An American in “Silicon Saxony”

How Bill discovered that Saxony can do more than “just” chips.
Bill startles and catches the sliding coffee mug just in time while the plane takes a turn during the approach: Dresden is coming closer. It’s been a long way from America’s East Coast to East Germany, contemplates the journalist. He’s accepted the invitation of a former fellow student. John told him about his new job in a high-tech company in Saxony — and then he said, “That’s where you’ve got to go! Silicon Saxony is the new Silicon Valley, believe me!” “Silicon Saxony?! What does John mean by that?” Bill immediately did some research — and became more and more curious. Aha, a professional colleague coined that term! Back then, 20 years ago, when the US semiconductor group AMD had been building a new factory in Dresden: The TIME Magazine journalist Richard Hornik was so impressed by Saxony’s fresh start that he wrote an article about a new cradle of silicon-based electronics right in the heart of Europe, an article about a “Silicon Saxony.”

**SAXONY INVESTED INTO SEMICONDUCTORS EARLY ON**

In 1886, the chemist Clemens Winkler discovered the element “Germanium” — the first semiconductor material — in Freiberg. In 1957, the VEB Spurenmetalle, a state-owned enterprise focusing on trace metals, was founded in Freiberg; here as well, the production of silicon blocks and wafers was launched in 1966. In 1961, the »Arbeitsstelle für Molekulartechnik« was founded as a workplace for molecular engineering in Dresden in order to develop and produce integrated circuits. After 1990, renowned semiconductor groups became interested in “Silicon Saxony:” Siemens (today’s Infineon) came in 1994, Wacker (today’s Siltronic) and AMD (today’s GLOBALFOUNDRIES) in 1996. Between 1998 and 2012, the 300 mm technology was developed in Dresden. In 2012, Heliatek launched the world’s first roll-to-roll vacuum production of organic solar cells in Dresden. In 2014, the “5G Lab Germany” was founded at Dresden University of Technology, uniting more than 600 scientists who conduct research on 5G key technologies under one roof. In 2017, Infineon and GLOBALFOUNDRIES expanded their Dresden fabs while Bosch decided in favor of Saxony and is building a mega fab for IoT chips in Dresden.

**WELCOME TO “SILICON SAXONY”**

“Silicon Saxony” is Europe’s largest microelectronics cluster and the fifth largest worldwide. Every third chip produced in Europe bears the label “Made in Saxony.” In Dresden, GLOBALFOUNDRIES, Infineon Technologies, and — starting in 2021 — Bosch operate some of the most modern semiconductor production sites to be found anywhere on the globe.

A unique concentration of companies providing extensive expertise in the sectors micro and nano electronics, organic & flexible electronics, 5G, MEMS / sensors, and automation technology is found in the region. Renowned research institutions such as the Fraunhofer Institute for Photonic Microsystems IPMS in Dresden are working on the technologies of tomorrow. With “Silicon Saxony e. V.,” Saxony has one of the most successful branch associations in Europe.

Continue reading and learn what else Saxony has to offer in addition to “chips”: www.business-saxony.com/micro or scan the QR code.
Next morning, when Bill stands in front of the bathroom mirror, his eyes wander over his memo pad. Of course, he knows that this is somewhat old fashioned in the age of smartphones and tablet computers, but Bill loves the written word – which is why he still scribbles all his appointments and notes onto a paper pad. As recently as yesterday evening, he met John for a nice Saxon beer. The two put their heads together over a map of “Silicon Saxony.” What’s an absolute must-see for Bill? He made some of his appointments already from New York. But there’s so much more to see! The map is now attached to Bill’s memo pad, abundantly garnished with annotations and markings. But Bill must hurry up now because he has ambitious plans for the next few days.
“IT’S ALL ABOUT THE PEOPLE!”

Checked with Sabine Nitzsche,
CFO, GLOBALFOUNDRIES
Management Services LLC & Co. KG

Bill: There’s stiff competition in the microelectronics branch around the globe. What are the general conditions that particularly speak on behalf of Saxony?

Sabine Nitzsche: During the 1990s, reindustrialization in East Germany was state-subsidized. This was also interesting for AMD. But it must be understood that just the money alone wasn’t the decisive motivation. Because of Saxony’s long tradition as a microelectronics venue, highly qualified and motivated employees were interested in us.

Bill: As measured by the number of employees, GLOBALFOUNDRIES is the largest company in “Silicon Saxony.” So you’ve come to stay here?

Sabine Nitzsche: Exactly. Today, “Silicon Saxony” is a magnet which attracts top talents. This not only refers to international specialists and executives, but also to students and young academics. Dresden University of Technology provides the best possible educational and research opportunities for young talents. For more than 15 years now, we’ve also been training and educating these people ourselves. Plus, we also cooperate, for example, with the dresden chip academy. That’s why most of our employees come from the region still today.

Bill: And how else are you benefiting from the “Silicon Saxony” ecosystem?

Sabine Nitzsche: In addition to having access to skilled professionals, we also benefit in our R&D activities from cooperations with many local partners – regarding such pioneering topics of the future as new radar solutions for autonomous driving or improving material properties which are of utmost significance for new chip generations.

The success story of Saxony’s microelectronics industry is essentially linked to AMD (today: GLOBALFOUNDRIES) setting up shop in Dresden: Since the electronics group had started to build its first processor plant outside the USA right here in 1996, more than 10,000 million euros have been invested into the Dresden site. Today, the GLOBALFOUNDRIES Fab 1 employs more than 3,000 technicians, engineers, and specialists. With its power saving FDX technology, the location in Saxony focuses specifically on electronics for the internet of things and other pioneering topics of the future. And just recently, the GLOBALFOUNDRIES factory in Dresden obtained the certification to commence with the sophisticated production of components for the automobile industry.

Well, you can’t really see much of the staff members in their cleanroom suits. That specialists from 50 nations work here, though, becomes all the more obvious in the company cafeteria. While having a salad and a cheeseburger, Bill listens to a multicultural mix of languages ranging from French to Korean. But above all, he hears many particularly soft consonants – aha, the “famous” Saxon dialect! Dresden not only seems to be an attractive destination for professionals from around the world; it also contributes lots of skilled employees whose home is here. Once again, Bill thinks of his colleague Richard Hornik: It was he who had asked the former AMD CEO Jerry Sanders why he invested in Saxony, of all places – and the answer was: “It’s all about the people!”

BIG PLAYER
IN SILICON SAXONY

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Everyone who gets into a car is likely to also have electronics from Saxony on board: The microcontrollers and sensors made by Infineon Technologies Dresden control engines, airbags, and many other components in modern automobiles – for example, in the BMW i3 from Leipzig. In fact, the largest customer of the “chips” produced in Dresden is the automobile industry. Its demand is growing – that’s one of the reasons why Infineon is currently setting up the world’s first mass production of power semiconductors on 300 mm silicon wafers in Dresden. And just recently, the group has distinguished the business venue with a development center for automobile electronics and artificial intelligence. Since 1994, a total of more than 3,000 million euros have been invested into this corporate site which is the workplace for more than 2,300 experts today.

CHIPS FOR THE CARS OF TODAY AND TOMORROW

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BOSCH IS ALSO ATTRACTION BY “SILICON SAXONY”

June 2017 – The sensation is perfect: The technology group Bosch is building a new mega fab to produce MEMS for applications in mobility and the internet of things. And the plant isn’t under construction somewhere in Asia; it’ll actually be completed in Europe by 2021 – right in the heart of “Silicon Saxony.” In Dresden! With 1,000 million euros, this is the largest single investment in Bosch’s more than 130-year company history. “For us, the business venue Saxony provides ideal prerequisites. The region is renowned and reputed for its microelectronics cluster, which is unique in Europe, and it also excels with a superb infrastructure – everything is within easy reach, and the transport connections are excellent,” Otto Graf, head of the future Dresden factory, sums up the reasons that prompted the group to decide in favor of Saxony.

“AUTOLAND SAXONY” MOVES AHEAD

Lighter, smarter, greener. With plenty of “chips inside.”
Intelligent machines in “Industry 4.0” factories, but also autonomously driven cars need a host of electronic sensory organs to get along in their environments and interact with humans. Many of these intelligent sensors are developed and produced in Saxony: The Dresden-based First Sensor Mobility GmbH, for example, manufactures pressure sensors and cameras for driver assistance systems. The EDC Electronic Design Chemnitz GmbH designs and develops sensors for the highly automated production of tomorrow – for example, for room monitoring and machine control. Saxony’s experts contribute their competence also in international research projects: Headed by Dresden University of Technology, the 82 partners of the “fast” project want to achieve the technological breakthrough for the real-time capability of sensor systems by 2020. “IoSense” is the name of the European pilot line project in which 33 partners from 6 countries are working on inexpensive production technologies for “smart” sensors and sensor systems under the auspices of Infineon Dresden.


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EYES AND EARS FOR INDUSTRY 4.0

As a matter of fact, Bill still loves to drive by himself. But for this road trip, he made an exception by activating all driver assistance systems in his borrowed e-vehicle: He wants to get a feeling of what automated car driving can already do. Today, he’ll visit a city in south-western Saxony which he’s never heard of before – Chemnitz. Here, entrepreneurs and researchers are said to be particularly “smart.” They put their knowledge and expertise into the so-called “smart systems” – for example, into sensor solutions for modern driver assistance systems. On his way back to Dresden, he plans a stopover in Mittweida. Here, a unique blockchain competence cluster is said to even lure away specialists from “Silicon Valley” ...
The Mittweida-based Slock.it GmbH transfers the blockchain principle to the internet of things. The objective is to facilitate the sharing of objects. The name of the startup stands for “smart lock,” an intelligent lock which is linked to the Ethereum blockchain.

With the help of “smart contracts,” also via Ethereum, the locks are opened and closed again. Renting cars or rooms, for example, would be very easy in the future: Just hold the smartphone onto the intelligent lock, and the money transaction as well as the conclusion of the contract are done. The door opens for the defined period of time.

The Slock.it team consists of employees from Germany, Brazil, Japan, Turkey, and from the USA. Being able to participate in the development of the blockchain technology of the future is a convincingly attractive reason for skilled professionals to move even from “Silicon Valley” to “Silicon Saxony.”

The Art of “Sharing”

SAXONY’S SOFTWARE COMPETENCE
for the technologies of tomorrow is multifaceted.

PROTECTIVE SHIELDS “MADE IN SAXONY”

Firewalls and virus protection alone do not suffice if factories, hospitals, and power plants are to be protected properly against cyberattacks. In Saxony, software experts are working on protective mechanisms for IoT applications that are difficult to decrypt. The specialists of the Rhebo GmbH from Leipzig, for example, have developed a protection system which fully automatically learns the “normal” communication patterns in industrial control networks. If the “Protector” identifies any unusual activities within the network, it will then set off an alarm in due time before the attackers are able to infest the system. When it comes to the protection of sensitive information of private persons and small firms, the Chemnitz-based comcrypto GmbH strikes a different path: It offers a software which is easy to operate for users, but encrypts, for example, the email traffic between companies in a bug-proof manner with the help of complex cryptographic processes running in the background. Primarily governmental authorities and energy suppliers place great emphasis on extremely safe and reliable solutions such as those provided by the Dresden University of Technology spin-off “Kernkonzept.” Kernkonzept has developed the L4Re system, an open source operating system / hypervisor for applications with special safety requirements. Today, L4Re is used in secure smartphones, laptop computers in governmental authorities, secure network infrastructures, eID solutions, cars, and many more.

CHAIN REACTION IN A SMALL CITY IN CENTRAL SAXONY

Hard to believe: When it comes to blockchain technology, the small city of Mittweida in Saxony is actually one of the leading locations. Its university founded the Blockchain Competence Center Mittweida (BCCM) in 2017. Here, scientists from various disciplines are working together with such partners from business as, for example, T-Systems, SAP, IBM, Deutsche Bahn, or Deutsche Bundesbank on such topics as the internet of things, booking systems, or digital identities. Yet not only research is conducted in Mittweida; another focus is on education: The university offers the bilingual master’s program “Blockchain and Distributed Ledger Technologies.” In Europe, similar programs are only available in Cyprus. Even Germany’s Federal Government has already an eye on Central Saxony. With its support, a showcase region for blockchain applications is underway here which is to set standards throughout the world.
The future belongs to autonomous, self-driving cars. Yet this requires the driver’s intelligence to be transferred to the vehicle. Preferably in conjunction with more accuracy and speed in the reaction. Software developers from Saxony equip cars and their assistance systems with senses, and train them to recognize the environment and defects. The Chemnitz-based startup SMART SOFTWARE FOR CARS equip cars and their assistance systems with senses, and train them to recognize the environment and defects. The Chemnitz-based startup SMART SOFTWARE FOR CARS.

Training instructions for robots – quickly and inexpensively thanks to the startup Wandelbots from Dresden. Programming industrial robots, that’s quite complex, time-consuming, and costly. Wandelbots provides a clever solution to this problem: The company founders are developing smart clothing which permits robots to be taught new work processes – without writing a single line of code. With the help of these jackets and gloves, it’s possible for everyone to simply show a robot how to carry out a task. Sensors register the movements of their wearers. A special software evaluates the captured data and generates from it the control program for the robot. Meanwhile, the first systems are on the market. The semiconductor producer Infineon already uses them in its production and Volkswagen is also one of the startup’s customers.

NAVENTIK, for example, has developed a software for precise orientation in dense urban traffic which compensates sources of interference and evaluates sensor data. This way, the position of a car can be determined even if the GPS signal is disturbed. Another example: On behalf of large automobile groups, the Chemnitz University of Technology spin-off Intenta develops solutions for automated environment recognition (e. g. of persons or the roadside) and makes them safe and reliable for the mass production of driver assistance systems.

Scripts for the Factory of the Future

... are written by such software developers from Saxony as SYSTEMA GmbH or AIS Automation GmbH. Both Dresden firms are system providers which not only make semiconductor fabs fit for the future. SYSTEMA analyzes, automates, and optimizes processes in production. Towards this end, the company integrates new plants and “trains” existing systems all the way to digitalization. AIS is also a full-range service provider of automation solutions for intelligent factories. For plant manufacturers, AIS has something special in store: Via an IIoT service platform with diverse apps, they can manage and monitor their “products” until they are finally used by the end customer. This permits a faster rollout and opens up new possibilities for “mobile” monitoring and plant support.

CLOTHES ARE THE BLUEPRINT FOR ROBOTS

A Prime Location for Startups

Saxony actively supports startups - with a wide range of founder contests and multifaceted technology funding.
AUTOMATION GADGETS
FOR EUROPE’S CHIP FactORIES

Many semiconductor producers from around the globe refrain from retrofitting their older 200 mm chip factories for the new 300 mm technology – too expensive. But to still be in a position to keep up with the productivity of the 300 mm fabs, many operators have the automation gaps in their factories closed. The Fabmatics corporation specializes in identifying automation gaps at Infineon, Bosch, and other clients and in closing these gaps with individually customized transport and robot technology. The company contributes its expertise to international development projects – for example, “Productive 4.0,” Europe’s largest research project in the digitalization sector.

TEST FIELD FOR “SMALL” DIGITALIZERS

For small and medium-sized enterprises, the hurdles on the way towards digitalization are incomparably higher than for the chip giants. Where to find the requisite knowledge for the implementation? What are the advantages for my company? Will it really pay off? They can get answers to these questions right behind Dresden’s central train station: Here, the HTW Dresden University of Applied Sciences has established an “Industrial IoT Testbed” together with business partners from Saxony – a highly automated test factory on a small scale. Engineers, managers, and employees can train how to use innovative process control software, acquire the requisite Industry 4.0 standards – and, above all, test if and how their company can switch to a highly automated, flexible, and networked production. Additional support is also provided by the Mittelstand 4.0 Competence Center for SMEs in Chemnitz.

After Bill has seen the world’s most automated production at Infineon Dresden, he wants to know why, of all places, the plant’s location is Saxony. But there’s reason for this, as he now knows: In Saxony, which has a long tradition as a vibrant mechanical engineering venue, there are software and system specialists who make factories fit for the future. After having just been in Chemnitz yesterday, he now rushes to northern Dresden to visit one of these specialists: “Aha, so it’s here where the systems are assembled that I saw earlier at Infineon.” Bill looks around in the assembly halls and sees how rollers turn into transport lines, how robots are briefed prior to their deployment in the cleanroom. “That’s so tecky, geeky cool,” he thinks to himself.

“But how on earth is this medium-sized enterprise going to equip the really big fabs…” He didn’t say it out loud, but his factory guide must have read Bill’s thoughts: “For the very big projects, we join forces with our partners from the Automation Network Dresden,” he explains. “One of our partners specializes in special machinery that closes automation gaps; others write the software that coordinates all these machines and robots.”

PARTNERS FOR SMART PRODUCTION

With a 200-year tradition, Saxony is the cradle of German mechanical engineering – and a powerful partner in automation today.
Due to its ultrashort reaction times, mobile communication of the fifth generation (5G) will permit the “tactile internet” in which humans and machines interact with one another without any noticeable delay. Someone who had anticipated this progress early on and who participated in the development of the requisite technological basis is Prof. Gerhard Fettweis. He heads the Vodafone Chair for Mobile Communications Systems at Dresden University of Technology, which was established in 1994 and has already excelled with LTE and other pioneering mobile communication technologies in cooperation with Vodafone. The Deutsche Telekom also supports 5G research in Dresden. Since 2016, the group has been financing the Deutsche Telekom Chair of Communication Networks at Dresden University of Technology, which is headed by Prof. Frank Fitzek. The chair heads the “Center for Tactile Internet with Human-in-the-Loop (CeTI),” an interdisciplinary and international research cluster which focuses on achieving a breakthrough in the field of human-machine cooperation.

**600 EXPERTS IN ONE LAB**

... this works surprisingly well in Dresden. Since 2014, the “5G Lab Germany” at the University of Technology in Saxony’s state capital has been the central hub of research which is conducted on the mobile communication technologies of tomorrow. In fact, as many as 600 scientists work here hand-in-hand, target-oriented, and successful on a single topic – supported by renowned industrial partners which include, for example, Vodafone, Deutsche Telekom, Nokia, Ericsson, Bosch as well as BMW and VW. Focusing on concrete 5G applications, the Dresden scientists also participate in such interregional development projects as “5G NetMobil” which pursues the objective of developing a real time communication infrastructure for the automated, secure, and efficient mobility in urban spaces. Within the scope of the major research project “National 5G Energy Hub,” they help utilize the 5G mobile communication standard for applications in building energy technology.

**THE POWER OF THE MANY**

Receiver and transmitter technology for mobile communication of the fifth generation is to consume little electricity, be reliable, and adjust to the current demand for data performance in the respective radio cell. Clever solutions which meet these high demands are the specialty of the developers at Airrays GmbH in Dresden. They don’t just install single antennas, but instead more than 100 micro antennas in the base stations. This permits the digital forming of the appropriate radio signal fields via software just as they are actually required. The Dresdeners have already convinced the big players of the branch with these concepts: The Deutsche Telekom has admitted the startup from Saxony to its “TIP Ecosystem Acceleration Center Germany” which promotes and advances innovation revolving around tomorrow’s network infrastructures.
THAT’S WHAT YOU NEED ON THE SCREEN!

Novaled GmbH is the only provider of organic dopants for the mass production of OLED displays on the entire globe. The knowledge and materials from Dresden can be found in virtually all smartphones and tablet computers with OLED displays. Rear lights for cars or organic solar cells use Novaled technologies as well. In August 2013, the company became a part of the South Korean Samsung Group which has been investing more than 25 million euros into the construction of the new Novaled headquarters in northern Dresden since 2017.

SUN WORSHIPPERS OF A SLIGHTLY DIFFERENT KIND

Engineers from Dresden have developed a technology which, for example, turns building facades into energy collectors. The Heliatek GmbH mass produces organic solar cells with a unique roll-to-roll procedure. Its solar foils are so wafer-thin, flexible, and, if required, also transparent that they adapt themselves to any surface: They cling to slender canopies and awnings, car bodies, house facades, and air-inflated structures; they can make entire homes energy self-sufficient. Heliatek is considered to be a global technology leader for these organic photovoltaic systems. The practical feasibility has already been demonstrated with numerous pilot projects in France, Singapore, China, Egypt, and other countries.

SAXONY’S PERFECT (ORGANIC) CHEMISTRY

With almost 40 companies and 20 research institutions, Saxony is considered to be one of the leading development centers for organic and flexible electronics. Here are just three examples of the many beacons in Saxony: Chemnitz University of Technology’s IPM Institute, for example, “prints” loudspeakers into “talking books;” engineers from the Fraunhofer Institute FEP Dresden develop micro displays for data glasses; and researchers from Dresden University of Technology’s Photonics Institute IAPP work on a new type of flexible retinal implants that will partly restore the eyesight of blind persons.
The Pros Behind It

... are the staff members of the Saxony Economic Development Corporation (Wirtschaftsförderung Sachsen GmbH). We’re promoting the business location Saxony with conviction. But we prefer to let our actions speak for themselves. We assist new business setups and company expansions, help develop new markets, and initiate networks between business and research.

You see, we give our very best for Saxony – and also for your project. Come and take a look behind the scenes: We’d love to hear from you! Call us at +49-351-2138 0.

www.business-saxony.com
Every third chip produced in Europe bears the label “Made in Saxony”.

11.6% share of Saxony’s industrial turnover

12.2% share of Saxony industry’s foreign sales

62,000 employees in Saxony’s microelectronics/ICT sector

of whom more than 52% work in the software sector

Follow our electronic tracks: www.business-saxony.com/micro or scan the QR code.