the choices we make as individuals, organizations and societies. It won't lift us into Utopia or carry us into an unwanted future. The power to do that rests with us human beings. Technologies are merely our tools. □



Amy Bernstein is the editor of Harvard Business Review. Anand Raman is an editor at large at Harvard Business Review.

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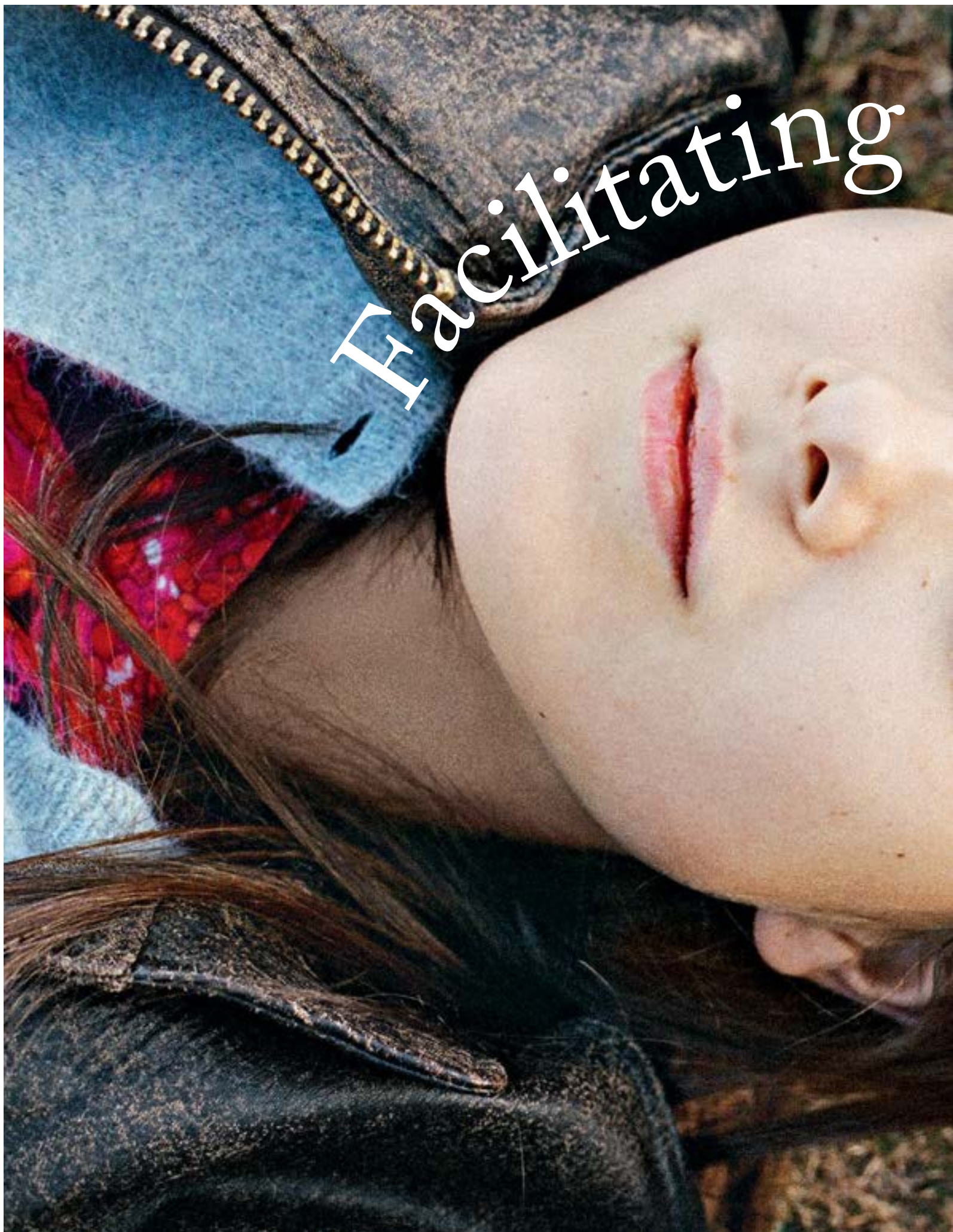
Our Commitment to Lower Youth Unemployment.



Through the initiative to tackle youth unemployment, Credit Suisse has been committed to improving the opportunities for career starters in Switzerland since 2010. More than 8,800 young adults have already received assistance from our partner organizations and from the bank. Since April 1, 2015, these services have been supported by the legally autonomous "Check Your Chance" association and managed sustainably by the partner organizations.

credit-suisse.com/youthunemployment

Facilitating



Inspiration



How do you come up with an idea?
There's no single recipe to follow.
But creativity needs freedom to blossom –
and it's hard work.

By Mathias Plüss

An old text on alchemy offers two suggestions for finding the philosopher's stone: "It can only be found by one who is consumed with its quest." And: "You labor in your search and find nothing – search not, and you will find."

The contradiction between the two reveals a deeper truth. Often, we can only find what we're looking for after we stop looking. The sleep that eludes us. True love that cannot be sought, only found. And also the inspiration that vanishes under pressure. Ideas are difficult to corral, like herding cats. And, like cats, they never come when we want them to.

The great zoologist Konrad Lorenz noticed that birdsongs are the most beautiful when they serve no particular purpose, while a blackbird's song becomes a harsh monotone when it wants to chase away an intruder or attract a mate. "It always amazed me," Lorenz wrote, "that the songbird reaches its artistic peak in exactly the same biological situation and mood as the human. That is, when it achieves a kind of spiritual equilibrium and distances itself from the seriousness of life, so that it sings in a purely playful way."

Failing the Stress Test

It's a common fallacy that necessity is the mother of invention. Art is the product of surplus, and even scientific research achieves its most useful results when it is not compelled to be practical at all costs. New discoveries cannot be planned, otherwise they wouldn't be new. It is counterproductive to demand creativity at the push of a button. >

“Many people think that they come up with their best ideas under stress,” says the German psychologist Ernst Pöppel. “But studies usually show the opposite. Stress and the pressure of deadlines seem to put the brain in a state of anxiety that hinders, or even blocks, free thinking.” One study, the colorfully titled “Creativity under the Gun,” shows how employees thought they were more creative under pressure – but in reality, their creativity dropped by 45 percent on the most stressful days.

Of course, some things do work better under pressure. Anxiety narrows your focus and sharpens concentration, which is good for thinking logically. But new ideas don’t come from logic. Inspiration requires a clear head, and thoughts have to flow, so that you can connect the most disparate associations. Interestingly, this type of thinking works best in the dark, as the night lets the mind roam free. Analytical work, however, needs bright light.

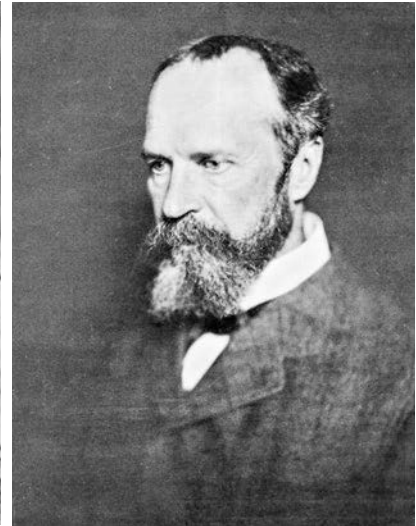
Creative Chaos

Analytic and creative thinking each correspond to different brain activity. Researchers have discovered that the brain experiences regular, short phases where the neurons are firing in areas of the brain in identical rhythm. But the pendulum swings to periods of chaos. We believe that the brain takes care of routine tasks in the orderly phase, while it tests out new strategies and builds new connections in the chaotic one.

The American psychologist William James (1842–1910) described what he believed to be “the highest order of minds” as a “seething caldron of ideas, where everything is fizzling and bobbing about in a state of bewildering activity, where partnerships can be joined or loosened in an instant.” Not coincidentally, this description is reminiscent of a dream. Numerous scholars and artists report how important ideas have come to them after a visit from the sandman. Thanks to creative dreams, we not only have the electric clock and the periodic table, but also Richard Wagner’s E-flat major chord at the beginning of “Das Rheingold,” and Paul McCartney’s melody for “Yesterday.” The American golfer Jack Nicklaus has even said that he dreamed up



Necessity is not the mother of invention: zoologist Konrad Lorenz (1903–1989); American psychologist William James (1842–1910), photographed around 1890.



a new swing in 1964, which brought him back to the top of his game.

This might sound like child’s play, but productive dreams are the result of hard work. Scientists may come up with the solution to a problem in a dream, but they likely have been pondering the problem for years. In order for something new to arise, the unconsciousness has to have space to roam. Inspiration often comes only after you’ve stepped away from the problem, whether by going on vacation or going to sleep.

Calm and Creative

Relaxation is helpful here, as is anything that takes your mind off the problem. You need to be calm to be creative. Studies show that people perform 50 percent better on a creativity test after a four-day backpacking trip, for example. And we are significantly more creative with a blood alcohol level of 0.75 compared to being stone cold sober. Simply put, creativity is about getting away from focused, logical thinking.

One proven method of distraction is to take a walk. “Most of what I later put to paper came to me on walks or in bed,” writes the German author Sibylle Lewitscharoff. “Never while sitting, and certainly not at my desk. Once I get to my desk, I can only refine and give final shape to what I’ve already thought, snatched from my mind’s flight, and relate it in a more or less logical order.”

Solitary walks let your thoughts flow freely. “Given enough time, your mind will often stumble across some old connection that it had long overlooked,” writes American science journalist Steven Johnson in his book “Where Good Ideas Come From:

The Natural History of Innovation” (Penguin, 2010). “And you experience that delightful moment of private serendipity: Why didn’t I think of that before?”

The “stumbling” that Johnson describes is an unmistakable sign of serendipity. Serendipity refers to the not uncommon phenomenon when you encounter things that you hadn’t been looking for, so long as you are open and receptive to it. The prototypical example is Columbus, who found America while trying to discover a new sea route to India.

The history of science is full of serendipity, especially in the pharmaceutical industry. Viagra, for example, began as a heart medication. Researchers learned that the drug had an altogether different effect only after male study participants didn’t want to give back their leftover pills.

Artificial sweeteners, too, were unplanned. Cyclamate was supposed to reduce fever, saccharine was to be a preservative, and aspartame was intended to treat ulcers. Chemists only discovered their sweetness because they licked their fingers in the laboratory.

The situation with psychiatric medication is particularly dramatic. All three major types (antipsychotics, antidepressants and anti-anxiety medications) came about by chance. We have to thank the attentive doctors who recognized the drugs’ psychological effects. With modern methods of drug discovery, they “probably never would have been found,” as pharmacologist Christian Fibiger writes. This raises the worrying question as to the value of these logic-based methods – particularly as it has



Thoughts flow freely on walks:
writer Sibylle Lewitscharoff.

been more than 40 years since a really innovative psychiatric medication has come onto the market.

Darwin or the Amateur's Advantage

"All inventions are a matter of coincidence," wrote the German aphorist Georg Christoph Lichtenberg, "otherwise rational people could simply sit down and make inventions, just like they write letters." Strictly speaking, that's correct. Nevertheless, you can give inspiration a helping hand.

It's helpful to exchange ideas with a diverse group of people. Big cities, coffee houses and interdisciplinary teams are ideal incubators of creativity. "All decisive advances in the history of science can be described in terms of the cross-pollination of ideas between different disciplines," said the writer and creativity researcher Arthur Koestler.

This cross-pollination can also take place within the mind of an individual. It's striking that many of the most innovative scientists had a variety of hobbies. The mind focuses on a succession of different topics, they can enrich one another. Take Francis Crick, one of the decoders of DNA – he came up with the idea of replicating DNA while he was thinking about how plaster casts are used to copy sculptures.

Or Charles Darwin. He wasn't a biologist. He was a theologian and a failed medical student, an enthusiastic pigeon breeder and insect collector, who also experimented with earthworms and dabbled in geology. But it is precisely these amateur qualities that predestined Darwin to create

the theory of evolution, while the leading biologists of his time couldn't see the forest for the trees.

It's good not to be too familiar with a particular field's conventions and proscriptions. Consequently, many scientific breakthroughs come from outsiders and non-traditional thinkers, who approach their subject without prejudice.

Consider Albert Einstein, perhaps the most creative scientist of the 20th century. His most productive phase occurred between 1902 and 1909, when he was working as a patent officer in Bern, and researching only in his spare time. He didn't draw intellectual inspiration from colleagues in his field, but instead from a colorful circle of two or three friends, none of whom were physicists. They gathered almost every evening over sausages and cheese, read books and

**The night lets the mind
roam free. Analytical
work, however,
needs bright light.**

philosophized about God and the world, and had a grand old time. Later as a professor, Einstein never could recapture the productivity of his time in Bern.

His mundane job at the patent office freed him from having to produce "scientific papers in impressive quantity," as Einstein later wrote. He cast bitter judgment on the universities: "It is, in fact, nothing short of a miracle that the modern methods of instruction have not yet entirely strangled the holy curiosity of inquiry; for this delicate little plant, aside from stimulation, stands mainly in need of freedom [...] I believe that it would be possible to rob even a healthy beast of prey of its voraciousness, if it were possible, with the aid of a whip, to force the beast to devour continuously, even when not hungry."

State of Creativity

Since Einstein's time, the pressure on scholars to publish, and the obligation to justify

their work, has increased dramatically. Nevertheless, universities still seem to be the best place for scholars to pursue their thirst for discovery, free of existential concerns. The economist Mariana Mazzucato recently demonstrated that the most important technological achievements of the last decades came from state research laboratories, including the technologies underpinning Apple products.

Steven Johnson shows in his book that two-thirds of the most important discoveries and inventions of the last two hundred years did not have a commercial motive. These include useful innovations such as the rechargeable battery, the nuclear reactor, GPS, the suspension bridge, the computer and the internet. The numbers suggest that most companies are not prepared to give their researchers sufficient freedom to create something truly great.

But there are exceptions. Google has long allowed its employees to dedicate 20 percent of their working hours to their own pet projects. Although not all employees have seized this opportunity, the program is nevertheless highly successful. More than half of all new projects at the company came about this way – including Gmail, Google News and AdSense, a service for targeted online advertising. The only question that remains is why other companies aren't copying this simple, yet innovative model. □

Mathias Plüss is a freelance science journalist.

Am I Creative ?

Defining creativity may be difficult, but
it's even tougher to measure it.
Nevertheless, a number of renowned
psychologists have worked
to develop their own creativity tests.
Here are the five most interesting.

By Mikael Krogerus and Roman Tschäppeler

1. Alternative Uses Test

Psychologist Joy Paul Guilford surprised his colleagues in the American Psychological Association in 1950 with this bold hypothesis: People do not need to have a high IQ to be original. Guilford defines originality as “divergent” thinking. Therefore, it is not about doing everything right, but rather about – in his words – “recognizing unusual possibilities when using certain objects.” According to Guilford, that is creative.

Seventeen years later, he unveiled a test that he believed could measure creativity.

The Task

Take this test with at least three people. Name as many alternative possibilities in two minutes for using:



← a bedsheet
a brick →

The Solution

Four different aspects are evaluated here:

1. Originality: Award 1 point for answers that another person also gave. 2 points for answers that only you gave.
 2. Fluency: Whoever found the most possibilities for using the item receives 4 points, the second 3 points, etc.
 3. Flexibility: How many different types of answers were generated? Count the “categories.” (Brick as a “weapon” and “device for self-defense” is the same category.) Whoever found the most possibilities for using the item receives 4 points, the second 3 points, etc.
 4. Elaboration: How detailed are the answers? (“A doorstep” = 0 points, “a doorstep to prevent a door slamming shut in a strong wind” = 2 points).
- Now add up all the points: Whoever has the most points is the most creative.

The test was never able to definitively answer whether being creative and intelligent are two different animals. And yet we read about astonishing findings time and again. In his book “Outliers,” (2010), American author Malcolm Gladwell wrote about a study done at a middle school in England where an average student scored significantly higher on this test than the student with the highest IQ.

2. Torrance Test of Creative Thinking (TTCT)

Building on Guilford’s creativity criteria, Ellis Paul Torrance developed the most well-known and likely the only scientifically recognized creativity test.

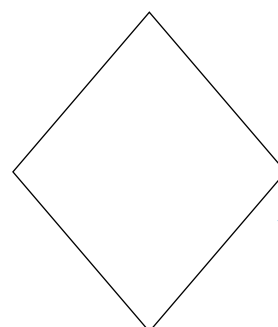
The Task

Complete the figures to create your own drawing.

The Solution

The drawings are evaluated by experts in the actual test. Anyone who wants to make it simpler can observe the images and ask themselves:

How original (not: how artistic) are the drawings?



← Your attempt

3. The Remote Associates Test

Professor Sarnoff Mednick's Remote Associates Test (RAT) is based on the concept that a person whose associations and ideas are not only diverse, but also solution-oriented is creative. In Mednick's own studies, the test achieved a sensational validity coefficient of 0.70. (Valid means that a test actually measures what it is supposed to measure. A coefficient of 1.0 would mean that the test exactly predicts whether a person is creative; 0.0 would mean that the test only says whether the person responded to the assigned task correctly). However, other researchers determined in a scientific study that test subjects who score well on the RAT do

not necessarily think creatively. Rather, they are strong verbal thinkers. Not that this is a bad thing, but it does argue against the test's high validity coefficient.

The Task: Which word creates a new word when combined with each of these words?

The Solution: honey

honey
-dew / -comb / -bee



1 cottage / Swiss / cake

2 cream / -skate / water

3 night / wrist / stop

4 cracker / fighter / drill

5 sleeping / bean / trash

6 light / birthday / candle

7 sandwich / house / golf

1) cheese, 2) ice, 3) watch, 4) fire, 5) bag, 6) light, 7) club

4. Solution Testing

Many researchers define creativity as the ability to find solutions for seemingly unsolvable problems. The nine-dot puzzle is a classic.

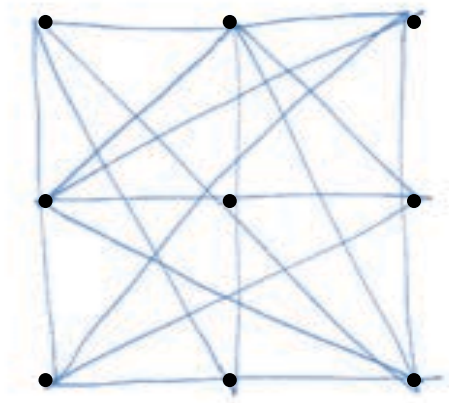
The Task

Connect all nine dots with a maximum of four straight lines without taking the pencil off the page.

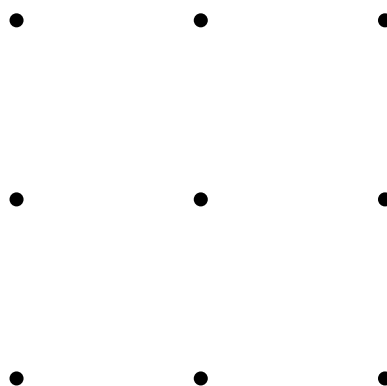
The Solution

The trick lies in extending the lines beyond the square. Managers like to use this type of test as an example of thinking outside the box. However, caution should be exercised as research with the Restricted Environmental Stimulation Technique (REST) has shown. With this method, people stay in closed, darkened rooms with no outside stimulation. The researchers determined that test subjects became quieter, their moods lightened and they became more creative in solving problems. In short: “If you want to think outside the box, it’s better to be thinking inside a box.”

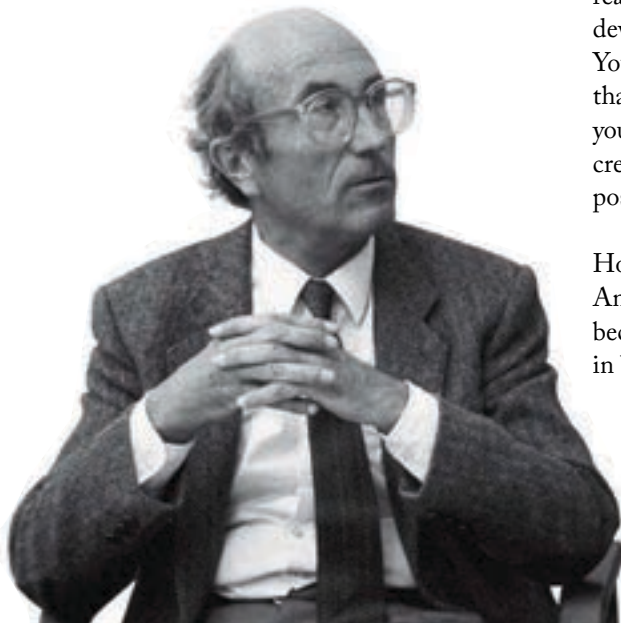
Incorrect



Your attempt



5. Niklas Luhmann's Creativity Test



The mastermind of systems theory gave his students the following two-part self-test in a lecture in which he succeeded in nothing less than debunking the entire creativity business:

“In the first phase, you must follow a simple behavioral rule: You must open your mind and go into the room next door. If you determine that your neighbor is reading books that you have not read yourself and you develop a guilty conscience, then you are not creative. You want to imitate him. By contrast, if you determine that your neighbor is reading the same books as you and you develop a guilty conscience, then you are probably creative. Because then you are searching for new paths, possibly unconsciously.

However, the following rules apply in the second phase: Anyone who uses a creativity test is already not creative because they have shown that they are interested in being creative. And after all, everyone wants that.”

Mikael Krogerus and **Roman Tschäppeler** are science writers. Their most recent work, “The Test Book,” is a compendium of the world’s most useful tests. (Profile Books).

Rethinking Bank

Thousands of new business models are sprouting up in the finance industry; investors are betting billions on the Fintech scene. While it may be surprising at first glance, traditional banks are among those profiting from this transformation. An industry report *by Helene Laube*.



Digital revolutionary: Mike Cagney, founder of SoFi, an online financial services provider.

ing



Mike Cagney often invites groups of carefully selected customers to his home in San Francisco. Fine wines are enjoyed, gourmet pizza proffered. But Cagney is not hosting a culinary event; his focus is on conversation with his customers. His online financial services company, Social Finance (SoFi), cultivates an especially intense style of customer relationship, hosting more than a hundred such gatherings each year. These events are supposed to move millennials to completely rethink their banking relationships and become lifelong SoFi customers.

It may be surprising to learn that digital revolutionaries rely on (analog) relationship management. But the personal note and the services they provide clearly pay off. Cagney and three other graduates of the elite Stanford Business School started the company in 2011 as a small niche provider in Silicon Valley while they were still at Stanford. Today, according to its own information, it counts more than 85,000 “members,” as its customers are known, it has lent more than 7 billion dollars, and its investors estimated its value at around 4 billion dollars at the latest round of financing.

Martial Rhetoric

Initially SoFi refinanced huge student loans at good terms for graduates of top American universities. The SoFi platform connects participants directly, enabling debtors

to connect with prosperous alumni who offer them better terms for student loans than the banks do. SoFi now also offers personal loans and mortgages, and institutional investors’ funds are supplementing those of private investors. Next up, the company, which is just a stone’s throw from the Golden Gate Bridge, has its eye on checking accounts, insurance services, and asset management.

For the long term, Cagney wants nothing less than to see his “non-bank bank,” as he puts it, replace traditional banks. “We’re trying to make these guys dinosaurs,” he says, with equal parts confidence and media savvy, “and I hope to be the meteor that does them in.” None of which, by the way, prevented SoFi from entering into a cooperation arrangement with Credit Suisse so that it can finance those mortgages. Despite the martial rhetoric, the emerging companies increasingly view traditional banks as partners. More on that below.

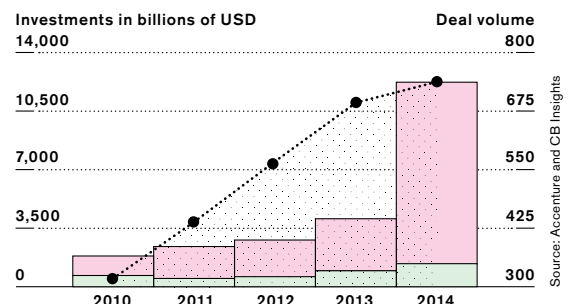
What Exactly Do Fintechs Do?

With Cagney’s high-flying plans and catchy announcements, SoFi is attracting a lot of attention. But this company is just one of many with similar intentions. Around the globe, thousands of Fintech companies have set about breaking apart the banks’ integrated value-creation chain and rethinking and rearranging the individual parts. In the process, they have elbowed out a few intermediaries, as SoFi has >

Gold Rush Fever

Worldwide, more than USD 12 billion was invested in Fintech companies in 2014, three times more than the previous year.

■ Subsequent rounds of financing
■ Initial financing round
..... Deal volumes



done, where debtors and creditors organize themselves. Fintech's goal is to disrupt the financial industry and to secure a part of that market for itself. The tools: new digital technologies, algorithms and data sciences; new business models; simpler, more efficient and more cost-effective services; and financial services tailored to the needs of the new generation of customers equipped with mobile phones and tablets.

The tools: new digital technologies, algorithms and data.

Many Fintech startups are plowing the same field. Almost half offer solutions for payments. That's where banks have the greatest transaction volumes to lose. "Due to the numerous new providers, the shift in payments is well under way, particularly in the UK and the US," according to Julian Skan, Managing Director of Financial Ser-

vices at Accenture, a consulting firm. "A lot of value from payments has slipped away from retail banking, and it won't be coming back to the banking sector."

Credit Suisse works with Accenture, for instance, at the Fintech Innovation Lab, a mentoring program for young business people. Urs Rohner, Chairman of the Board of Directors of Credit Suisse, sees opportunities for traditional banks in the rise of Fintech. "Innovative disruption, in the finance industry as elsewhere, makes existing services available to a much broader group of consumers, whether because of price or improved user friendliness. And they are often combined."

Major Fragmentation

More and more companies and customers, especially younger ones, no longer head to a retail bank first. Instead they use options provided by individual product specialists. Anyone who pays or receives money over the internet or on a mobile phone, anyone who needs a payment system for their online or brick-and-mortar shop – they use services with names like Venmo, Klarna, Square or Stripe. When you want to send



Jack Dorsey, co-founder of the short message service Twitter, took his FinTech company, Square, public on November 19, 2015.

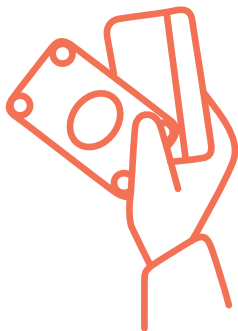
funds in a different currency, you turn to TransferWise, Azimo or WorldRemit. Nutmeg or eToro manages your assets, Betterment or Wealthfront manages your personal finances, and stocks are traded – free of charge – with Robinhood. Looking for a personal loan? Go to Borro, Zopa or Ox. Business loans can be financed online at >



"Make services available to a much wider group of users," Urs Rohner, Chairman of the Board of Credit Suisse.

Fintech in a Nutshell

Finance startups can be divided into four segments. There are countless small and larger new companies in each segment. Here is a selection:



Payment Transactions

Klarna (Stockholm) – Klarna offers invoice-based payment solutions for operators of online stores in 18 countries. People in Germany can also open fixed-term deposit accounts with attractive interest rates.

Powa Technologies (London) – Powa sells point-of-sale systems to retailers, a Cloud-based e-commerce platform and an app for smartphones that customers can use to quickly pay with their mobile phones.

Square (San Francisco) – The second startup of Jack Dorsey, who also founded Twitter. Square started with a credit card reader that attaches to mobile phones and a payment solution consisting of tablets and smartphones for online and offline stores. Now Square offers services to companies including payroll accounting software, advances on expected receipts (“merchant cash advance”) and food delivery services via Caviar, a startup Square acquired.

Stripe (San Francisco) – Stripe enables individuals and companies to accept payments over the internet. The startup supplies the entire infrastructure that individuals and businesses need to set up online payment systems for credit and debit cards.



Lending

Avant (Chicago) – Avant makes private loans, primarily to people with lower credit ratings. With its web apps, algorithms, and machine learning, Avant offers loans at rates lower than those of traditional banks.

Funding Circle (London) – Funding Circle provides loans to small businesses through its platform. Creditors can be individuals or institutions with large assets and government offices, but not banks – what is known as peer-to-peer lending.

Prosper Marketplace (San Francisco) – Prosper is another peer-to-peer lending platform. It brings borrowers and lenders together.



Wealth Management

Nutmeg (London) – Nutmeg manages investment portfolios. Mainly younger customers set their savings goals and strategies online, and then this startup does the rest, for a fee of no more than one percent (per annum) of the capital invested.

Vaamo (Frankfurt) – At Vaamo, investors independently invest their money through the website, where they determine their own savings goal and willingness to accept risk.

Wealthfront (Palo Alto, California) – Wealthfront is an automated investment service, also known as a robo-advisor. The company specializes in long-term financial investments and offers low fees and simple, modern online access.

Digital Currency

Bitpay (Atlanta, USA) – Provider of Bitcoin* payment services that enable companies to accept Bitcoin

as a means of payment and individuals to manage their Bitcoins.

Coinbase (San Francisco) – Coinbase is a Bitcoin* administrator and operates the first government-licensed Bitcoin exchange in the US.

Xapo (Zug) – Xapo is one of the biggest Bitcoin* administrators; it transferred its headquarters to Switzerland in 2015. Xapo stores Bitcoins on its servers, which are located at Swiss storage sites (see the January 2015 Bulletin).



** Bitcoin is not itself a company but rather a decentralized payment system available worldwide, and the name of a digital monetary unit.*

lending market places like SoFi or Funding Circle. (See the box on p. 45 for Fintech's lines of activity.)

Each new product and each new service must offer some advantage over traditional options. One advantage is that they generally are integrated into a longer consumer chain. One example is Uber, the California mobile ride request company based in San Francisco, also a Fintech company. With one click, everything is taken care of: request, ride, pay, get a receipt.

In spite of the ease that these individual services offer, there is one undeniable disadvantage. Where in the past a person had one bank that was responsible for all money matters, the Fintechs expect an individual to be willing to use untold numbers of different services and products. That doesn't appear to bother a lot of people and

companies, especially younger ones. They are used to fragmentation on their smart phones, where even the smallest need is covered by a separate app.

Investments Tripled

Investors at least are firmly convinced that Fintech companies, with much ambition and few constraints, will change the industry.

Gold rush fever prevails. According to Accenture, worldwide investment in Fintech more than tripled in 2014 alone, reaching more than 12 billion dollars.

It's no wonder that Fintech has developed into one of the most active investment fields for risk capital lenders. Goldman Sachs estimates that startups could challenge established financial services providers to the tune of up to 4.7 trillion dollars in sales and profits of 470 billion

dollars annually. A company that captures a market share of less than one percent could still claim a handsome business.

So that's why investors are putting billions into thousands of companies whose valuation on paper skyrockets, in the hopes that one or the other candidate proves to be a jackpot. In 2010, 220 venture capitalist companies invested in Fintech startups. By 2015, CB Insights, a market research company, had almost 900 active investors. Top venture capital companies, like Sequoia Capital, Union Square Ventures, Index Ventures, Greylock and Benchmark, are concentrating on the following areas: offers relating to payments, financial bookkeeping for individuals, lending and digital currency like Bitcoin and its centerpiece, the blockchain. All transactions are registered in a

The Forerunners

Financial innovations have been promoting exchange, trade and prosperity for centuries.



3000 BCE

Lending/Interest

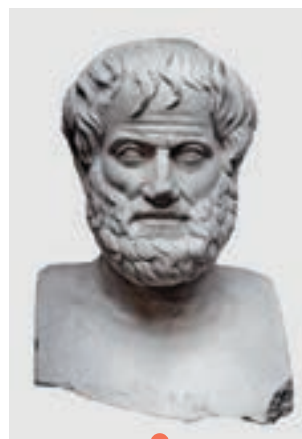
Around 3000 BCE, farmers in Mesopotamia (today's Iraq) lent seed for planting. After harvest, they received more seeds in return. This was the start of lending and interest, which promotes economic activity.



8th/7th C., BCE

Coins

Before there was money, people had to rely on barter. Starting in the 8th century BCE, the first coins made of precious metal appeared in Lydia (today's Turkey). It was the beginning of a revolution. Now people could save money, buy something with it, or use it to express value.



4th C., BCE

Forward Transactions

Derivative financial instruments are not a modern invention. For instance, in his "Politics," Aristotle describes how Thales, a philosopher, used olive trades on a forward basis to get rich back in the 4th century BCE.



7th century

Bank Notes

Starting in the 7th century, the Chinese stored their heavy metal coins with merchants. In return, they received paper receipts that they could use as means of payment. The government took up the idea. Money in the form of bank notes is now very easy to transport and store.

global database, which facilitates infallible exchange of values, not just the bitcoins themselves.

The Procedure

All of these emerging companies pursue similar strategies. They concentrate initially, like SoFi, on parts of banks' value creation chains. When they've had a certain success, they quickly expand their offering to include entire business models that can pose a real danger to banks.

Even some representatives of the establishment are beginning to sound like Silicon Valley raiders in suits. "Many conventional banks are going to fall by the wayside," according to Francisco González. "Those that make it will no longer be 'banks,' but software companies, competing with the digital players and

with a completely different value proposition." Last year González, Chairman and CEO of Banco Bilbao Vizcaya Argentaria (BBVA), a major Spanish bank, predicted that up to half of banks around the world would disappear in the wake of this digital disruption.

Those that make it
will no longer be
"banks", but software
companies.

One look at Amazon's transformation of the retail sector, Airbnb's disruption of the hotel industry, and Uber's blow to the taxi indus-

try shows that banks had better take these ambitious upstarts seriously. "Other – typically unregulated – industries have reset consumer expectations when it comes to the customer experience. This results in pent-up demand within financial services. The incumbents, however, are preoccupied with other activities and this opens the door for new entrants," says James Dickerson, Program Director, Fintech Innovation Lab, Accenture, in London.

Banks were able to avoid the violent upheavals of digitalization for quite a while. So according to Dickerson, "Banks have not been forced to innovate to compete like other industries have because the regulator has shielded them. In addition to that, this industry is much more complex than, say, transportation, retail or music and therefore more difficult to disrupt." >



13th/14th century

Banks

In the late Middle Ages, the city states of Florence, Genoa and Venice revolutionized finance. Their role in this is still reflected today in words borrowed from Italian, like giro, account and credit. The Medici family established the first modern bank in Florence.



1602

Stock Exchanges/ Shares

The Dutch East India Company was founded in 1602. It secured capital in a completely new way: It issued shares. The company also established the first securities exchange in the world, the Amsterdam stock exchange.



1950

Credit Cards

In 1950 American businessman Frank McNamara invented the first credit card that could be used everywhere, not just in one store: the Diner's Club card. In just one year, more than 42,000 Americans had one.



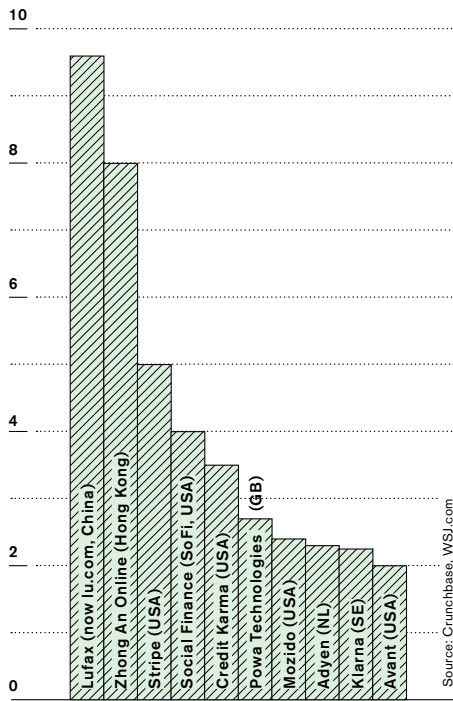
1967

ATMs

Paul Volcker, former Chairman of the US Federal Reserve, maliciously said once that the automatic teller machine was "the only financial innovation" of any use in modern times. The first ATM was installed in London in 1967. You could withdraw the grand sum of 10 pounds.

Top Ten

The highest-valued Fintech startups
(in billion USD):



In fact, reality has relativized investors' high expectations. The challengers are still in the starting blocks, and very few Fintechs have been able to conquer noteworthy market shares.

No Tsunami

And even as aggressive attackers from California's technology valley who want to turn the industry on its head make their pronouncements, Accenture consultant Julian Skan takes a more relaxed view on Fintech. "We don't think this is a tsunami that will destroy the sector." Skan certainly believes that digital transformation holds the potential to reduce the role and relevance of traditional banks, but at the same time those banks could, like the startups, use that technology to create faster, better and cheaper services. "We have always felt that this will depend on speed, that the value will be created largely through the existing banks, and that the faster they adopt the technology, the better their first-mover advantage will be."

Many startups and banks are taking note. They have now moved from confrontation to cooperation. Both sides could derive great benefit from these developments. Banks can profit from the Fintech's know-how, their agility and proximity to young

customers by integrating Fintech's innovations in their own products. On the other side, Fintechs want to make use of the established banks' expertise acquired over centuries, their familiar brands, gigantic customer base, licenses and, not least, their customers' trust.

Even startup entrepreneurs – by definition, optimists – know that this will help them improve their poor odds of survival. According to the statistics, 80 to 90 percent of all technology startups disappear within a few years of their founding. One study by Stanford and the University of California at Berkeley concluded that a massive 92 percent of tech startups failed within the first three years. Young entrepreneurs have an even harder time in the strictly regulated financial industry than in other sectors.

Frenemies

As a result, Fintechs and banks are increasingly going over to the frenemies principle, as illustrated by the cooperation between SoFi and Credit Suisse. A rival (enemy) you depend on becomes a business partner (friend).

Credit Suisse manages its own Fintech investment fund, Credit Suisse NEXT, which, for example, was the leading investor in a 165 million dollar financing round for Prosper, a peer-to-peer lending platform. (Peer-to-peer refers to an arrangement in which private individuals are connected directly with each other, not as conventionally, companies connected with private individuals.)

Urs Rohner, Chairman of the Board of Directors of Credit Suisse, says, "In the end, cooperation remains the most promising option, both for established banks and for innovative startups. It helps by reducing increasing cost pressures and by increasing the efficiency of process flows, and all of this helps increase the longevity of your business."

Other banks are cultivating frenemy relationships with Fintechs too. JP Morgan Chase, for instance, recently merged with On Deck Capital, a peer-to-peer lender, in order to offer loans to small businesses over the internet. Canada's Scotiabank, together with investors like Santander and ING, is investing 135 million dollars in Kabbage, a step aimed at opening the path to coopera-



Uber, the mobile ride request company: request, ride, pay, get a receipt with your smartphone.



Working with traditional banks: On TransferWise's platform, funds can be inexpensively transferred from one currency area to another. (Photo: the company's office in the Shoreditch district of London).

tion between the trio of banks and the American operator of a platform for small business lending.

Taulia, a financial supply chain company, is cooperating with the Royal Bank of Scotland and has obtained risk capital

**Frenemies:
a rival (enemy) you
depend on becomes a
business partner
(friend).**

from BBVA Ventures. "The global reach of BBVA in Europe, North and South America will support Taulia's global expansion over the coming years," said Markus Ament, a German co-founder of San Francisco-based Taulia, who like so many young entrepreneurs wears a beard out of biblical times. "Banks finally now see that parts of their traditional business are at risk. Smart financial institutions are now engaging, either through investments,

partnerships, or by their own internal incubators to drive innovation."

Even TransferWise, a startup whose peer-to-peer platform allows users to transfer funds to a different currency area at fees lower than banks, is allying with banks. The London-based company's email welcoming new members still declares, "Congrats on waving your bank bye bye." Nonetheless, in December TransferWise entered into an initial agreement to work with LHV, Estonia's largest bank. TransferWise members can now use its services through the LHV app and website. More such agreements are expected to follow in Europe and the US since transfer technology can be set up through online market places, mobile communications operators and any number of other digital services.

Fintech Is a Top Priority

The lion's share of investments is made in startups in Silicon Valley, New York and London. By contrast, Switzerland and even Germany are still developing countries when it comes to Fintech. There are hundreds of startups in Zurich, Geneva and Berlin, and incubators and Fintech experimental laboratories are supported. So to >



UK Prime Minister David Cameron supports the UK Fintech 2020 Manifesto. Goal: attract eight billion pounds in investment to the industry and create 100,000 new jobs.

some extent banks are investing and entering into cooperation agreements with startups, or networking with them to pick up on their initiative.

But outside the US, the action is on the banks of the Thames, in startup districts like Soho, Tottenham and Shoreditch. More than half of all European capital invested in Fintech companies is in those three areas.

“London is good at both fin and tech.”

London is an attractive financial center, with its relaxed regulations, countless financial experts and developers, a startup culture similar to Silicon Valley that has developed over decades and the large-scale venture capital scene and international flair to go with it. The fact that Prime Minister David Cameron long ago made promotion of London Fintech a top priority hasn't hurt either. The British prime minister supports the UK Fintech 2020 Manifesto issued by the London-based Innovate Finance, an association of Fintech companies that aims to attract eight billion pounds for the industry and create 100,000 new Fintech jobs.

If George Osborne has his way, London will become “the global center for Fintech.” The UK's Finance Minister announced in November that London is “good at both fin and tech.” We are still waiting for comparable pronouncements from Germany and Switzerland. □

Helene Laube is a freelance journalist in San Francisco. She was a founding member of Financial Times Deutschland and was its longtime Silicon Valley correspondent. Prior to that she was the editor of Manager Magazin in Hamburg. Her articles have also appeared in media such as Financial Times, Zeit Online, brand eins Wissen, Stern, Capital, Technology Review, Bilanz and Du.

“It's about the jobs.”

Switzerland is well positioned for the future of the finance industry, according to this Credit Suisse specialist.

But something is still missing for a spot on the world map.

Interview: Simon Brunner, Photography: Simon Habegger



“Some lines of business will disappear.” Christine Schmid.

Ms. Schmid, what does the Fintech innovation wave mean for traditional banks?

On the one hand, it means competition for individual products and services, and on the other, Fintech products and platforms enable traditional banks to offer their products, processes and services more quickly, securely and more in line with customer needs. So traditional banks also see an opportunity in the Fintech industry.

Twelve billion dollars of venture capital were invested in Fintechs in 2014, and even Facebook has a banking license. Are we approaching the end of the major bank?

Fintech companies are changing the banking industry – no question about it. From our perspective they will not replace traditional banks, but they will change them significantly. We anticipate that individual lines of business will disappear, for instance, payments. In general, you can say that banks profit from the innovations, whether through better and quicker data analysis, greater security or higher volumes and lower costs thanks to automation. Banks have begun those transformations and completely new job profiles have come into existence in recent years, for instance we are now hiring data scientist experience designers, algorithmic risk specialists and

community advocacy builders. The titles of these jobs reveal that digitalization is happening everywhere.

Many observers expect that Fintech companies will put more pressure on margins. How can banks avoid that?

There's no question that margins in banking are falling. But, from our perspective, Fintech is just one reason for this. Central banks' interest policies and the customer investment strategies that are a result of these policies lead to lower interest margins and commission earnings. Regulatory rules exert further pressure on margins. Increased transparency and automation through central clearing entities reduce margins in trading. How can banks work against these trends? Improved efficiency or, to put it simply, measures to reduce costs, automation, and finally critical size are all relevant factors. Banks are focusing more and more intensely on their core business, where they have critical size. Lines of business or units in individual countries that are too small will be or have been sold.

Did banks simply sleep through the Fintech trend?

In the beginning, just after the financial crisis, financial institutions were preoccupied with their own problems. They were focused on survival, then on the new regulations and strategic reorientation. The wave of innovations quickly moved into the foreground during this process. The banks we are in touch with have been mentioning this trend for several years and are very closely following developments in the Fintech area. Three strategies are pursued: acquire and integrate startups, which has its risks; joint ventures and cooperation, primarily to more closely analyze the processes; or build something yourself, but that can be somewhat slow.

Christine Schmid is the Head of Global Equity and Credit Research at Credit Suisse. She joined Credit Suisse in 1993, working first in controlling and then in portfolio management. She earned a master's degree in economics from Zurich University and is a CFA Charterholder and a member of Swiss-American Young Leaders, and she is a lecturer at St.Gallen University.

For example in pharmaceuticals, large companies depend more and more on external research. They purchase technologies, patents, etc., instead of developing a drug themselves from the outset. Will that approach take hold in the finance industry?

There is no patent protection in finance, a major difference compared to pharma, which can legally secure multi-billion revenues. That's why investments in research and development were and are very different. But banks are increasingly trying to acquire startups, enter into joint ventures with them, or quickly "copy" them.

CS is involved in Fintech in various locations. What are the most important fields and what are the results?

Credit Suisse is involved in Fintech Innovation Labs and mentoring programs in the US, the UK and Asia, as well as mergers in Switzerland. Most important

**Valuable time is
being lost in
the political discussion,
in planning.**

are new developments in asset management, security, and developments in the bitcoin field.

Finma wants to promote Fintech startups in different areas, for instance, simplifying compliance for them. Is that fair to established institutions?

Fundamentally, it's about promoting innovation, and, of course, jobs in Switzerland in the long term. That is positive. The idea is that regulation and with it, compliance, should be based on the size of the company at the start. What's important for startups in this context is a speedy approval process, with strict, clear and simple rules. As soon as a startup has reached a certain size, it has to catch up with regulatory rules, so it will be on a par with established banks. That makes sense. Protection of the customer, protection of the system, must be ensured whether an established financial institution is involved or a new platform.

In one analysis, you described the weaknesses of our Swiss Fintech scene as a "very academic approach," which is "too slow," and "doesn't sell well."

Can Swiss startups make it internationally?

Absolutely, there are plenty of positive examples. It would be great, however, if there were a stronger nationwide Swiss voice – especially on the political level – and a flagship event in the Fintech field. Even while an innovation park like in Dübendorf* is very positive in the long term, at the moment valuable time is being lost in the political discussion, planning and, of course, the physical creation. Time that competing financial centers are using or have already used.

According to a study by Roland Berger (Swiss Fintech Study 2015), Switzerland does well in talent and skills, and is well respected for its political and legal stability, but there are gaps in financing and political support.

Correct. There is a lack of official support to position Switzerland as a Fintech hub on the world map. In good Swiss tradition, individual stakeholders have organized themselves by the various regions of the country. And financing for really good ideas is there, we don't see problems in that regard. On the contrary, competition among venture investors to invest in Fintech has intensified. Credit Suisse is active with one fund that invests in Fintech companies. □

* A national innovation park is being built on 71 hectares, where "established companies can combine their research and development activities with those of ETH Zurich, the University of Zurich and other technical universities." (Dübendorf's own marketing)

Who, Where, How Much?

Innovative Swiss sectors and where they are located

By Sascha Jucker and Nicolas Rapp (map)

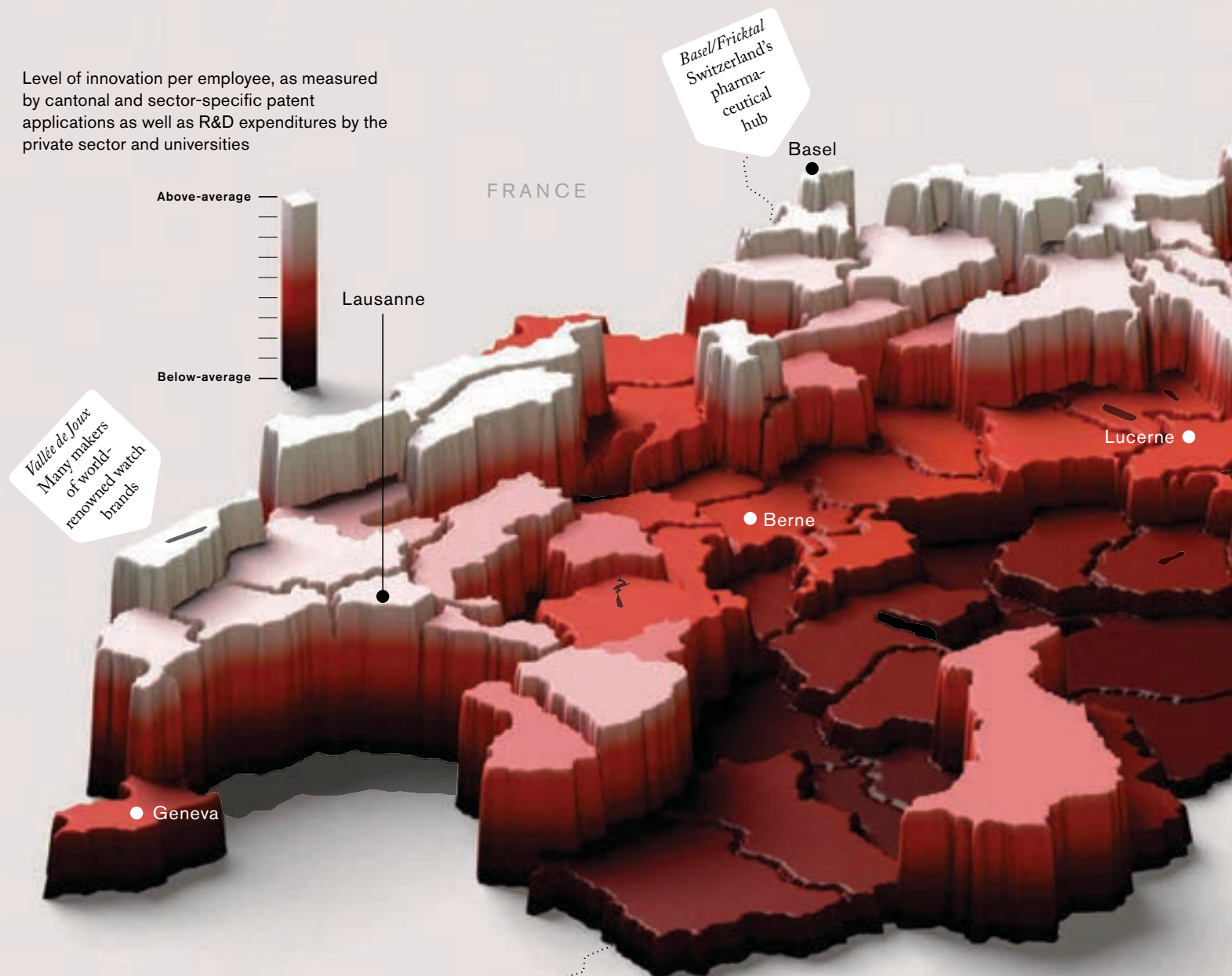
The high-tech industry* is the clear leader in innovation within Switzerland's private sector – especially the pharmaceutical industry. This industry alone accounts for a third of private expenditures on research

and development (R&D), and one in ten patents registered in Switzerland is based on the sector's research activities. So it is little wonder that the pharmaceutical industry tops all other sectors in our innovation indi-

cator, which was prepared especially for this issue of Bulletin, both in overall terms and per employee.

For this innovation indicator, we take account of the number of patent applications in the various sectors of the Swiss economy as an important innovation factor in addition to R&D expenditures. Alongside corporate research departments, Swiss universities and universities of applied sciences are also important drivers of innovation, especially for those sectors that carry out little in the way of research themselves. Of course, innovation happens without patent applications and outside of R&D departments and universities. Innovation can include new business processes, alternative sales and distribution strategies and completely new business models, such as the

Level of innovation per employee, as measured by cantonal and sector-specific patent applications as well as R&D expenditures by the private sector and universities



sharing economy (Airbnb, Lyft, Uber, etc.). Due to a lack of data, services innovations are only included in our indicator to a limited extent.

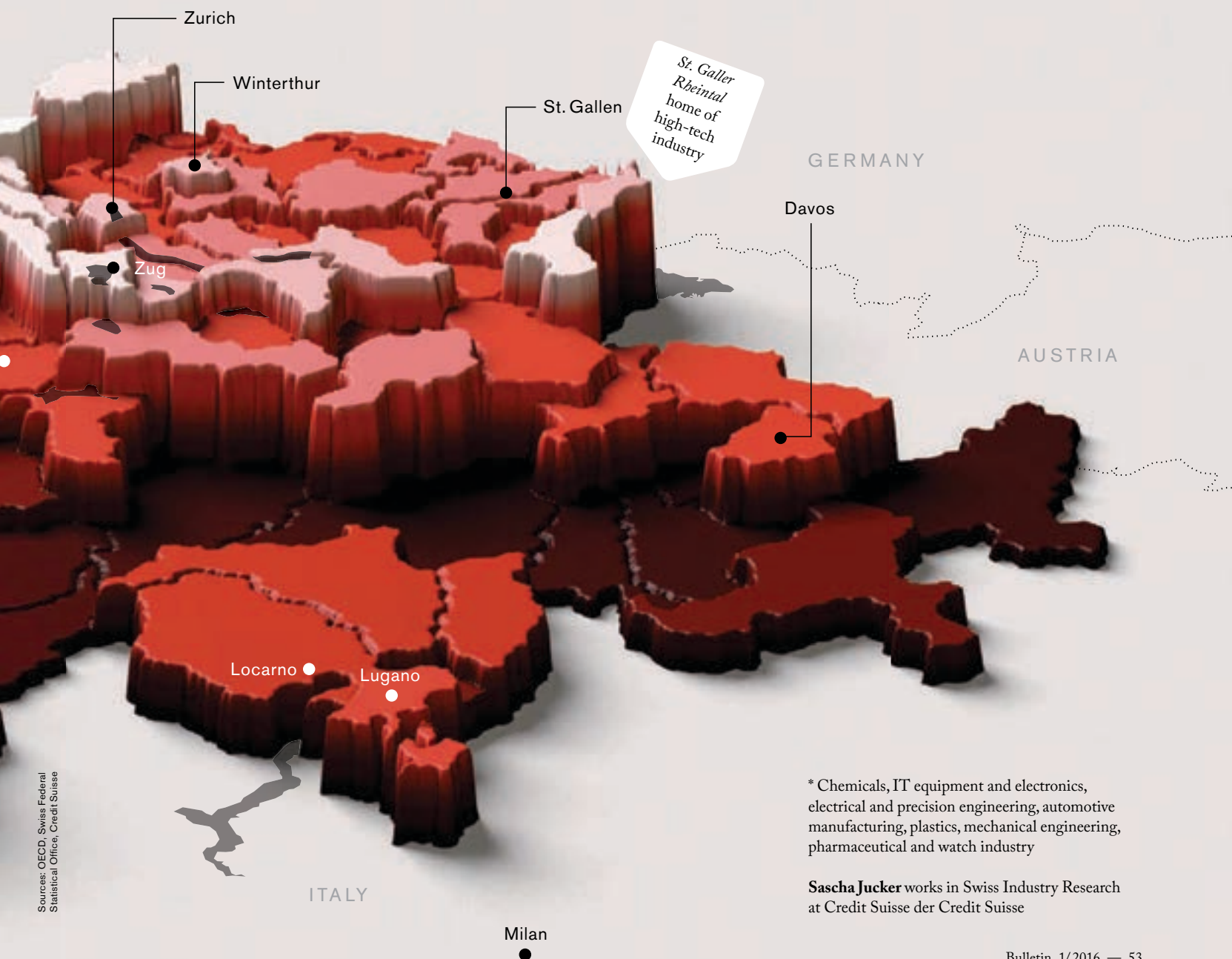
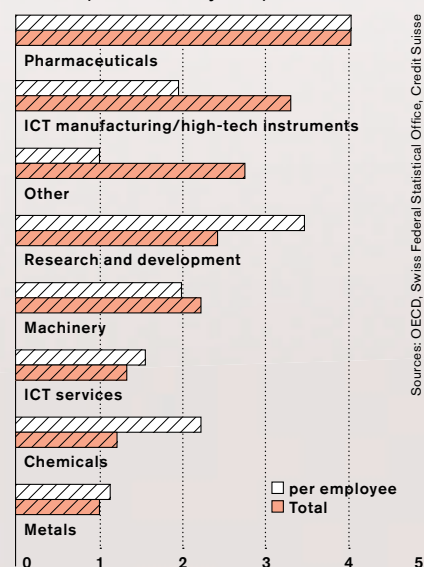
Since we know where the innovative industries in Switzerland are located and how many patents are registered in which cantons, we can use our indicator to approximate the level of innovation per employee and by region. It reveals that the level of innovation is well above-average in and around Basel, in the Fricktal and southwest of Lake Neuchâtel (Vallée de Joux). While the pharmaceutical industry is located in the Basel region and the Fricktal, the Vallée de Joux is home to numerous world-renowned luxury watch companies. These watch companies also play a major role in the innovative region of Neuchâtel and La Chaux-de-

Fonds. St. Gallen's Rheintal on the eastern border south of Lake Constance has established itself as a high-tech location, serving as the home for precision technology, precision engineering and optics companies.

Most of Switzerland's major cities outside of Basel would be below average in the innovation indicator on a per-employee basis without the inclusion of universities, since many employees in these cities work in service sectors, relatively little is invested in R&D, and there are few patent registrations. However, viewed in absolute terms (and thanks to their universities) the cities are crucial to Switzerland as a center of innovation. Measured by our innovation indicator, the five largest Swiss cities – Zurich, Geneva, Basel, Lausanne and Berne – generate nearly 40% of Swiss innovation. □

Who is innovative?

Innovation, per employee and total, measured in terms of sector-specific patent applications as well as R&D expenditures by the private sector



* Chemicals, IT equipment and electronics, electrical and precision engineering, automotive manufacturing, plastics, mechanical engineering, pharmaceutical and watch industry

Sascha Jucker works in Swiss Industry Research at Credit Suisse der Credit Suisse



Sophie Kornowski-Bonnet is head of Roche Partnering, the department that oversees external cooperation.

“Diversity and Freedom”

Every year, Roche spends nine billion Swiss francs on research, an amount exceeded by only four companies worldwide. Sophie Kornowski-Bonnet talks about whether it's better for companies to purchase innovation or to do it themselves.

Interview: Simon Brunner

The pharmaceutical company Roche invests nine billion Swiss francs in research and development (R&D) each year. At the same time, it spends billions on acquisitions. Is it generally better for large companies to conduct their own research, or to make interesting acquisitions?

I think you need to do both. Companies in innovative industries always require a strong R&D capability. They need a solid foundation of knowledge to make the right decisions on both internal projects and external opportunities. But as you're suggesting, I think, a great deal of innovation now takes place outside of companies, and partnerships – in whatever form – are becoming increasingly important to ensure access to such innovation.

Sophie Kornowski-Bonnet, 52, is head of Roche Partnering, the department that oversees external cooperation. Kornowski-Bonnet holds a doctorate in pharmacy from the Faculty of Pharmacy in Paris and an MBA from the University of Chicago. She was inducted into the French Legion of Honor in recognition of her contributions to research, and is a member of the Roche Corporate Executive Committee.

Three-quarters of the 30 new drugs with “game-changing potential,” according to Goldman Sachs, were not developed by the pharmaceutical companies that own them today. Has the time passed when products were developed entirely within a company?

External research has always been important to Roche. More than a third of our marketed products are the result of external collaboration, and that proportion will remain high going forward. Truly innovative research is most likely to flourish in companies with strong in-house capabilities, coupled with extensive networks of partnerships with academic institutions, start-ups and other companies.

In the 1980s and 1990s, your competitor Merck was named the “World’s Most Admired Company” seven times. Even then, its success was based largely on licensed compounds. What has since changed?

A great deal! Science has flourished both externally and internally. Today much more venture capital is available, IPOs are far more common, very small start-ups are working directly with the largest

pharmaceutical companies – all of these changes have fueled a number of external R&D activities that didn't take place in the past.

There are many partnering models.

How do takeovers, licensing, mergers and collaborations differ?

All of the various partnering models have their own specific mechanisms and a long list of advantages and disadvantages. The key is to stay flexible so that we can find the best models to suit our needs and those of our partners. In the current market environment, where valuations are high, we are particularly interested in de-risking and shared-risk models in which we conduct projects with external partners step by step, and share the costs and revenues upon reaching our agreed goals. Our partners participate in both the profits and the risk, which minimizes bad investments and conflicts of interest. The important thing is for all involved to benefit from whatever partnering model is chosen. Our primary motivation is to develop drugs that offer substantial benefits to patients.

Your job might be compared to that of a soccer talent scout. How do you find the next Messi or Ronaldo?

We screen over 2,500 opportunities for cooperation each year, but in the end we conclude only between 50 and 100 deals annually. For the most part, our success can be attributed to hard work and the fact that we conduct the necessary research – we look for the assets we need and the right partners to work with. We are interested in university-based projects that are still in the very early stages, as well as mid- to later-stage ideas developed by other companies, and we also look into acquisitions. But it's not just about “winning” against thousands of competitors.

But rather ...?

We show what Roche has to offer in terms of scientific, commercial and manufacturing expertise, and we work together with potential partners to determine whether it's the right fit. Not all competitors are alike; they're not all interested

Good Ideas Don't Come Cheap

in the same deals. To return to your analogy: One team might be looking for a striker, another for a defender. Likewise, biotechs and start-ups seeking partnerships have certain ideas about the companies they want to work with.

Pharmaceuticals is recognized as being one of the world's most innovative industries. What is the secret of Roche's success in keeping a spirit of ingenuity alive over the course of decades?

In my view, diversity is one of the most important factors in our model's success. We don't have a global head of R&D. We maintain several independent units for pharmaceutical research, and they have a great deal of freedom. Another indication of the success of our model is that we will be introducing as many as six new drugs in the next 18 months – more than ever before over such a brief period of time.

In 2009, Roche acquired Genentech for nearly 50 billion dollars. One of the big challenges in acquiring a company is to merge two different cultures. How have you been able to reconcile Californian and Swiss attitudes toward work?

Here, too, we have embraced diversity. Only our global functions have been integrated; our research and early clinical development units continue to operate separately. And this holds true not only for Genentech – each Roche site has its specific local culture and flavor. Other companies may choose a centralized approach, but for our part, we believe that diversity and freedom are essential for Roche's dynamism and innovative capacity. □

Switzerland is considered to be the most innovative country in the world. It has an abundance of knowledge and good people. When it comes to venture capital, however, there is room for improvement.

By Sara Carnazzi Weber and Jan Riss

For the fifth time in a row, Switzerland took first place in the Global Innovation Index in 2015, earning the right to call itself “the world's most innovative country.” The GII, an annual assessment of countries' innovative capability and the measurable innovations they have achieved, ranks Switzerland at the top with regard to human capital as well as research and development (page 14).

But much remains to be done. There is room for improvement in the basic conditions for financing innovative projects, which are critically important when seeking to translate enormous potential into practice. And in an aging society with little growth in the working population, ever new innovations are needed to generate growth and prosperity.

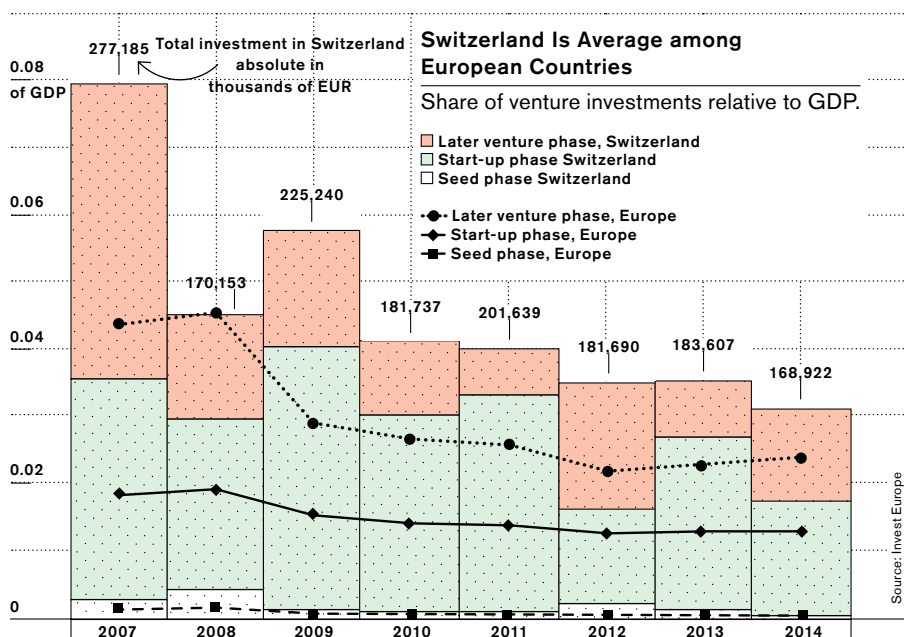
In most cases, it takes a great deal of capital to turn an idea into a product that can be launched on the market. Putting scientific knowledge into practice is ex-

pensive, and creating a company usually involves high fixed costs. Young entrepreneurs who lack large amounts of collateral often have trouble obtaining loans. It is therefore especially important to raise off-market capital.

Capital and Knowledge

Venture capital is a common approach to financing a business's start-up phase. As is generally the case with private equity, investors tend to reap generous returns if the company proves successful. There is also substantial risk of default, more than with other types of investments. Company founders, who frequently lack experience, are supported with expertise in business management as well as provided with capital.

Those who say that risk financing is underdeveloped in Switzerland are mistaken. Indeed, a lively market for venture capital has developed over the past >



two decades. This is reflected in the most recent figures from Invest Europe, a European association representing providers of venture capital. In terms of the ratio of investments in venture capital to gross domestic product (GDP), Switzerland ranks above the European average – fifth after Sweden, Finland, Ireland and the UK.

In Switzerland, the level of venture capital investments during the start-up phase exceeds the average, while investments in the period prior to market launch (seed investments) and the later venture phase are at an average level. Throughout Europe, the ratio of investments to GDP has declined since 2007. The life sciences sector, however, is showing an upward trend. Its share of total venture capital investments increased from 60 percent in 2007 to approximately 88 percent in 2014.

Good News

In an effort to maintain Switzerland's position as a highly innovative country, the federal government is working to improve the relevant framework conditions. While

Bringing capital and good ideas together continues to be a problem in Switzerland.

several cantonal economic development agencies have introduced initiatives to promote development and networking, direct government funding for start-ups is the exception, in contrast to a number of other countries. There is the potential for improvement in incentives and conditions to encourage research activity (education policy, regarding both schools and universities, taxation, simplified administrative procedures, etc.).

This, in turn, would make room for a multitude of private initiatives to promote forward-looking, innovative business ideas. Those involved might include private individuals and entrepreneurs who, as “angel investors,” quietly invest in companies and offer the benefit of their knowledge and



Linking research, technology and business: Zurich's Technopark.

contacts during the early stages. It should be noted, however, that in many cases financial resources are not put to best use, owing to a lack of professional expertise. Given Switzerland's wealth, resources should, in fact, be available. Bringing capital and good ideas together continues to be a problem in Switzerland.

Overall, there is no indication that a lack of venture capital systematically interferes with the implementation and marketing of new product ideas. Finally, the good news: The Swiss Federal Institute of Technology Zurich reported more spin-offs in 2015 than ever before. □

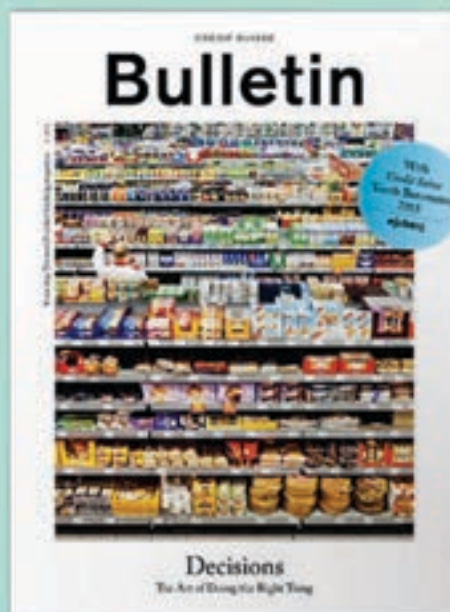
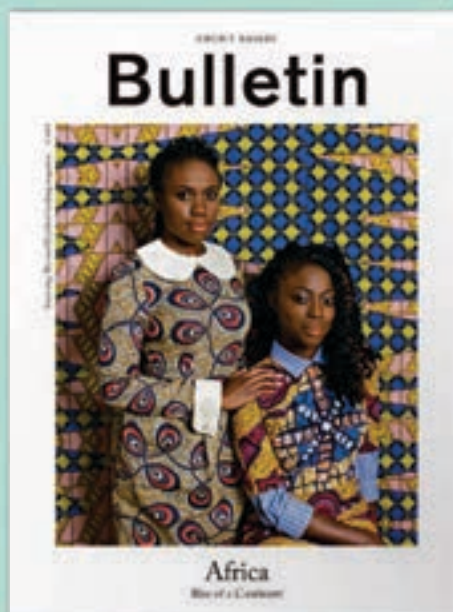
SVC – Ltd. for Risk Capital for SMEs

In cooperation with the Swiss Venture Club (SVC), Credit Suisse provides venture capital totaling up to 100 million Swiss francs to small and medium-sized businesses and start-ups. These funds are made available to innovative companies during various stages of development, in the form of additional equity capital or as loans with profit participation. The focus is on strengthening Switzerland's employment base and creating and preserving jobs. The capital is managed by SVC Ltd. for Risk Capital for SMEs, a wholly-owned subsidiary of Credit Suisse and strategic partner of SVC that is active throughout Switzerland. www.svc-risikokapital.ch

Sara Carnazzi Weber is head of Fundamental Macro Research at Credit Suisse.

Jan Riss completed an internship in that department.

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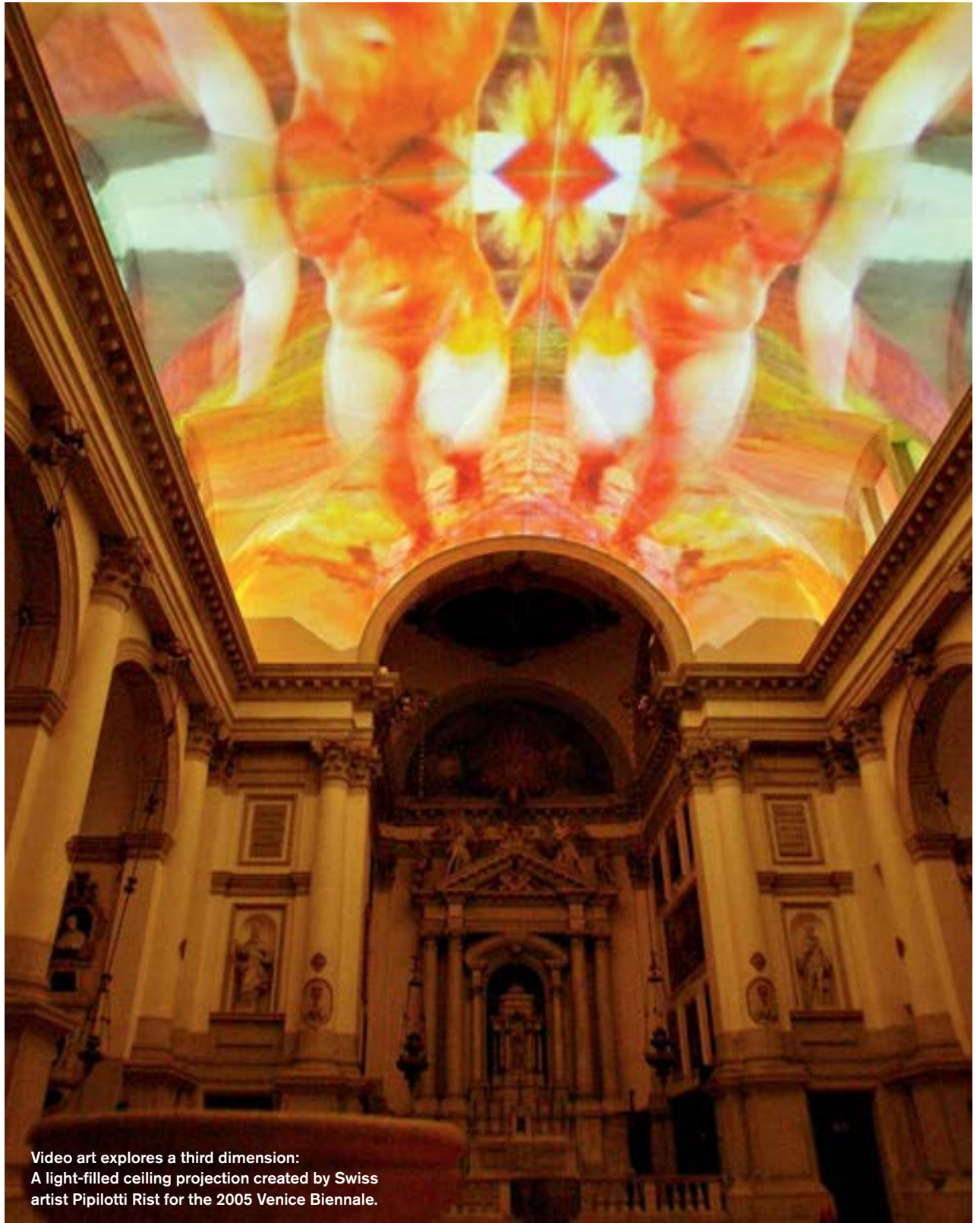


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Art(istry)



Video art explores a third dimension:
A light-filled ceiling projection created by Swiss
artist Pipilotti Rist for the 2005 Venice Biennale.



Pipilotti Rist, "Homo Sapiens Sapiens", 2005, Audio Video Installation, installation view San Sae Church, La Biennale di Venezia, Venice, Italy (2005).
Courtesy the artist, Hauser & Wirth and Lubring Augustine. Photos: Stefan Alenburger Photography Zurich; Heiner H. Schmitt Jr.

Artist and artworks have changed the world. We spoke with
James Koch, director of the Hauser & Wirth gallery
in Zurich, about five modern works that made their mark on art history.

By Daniele Musciconico



A new era in art: Mark Rothko's color field paintings are among Abstract Expressionism's most important works. They encourage the viewer to engage with the picture.



Social sculpture: In addition to being an unusual work of performance art, Joseph Beuys's "Feuerstätte" is a "social" artwork because it gets people involved.

Mark Rothko, Sketch for "Mural No. 4", 1958, oil, glue, egg, natural resin and synthetic resin on canvas, 265.8 x 379.4 cm. Collection of Kawamura Memorial DIC Museum of Art. © 1998 Kate Rothko Prizel & Christopher Rothko / 2016, ProLitteris, Zurich;
Joseph Beuys, "Feuerstätte II", 1978-1979, installation with elements of copper, iron, felt, Kunstmuseum Basel, gift of the artist with the participation of the Fasnachts-Clique Alti Richtig et al 1979, Courtesy Kunstmuseum Basel. © 2016, ProLitteris, Zurich. Photo: Gina Folly

Who was first? Who has imitators and secret copiers? And how many? It's true of the goods market, and it's also true of the art market: Whatever is truly new is innovative, but there's more to it than that. Innovation can mean using a medium in a different way, reinterpreting, reevaluating a familiar material – or it may involve a response to something happening in society, the anticipation of a trend. What is a mutant, giant spider doing outside of a zoological laboratory? It is innovative, since it lays claim to being art; innovative art is a collaboration with an unexpected context that generates new meaning.

James Koch is one of the executive directors of Hauser & Wirth, which was described by the British magazine *Art Review* as the world's most important gallery. He selected five modern works for *Bulletin* that he considers to be artistically innovative. Koch manages the branch of the Hauser & Wirth Group in Zurich. A charming art connoisseur, Koch speaks with such passion about art and artists that it is evident that the works he has chosen have personal significance for him.

A video renaissance

Pipilotti Rist, *San Stae, "Homo Sapiens Sapiens,"* 2005

Is this what a painting on the ceiling of the Sistine Chapel looks like? Yes, when it is reimagined for the modern age by Swiss artist Pipilotti Rist. Rist has liberated video art from the display screen and expanded it to include a third dimension. Her video art enters the room – and is, in itself, a kind of room, a space where the viewer's imagination can wander. Rist's video is a post-Renaissance concept, something that is familiar in the work of countless artists today.

For the 2005 Biennale, Rist created a technically complex "painting" of pure light to project onto the ceiling of a pope's burial vault. Her work, contrasting with Michelangelo's monumental *"Erweckung des Adam,"* depicts the sensual, nude figures of two sisters dancing. From what perspective did visitors view it when it was originally shown in San Stae? Sometimes they would lie on the soft cloth "leaves" of a gigantic branch, close to the sky and at one with the wild women in the projection.

"It is an innovation to be able to step into a work of art," says James Koch. "It's impressive that the artist has been successful with the medium and remained true to it." He quotes Pipilotti Rist: "Video is like a handbag, with room for painting, literature and music." But innovation also goes hand in hand with incomprehension, resistance and scandal. Fundamentalist groups forced the installation in Venice to close prematurely.

Art is social

Joseph Beuys, *"Feuerstätte (the Hearth) II,"* 1978/79

The name of the work, in English "Hearth", is a metaphor for warmth, energy, life. Copper rods forming a circle, gray felt suits piled up to form a sculpture: James Koch is also attracted to this work for reasons of family history. "Beuys was a significant per-

formance artist of the 20th century, and he had an impact on both society and politics. My father, who was a member of one of the traditional groups that celebrate Fasnacht, or carnival, in Switzerland, had a personal connection to the creation of that artwork." Beuys is one of the most important contemporary artists, Koch says, and some of his work is still misunderstood. This installation – the most significant piece in the Beuys collection at Basel's Museum für Gegenwartskunst – points to the humanism of Koch's hometown and the importance of art to Basel.

An innovative aspect of *"Feuerstätte II"* is that it allows people to participate in *"soziale Skulptur"* (Koch). In 1978, Beuys roamed through the streets of Basel with the *"Alti Richtig"* carnival group, and he later used some of the group's equipment for satirical purposes. It is also significant that Beuys merged tradition and customs with a type of art that had by no means gained acceptance. But Beuys, who was both clever and PR-savvy, knew what he was doing. His performance, coordinated with Basel's carnival, earned him widespread popular support, and also helped him recruit ambassadors for his art – which sought to change society.

See for yourself

Mark Rothko, *"The Seagram Murals,"* ca. 1958–1970

Rothko's work marks a break with the past and the beginning of a new era in art. No one can remain unmoved after visiting this room, which was painstakingly created by Mark Rothko down to the last detail. He determined precisely how his paintings were to be hung and illuminated; if it had been possible, he would no doubt have specified the appropriate distance between viewer and painting. Rothko (1903–1970), an American artist, is a master of effects and judgments, color values and energies. *"The Seagram Murals,"* a series of paintings that London's Tate Modern hung together to form a single work of art, are like a sanctuary where the secular can meditate.

Thousands and thousands of painters have imitated Rothko over the past 50 years. "I think of my pictures as dramas," he said. "The shapes in the pictures are the performers." James Koch considers Rothko to be one of the most important artists of Abstract Expressionism and color field painting, which emerged in the United States in the mid-1950s. "His innovation was to encourage interaction between the viewer and the picture. Even those who are relatively unfamiliar with monochromatic painting will get goosebumps when they first encounter Rothko's work. I will never forget when I first saw it, when I was a young boy."

Rothko's use of color makes abstract art accessible. Koch points out how Rothko experimented with color and paint in a way that made even the process of creating the painting generate a kind of magic. The surfaces of Rothko's paintings are luminescent, with gleaming colors. They sometimes glow like a single pixel; sometimes they are cloudy and blurred. Looking at Rothko's use of color, we see how color fields begin to take on a life of their own. Rothko wanted the relationship between the picture and the viewer to be a >

function only of the colors and their impact, and that was why he avoided representational images. Silence, meditation, ultimate concerns. Rothko's works speak the language of pure color, and the viewer becomes part of the picture – indeed, perhaps part of art itself.

In the web of biography

Louise Bourgeois, "Maman," 1999

The spider, made of bronze and steel, is nine meters tall, but her legs are slender and as fragile as those of a prima ballerina. In a sac on her body, "Maman" carries 29 white marble eggs. The viewer's initial shock gives way to sympathy, and fear is mixed with respect. We admire what this monumental monster is secretly bringing forth.

It was thanks in part to James Koch that Fondation Beyeler's bronze casting of "Maman" was exhibited in Zurich, Berne and Geneva in 2011. But this was not the only reason why he chose to show us this work, one of the most important and well-known creations of French-American sculptor Louise Bourgeois (1911–2010). Koch explains why Bourgeois was innovative: "She was one of the most important artists of the 20th century. Particularly impressive are her innovative, radical pictorial language and the symbolism of her drawings and gouaches, her textile works, but also her

large sculptures. To understand Bourgeois and her work, you have to understand her spiders, particularly this oversized piece about her mother. Her mother worked as a tapestry restorer in Paris, replacing old fabric with new. The sculpture honors Bourgeois's mother by depicting a spider as a symbol, a creature that incessantly spins the threads of life.

"This combination of the terrifying and the protective, the image of a mother who weaves the threads of family, has a very ambivalent impact," says Koch. It is also notable that the spider was created in 1999, when Bourgeois was over 80 years old. She was not widely recognized until very late in life. That, too, is part of innovation: It is only achieved through consensus and the public.

In a critical light

Bruce Nauman, "Having Fun/Good Life, Symptoms," 1985

In this case, the artist's innovation lies in anticipating what is latent, festering, in society. This work is particularly innovative because it is visually appealing, seductive, aesthetically pleasing. It depicts the two "wheels of fortune" that make up our lives: a glittering whirlpool, an emotional, evocative, never-ending game. Bruce Nauman is innovative because he has inspired so many other artists, Koch explains, and because his works deal with sensory perception. Nauman, an Amer-

Seduction through aesthetics: In his light installations, conceptual artist Bruce Nauman plays with the messages that advertising sends, promising us happiness and a better life.



ican artist born in 1941, began his career as a painter, then turned to film, sculpture and performance art. In his key works, he introduces material that he borrowed from another context, namely the commercial sector and advertising: He used neon light to evoke the “good life.”

Nauman created conceptual art, and it plays with a message whispered in our ears by advertisers: “We’re having fun.” But they only allege that we’re having fun; the neon spirals suggest movement, but are actually standing still. One spiral shows slogans about never-ending fun; the other contains a contradictory message showing the price we pay for a life of luxury, says James Koch: “up and down” and “in and out.” Even those words are written in luminous, fluorescent lettering, since with the help of the right colors you can do a brilliant job of selling even misfortune. Nauman’s concept is innovative because it communicates a social message through a medium that advertisers have claimed as their own. But these wheels of fortune, with their critical commentary on our lives, can do still more. They combine two types of art to form a new, third, kind: Installation is merged with performance, alleged movement with actual stasis – a zero-sum game. □

Daniele Muscionico is a prizewinning journalist who writes about art and culture for the *Neue Zürcher Zeitung*.



James Koch, born in Basel in 1973, studied law and worked for a leading law firm before following his heart to pursue a career in the art world, first as the commercial director of Fondation Beyeler, and since 2014 as executive director of the Swiss branch of the Hauser & Wirth gallery in Zurich.



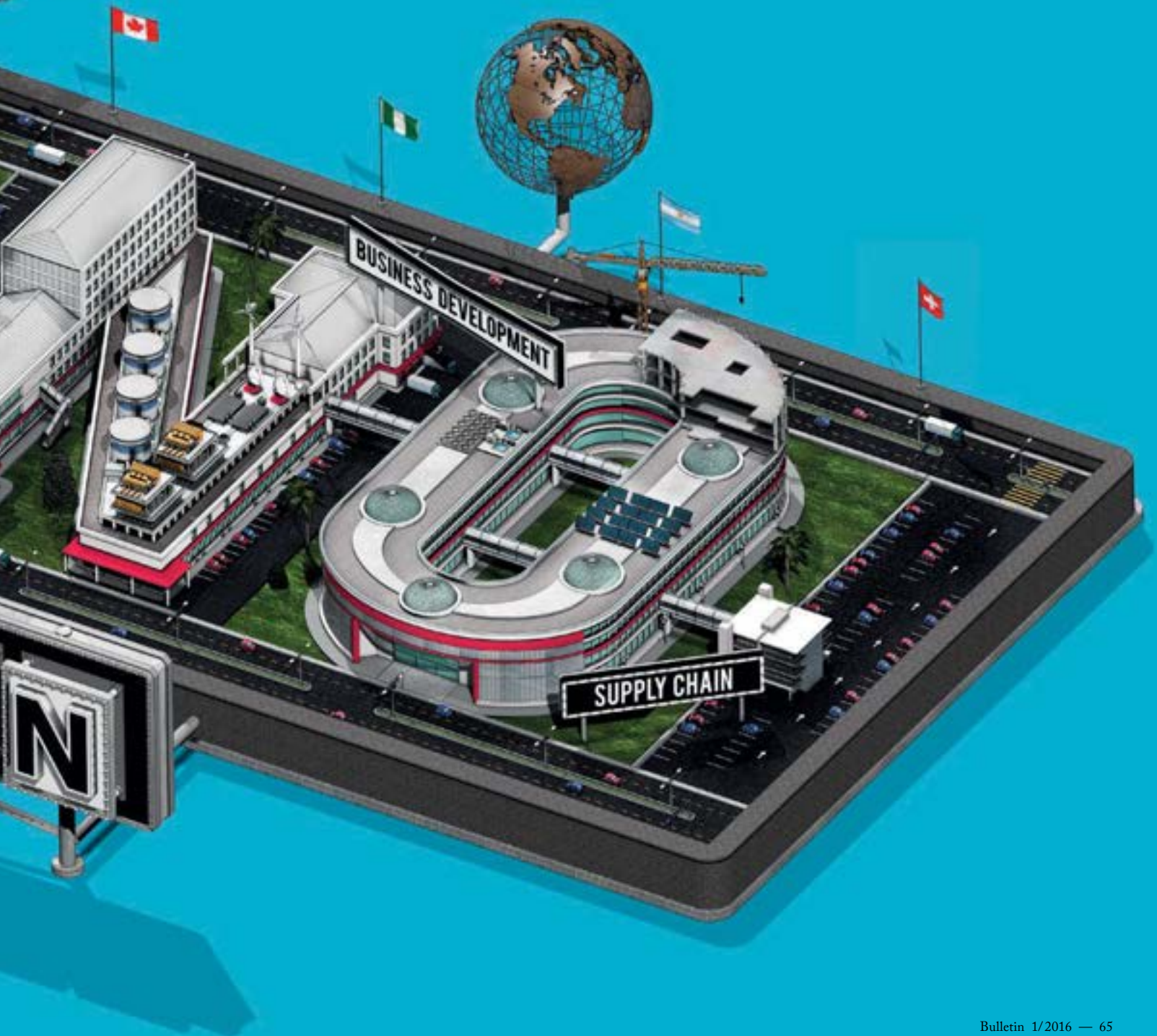
Mother spider: Louise Bourgeois' gigantic bronze spider symbolizes the artist's own mother and honors her as a creature that spins the threads of life.



It Doesn't Always Have to Be Digital

“A trade in hand finds gold in every land,” says the proverb. Manufacturers are developing carbon sailing masts, automatic honeycombs, or the first Nigerian car brand: A portfolio of small and medium-sized enterprises from around the world, succeeding because of – or in spite of – unusual ideas.

Illustrations by Stephan Walter





From the Sea to the Farmer's Field

King Composite came very close to striking its sails. Two decades ago, Guillermo Mariani began building masts for racing sailboats from carbon fiber, a new material at the time. The San Fernando-based company survived Argentina's national bankruptcy because it had sought out affluent clients, especially from across the Atlantic – in Spain, Italy and Greece. Everything was going well – until the crisis year of 2008, which hit southern Europe's economy hard and made sailboats an unnecessary luxury product. It seemed that the Argentine company was going to go under – but then the crew caught sight of land.

Today, the company is considered the top innovator in Argentina's agricultural technology sector. In mid-2015, King Agro signed an exclusive contract with agricultural machinery conglomerate John Deere, which now distributes worldwide the idea that kept the company afloat.

But how did this come about? Applying its expertise in carbon mast technology, King Composite expanded into crop-protection machinery (and added "Agro" to the company name). Since 1996, when Argentina began permitting the use of genetically modified seed, agriculture in the pampas has radically changed. The land under cultivation has grown from 20 to 33 million hectares. At the same time, the government imposed high export taxes on soy, wheat and corn, forcing farmers to trim costs wherever they could.

The key to this is direct sowing, in which the soil is not disturbed through tilling, thereby saving work time and preventing soil erosion. However, this technique requires regular pest and disease control. These agents are traditionally sprayed from airplanes. Or they can be applied by special tractors, which in Argentina are known as "pulverizadoras." Some 5,000 to 7,000 of these machines are currently in use in the agricultural country – and the number is growing, because the new government has removed export barriers and lowered customs duties.

To distribute their load across the fields, the tractors extend a telescopic boom on each side, with hoses and spray nozzles attached. Conventionally made of steel, these booms are quite heavy. And this is where the mast-builders from the sailing industry stepped in: The King engineers built carbon booms that can replace the existing steel structures. Carbon fiber is six times stiffer than steel and resistant to sprays. Most importantly, the material is 5.5 times lighter than the metal. By switching to carbon booms, a

spraying machine can be enlarged from its original span of 25 meters to 32, 36, and even 45 meters, without becoming any heavier. This enables the operator to work larger areas in the same amount of time. Furthermore, broader spans mean less loss due to ruts, ultimately increasing the yield by 1 percent. This may seem unremarkable, but 1 percent greater yield on every field in Argentina would equal 400 million dollars more each year coming into the country. And though retrofitting is relatively expensive, at about 40,000 US dollars per tractor, it pays for itself after two years, according to the company.

"We believe that the telescopic booms are just the beginning," says Guillermo Mariani. "Carbon fiber has significant advantages in agriculture: greater productivity, lower operating costs and less soil compaction." So far, 250 spraying machines in Argentina are using carbon booms. But after the renovation of a factory in the city of Campana and the contract with John Deere, all signs point to expansion. King Agro can now build up to 1,000 booms per year. "The market is growing by 50 percent each year," says Alejandro Colla with satisfaction. He once won medals racing sailboats. But those days are long gone. (*Text: Andreas Fink*)



Name	King Agro
Industry	Agriculture
Where	San Fernando, Argentina
Employees	43
Founded	1983

Name	Flow Hive
Industry	Beekeeping
Where	Byron Bay, Australia
Employees	20
Founded	2015



Stuart (left) and Cedar Anderson with their FlowTM Hive beehive.

The First Million Is the Easiest

The first million is said to be the hardest. Not so for Cedar and Stuart Anderson, whose coffers were filled with two million US dollars in less than 48 hours – in the brave new world of crowdfunding! The two Australians had set a goal of 70,000 dollars for their internet campaign publicizing a beehive that extracts honey through a tap directly into jars – an invention they call “FlowTM Hives.” They met their goal in less than an hour. Eight weeks later, the father and son team had orders and capital amounting to 12.4 million dollars – and a new problem. Instead of building a few hundred FlowTM Hives, they now had to fill more than 24,000 orders from 150 countries.

Their innovative source of honey was the most successful campaign ever for the California-based Indiegogo crowdfunding platform, which ranks among the pioneers of this type of online fundraising. The principle: A project or product must convince as many people as possible to support it in advance. In return – provided that enough capital is pledged – funders receive the product or, for example, see a proposed film become reality through their contribution. Crowdfunders support charitable organizations simply by making contributions. Indiegogo puts campaigns on the web for free, but it keeps 5 percent of the collected capital.

The FlowTM Hives project was a sensation, but its success hardly came overnight. The hobby beekeepers had tinkered for ten years, seeking a way to separate the honey from the honeycomb more easily. They tested prototypes for three years. When they were sure their invention worked, they were eager to market it. Cedar Anderson grew up in an alternative community co-founded by his father, Stuart, near Byron Bay on the east coast of Australia. He loved honey and had kept bees since he was six years old. However, he was less at home in the world of venture capital. Crowdfunding seemed to be

the perfect solution. He could produce to meet the demand, since his customers paid in advance. And there were more of them than he expected: Over 37,000 supporters invested in the Australian patent whose purpose was to make life easier for beekeepers and bees alike.

Unlike in conventional methods, the FlowTM Hive does not need to be taken apart to harvest the honey. The honeycomb frames are preformed cell systems made of synthetic material. When the bees have filled them and sealed them with wax, they are separated by turning a lever. The honey flows through a tube directly into the jar. When the beekeeper turns the lever back, the tap closes, the cells are rejoined, and the bees can begin to fill the comb again.

According to Elena Ginebreda-Frendel of Indiegogo, one reason for the Australians’ success was their thorough preparation. “The product was well thought out, and at the same time the family was great at making the most of social media, building a huge fan base well in advance,” says the Indiegogo representative. “By the time the campaign opened, admirers had already clicked the ‘Like’ button 80,000 times.” The million-dollar haul stoked enormous media interest, which in turn brought new fans into the huge online community. A video of the invention, filmed by Cedar’s sister, Mirabei Nicholson-McKellar, has been viewed more than 30 million times online. Meanwhile, the supporters are summoning their patience. The next challenge for the Andersons is to meet the enormous demand. And crowdfunding can’t help them much in that regard. (*Text: Julica Jungehülsing*)



The Happiest Company in Japan

Towards the end of December, the lights go out at Mirai Industry. At 4:45 pm – the normal closing time – the factory halls fall silent at this small building technology business in Gifu, two hours west of Tokyo by train. Machines that otherwise churn out plastic parts every few seconds stand still. Computer screens remain dark – for more than two weeks. Anyone who calls during this time hears only a friendly voice on the answering machine.



When the employees of Mirai Industry come back to work in the new year, they have enjoyed more days off than most Japanese workers will take all year. True, every full-time worker in Japan is entitled to about 20 vacation days per year. But the average worker takes only half of them: This “gift” to their employer is considered good form. At Mirai Industry, the opposite is true. Including weekends and the period when the factory is closed, each employee has 140 days off. In addition, they each have 40 days of paid vacation per year.

Many people have a hard time believing that a company like this could stay in the black, least of all in Japan, where a constant presence in the office is essential to any career. But this is exactly what Mirai Industry has done ever since its founding in 1965. In March of 2015, with 900 employees, it recorded revenues of 28.6 billion yen (235 million Swiss francs).

Part of this success is grounded in the company philosophy, which is posted on the walls everywhere: “Tsune ni kangaeru” (“Always think!”). Every suggestion, no matter how workable, is rewarded with at least 500 yen. That’s enough for a simple lunch. Really good ideas win prizes of up to 30,000 yen.

And indeed, the think-tank approach has boosted the product mix to more than 10,000 different items – from plastic casings for switches to cutting tools to vinyl housings for electrical cables, making Mirai Industry the leader in niche markets. The building technology company holds 80 percent of the market share for light switch boxes in Japan. And yet, the company’s name is not widely known. “Our products are mostly built into the walls or floor,” explains one manager.

Takuji Nomura, a young engineer, says his friends envy him, often asking “Do you actually do any work?” He laughs. His friends often have to stay late at the office. Nomura readily admits that he

applied at Mirai Industry because of the shorter working day. Standing next to him, his supervisor shows no surprise. Longtime managing director Katsuhiro Takigawa, now retired, says, “We think it’s important for our employees to work with full commitment for eight hours and have their evenings to relax.”

Overtime is not allowed. “We couldn’t add those costs to the products out of the blue,” says Takigawa. But that’s not the only reason: “The workday is eight hours long, and then our employees should get eight hours of sleep every night. Then there are four hours for the morning routine, showering, eating and commuting. That leaves a good four hours for personal time, hobbies and the like.”

Making sure that employees had enough free time was already important to the firm’s founder, Akio Yamada, who had a passion for theater. He had worked in his father’s company for 15 years. When he was 34, the boss told him he wasn’t working hard enough – and showed him the door. Yamada took this experience to heart. With friends from his acting troupe, he founded Mirai Industry (Mirai means “future” in Japanese). Right from the start, he initiated the (then highly unusual) five-day week and flat hierarchies. In return, his employees hustled all the harder. “We have zero turnover,” says former managing director Takigawa. Hundreds of people apply for every opening. No wonder Mirai Industries is known as “the happiest company in Japan.”

Why do other Japanese companies find it so hard to change their culture? “They’re afraid of how their customers will react,” says Takigawa. At first, some customers were irritated that Mirai Industry shuts down for at least two weeks in midwinter. But because they also noticed how hard its employees worked to solve problems and respond to customers’ requirements, they have remained loyal to this unusual company.

(Text: Sonja Blaschke)



Name	Mirai Kogyo
Industry	Building technology
Where	Gifu, Japan
Employees	900
Founded	1965

Name Friesens Corporation
Industry Printing
Where Altona, Canada
Employees 600
Founded 1907



When the Printing Company Belongs to Its Employees

Thirty-six years ago, the owners of Friesens, a Canadian company that prints high-quality illustrated books, came to a far-reaching decision. The three sons of founder David W. Friesen made their employees owners of the company. Today, this small business in Altona, Manitoba, still has those approximately 600 employees. Employee ownership is good for business. In the past 20 years, the company has always made a profit, says CEO Curwin Friesen, who is not related to the founding family.

Friesens Corporation is Canada's largest printer of hardcover books. The company has won several awards for the high quality of its art and coffee table books. Friesens relies mainly on German technology, such as printing presses manufactured by Heidelberg and Man Roland and bookbinding technology from Kolbus. Friesens is known for investing heavily in its machinery. That is why the renowned Canadian nature photographers Rosemarie and Pat Keough chose Friesens to print a 366-page portfolio of color photographs that weighs 13 kilograms and sells for 4,300 Swiss francs. The Keoughs were impressed by the employees' commitment and skills: "They bent over backward to help us."

The Friesen family is descended from Dutch Mennonites who immigrated to Canada via Prussia and Russia in 1870. According to CEO Curwin Friesen, the decision to make their employees owners of the company was motivated by the family's

religious beliefs and the tradition of cooperatives in western Canada. To survive and thrive in the prairie province of Manitoba, the immigrant settlers had to support each other.

The company's stock is held by a foundation owned by the employees. The foundation distributes dividends to the employees: "When the company does well financially, so do the employees," says CEO Friesen, and this ownership structure is a major incentive for them. For example, if work needs to be done on the weekend, there are always people ready to step in. "They work harder and make fewer mistakes."

The employees were taught what it means to be the company's owners. "Owning shares in a company doesn't mean that you run the business," Friesen notes. That is the responsibility of the board of directors and the management. But dialogue is encouraged within the company, he says, and new ideas are welcome.

As early as the 1950s, with a workforce of 20, the Friesen sons had issued shares to their employees. But they in turn sold them or traded them for goods and services, which was not the point of the exercise. As a result, the founder's heirs ultimately established the foundation. When employees leave the company, they must sell back their shares.

Curwin Friesen acknowledges that this sort of structure makes it impossible to raise capital on the market, as a listed company can do. But when the company belongs to its employees, everyone works toward the same goal, he says. "This system rewards the workers for the company's success."

(Text: Bernadette Calonego)



CEO Curwin Friesen in the employee-owned printing company.

Name WeiTec
Industry Mold manufacturing
Where Dietlikon, Switzerland/Ningbo, China
Employees 24
Founded 2004



Complexity as Opportunity

“Think globally, act locally.” This popular saying makes globalization sound simple and promising. The management boards of many large companies see it that way. In truth, however, what matters is people, and this is where the challenges come in. Each culture not only has a different language, but also different ideas about reliability and about when the working day starts and ends.

WeiTec benefits from this. The company is based in Dietlikon, but is it a Swiss company or a Chinese company? Or even a German company?

Company founder and CEO Othmar Weibel, 64, describes the business model: “Most of our customers are German, and they receive advice and service from Switzerland. We manufacture in China, but the customers don’t notice this – except for the lower prices.”

WeiTec – short for Weibel Technology – is a supplier to the automobile industry, working primarily for the major German car manufacturers: Audi, BMW, Mercedes and Porsche. “The individual parts of a vehicle consist of precisely formed steel, aluminum, or plastic,” says Weibel. “We are responsible for making molds and tools to produce these parts. These can weigh up to 20 metric tons, and are produced in China. We also support the development process, from optimizing parts to global after-sales service.”

In early 2000, the German automotive industry was under pressure to lower its production costs. At the same time, they were growing fast in China and had a need for forms that met German standards. But how to achieve this?

Othmar Weibel had more than 30 years of international business experience in Europe, the US, Brazil and Japan, but he first went to China in 2003.

WeiTec learned the hard way: “We started a little more than ten years ago and made all the typical mistakes. We signed very large contracts without understanding the local business mentality. We were never paid. We were confronted with a lot of projects – we said ‘yes’ too often and got involved with the wrong people. We thought we understood the Chinese mindset.”

Today, WeiTec has found the recipe for success. The company employs Chinese engineers, and the mold makers are hired on a project basis. “This saves us the fixed costs for the huge machines,” says CEO Weibel. But the model requires state-of-the-art technology and project management, as well as a strong local presence at the mold makers. Close supervision ensures quality and on-time

delivery. Several inspection visits a week are necessary for the mold makers, despite many years of partnership.

The greatest advantage of production in China? “Exceptionally hard work and high energy,” says Othmar Weibel. “The Chinese work around the clock if they have to. If you give the Chinese the right information, and instruct them correctly, you can achieve the unthinkable: very good quality, in a short time, and for a great price.”

The greatest disadvantage? “I had to learn that the average Chinese worker feels most comfortable when you give him precise instructions. It’s tough when I want to try something new and I say: ‘Go for it!’ They aren’t used to taking on responsibility, since creativity entails a risk. The workers don’t yet understand that good project management offsets the risk.”

Weibel, who has an engineering degree from the Federal Institute of Technology (ETH) in Zurich, laments the huge gap between bosses and employees in China. “It can be years before an employee feels comfortable sharing even the slightest bit of doubt with the boss about a work method or a product. I would love to get that kind of feedback! But we have found a way to harmonize the Swiss and Chinese cultures. It’s important that we take care of our Chinese employees.”

After all these years, does Othmar Weibel now understand the Chinese mentality? “No, and I probably never will. But I have learned how to work in China and appreciate its many advantages.” (Text: Simon Brunner)

*WeiTec is a portfolio entity of SVC – Ltd. for Risk Capital for SMEs (a subsidiary of Credit Suisse AG). See also page 56.



Company founder and CEO Othmar Weibel (right) learned the hard way.

First Nigeria, then the World



When Innocent Chukwuma told his friends, acquaintances and anyone else who would listen that he planned to sell cars in Nigeria, hardly anyone took him seriously.

Just a few years later, it was clear that Chukwuma, now 56 years old, and his company, Innoson Vehicle Manufacturing (IVM), had proved the pessimists wrong.

Chukwuma entered the business world at the age of 19. For a few years, he worked as an apprentice for his older brother in a trading company for raw materials, but he soon began to trade for himself. His company, which he named Innoson Nigeria Limited, imported replacement auto parts from Europe and Asia, selling them at a profit in Nigeria. The year was 1981.

In the 1980s, Chukwuma discovered that lightweight motorcycles were sold at very high prices in Nigeria – about 750 Swiss francs. “I added up the cost of all the components and discovered that this was too high.” These motorcycles are the favorite means of transportation for lower-income people in Nigeria. But because new ones are so expensive, many Nigerians buy used, unreliable machines.

With his experience in the replacement parts trade, Chukwuma began to buy not just spare parts, but also the chassis, motor, wheels and brakes, plus the tools needed to assemble them. He also flew in experienced mechanics from China who taught his Nigerian employees how to build a motorcycle. Thus, in 2009, his second company was born: Innoson Vehicle Manufacturing (IVM). A short time later, his company was able to assemble motorcycles in Nnewi, a small commercial town in southeastern Nigeria.

“Once we had built the motorcycles, we calculated their value and realized that we could more than halve the customary market price and still make good money,” says Chukwuma. “Before we knew it, Innoson motorcycles were a hit – everyone wanted one. We clobbered the competition.”

The next step was logical, says Chukwuma: “When we realized how successful our motorcycle business was, we thought about what the next big thing might be.” The resourceful entrepreneur had an idea: “Most Nigerians buy used cars, because the new ones are too expensive. The used ones are imported from Germany, the US and other countries. I thought, maybe we should build the cars here in Nigeria as well; that would make them less expensive. Then more Nigerians could afford a new car.”

Innoson began to import car engines from Japan, brakes and electronic components from Germany, China, Japan, Mexico and Canada – wherever he found price-conscious manufacturers. Less technically demanding parts, such as the body, the floor components or the seats, were purchased from local manufacturers.

In 2010, IVM began to build minibuses. Then came SUVs, pickups, small trucks and finally, in 2013, passenger cars. The automobiles are inexpensive, selling for 7,000 to 12,000 Swiss francs (comparable alternatives cost about three times as much). The larger SUVs sell for a little over 15,000 Swiss francs. Chukwuma says that by 2014, they had already sold 4,000 cars.

Today, 70 percent of the parts for a car or motorcycle from IVM are made in Nigeria, and the share is steadily rising. For Chukwuma, this signals the emergence of a domestic auto industry. But even this little industrial miracle has had its share of setbacks: In the wake of Nigeria’s economic crisis, IVM recently announced that it would have to let half its employees go.

Chukwuma remains buoyed by the success of his ideas. First, he plans to sell cars in the other countries of West Africa, but “the goal is to capture the whole African market. And then, the world.”
(Text: Mfonobong Nsehe)



Name	Innoson Vehicle Manufacturing (IVM)
Industry	Auto Industry
Where	Nnewi, Nigeria
Employees	7000
Founded	2009

Innovation and Production



Pieter Van Eenoge produces illustrations for magazines, books, posters and advertising.
He lives in Bruges, Belgium.

Who's giving Lindt's CEO reason to celebrate?

The acquisition of Russell Stover/Whitman's is helping Lindt's global growth gain momentum. Find out how Credit Suisse could give you something to celebrate at credit-suisse.com/lindt





How about an apartment where the breathtaking view is only the first thing on a long list of special features?

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