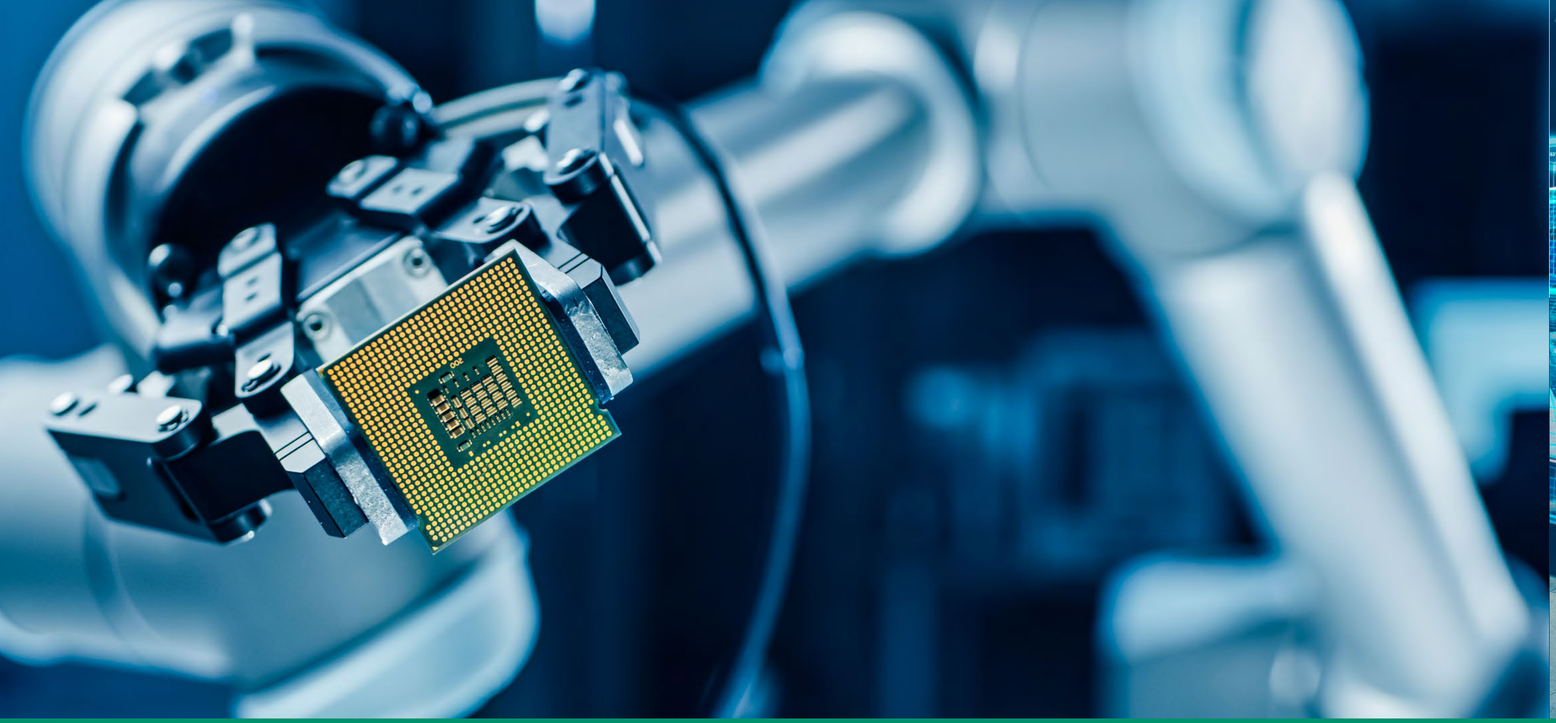

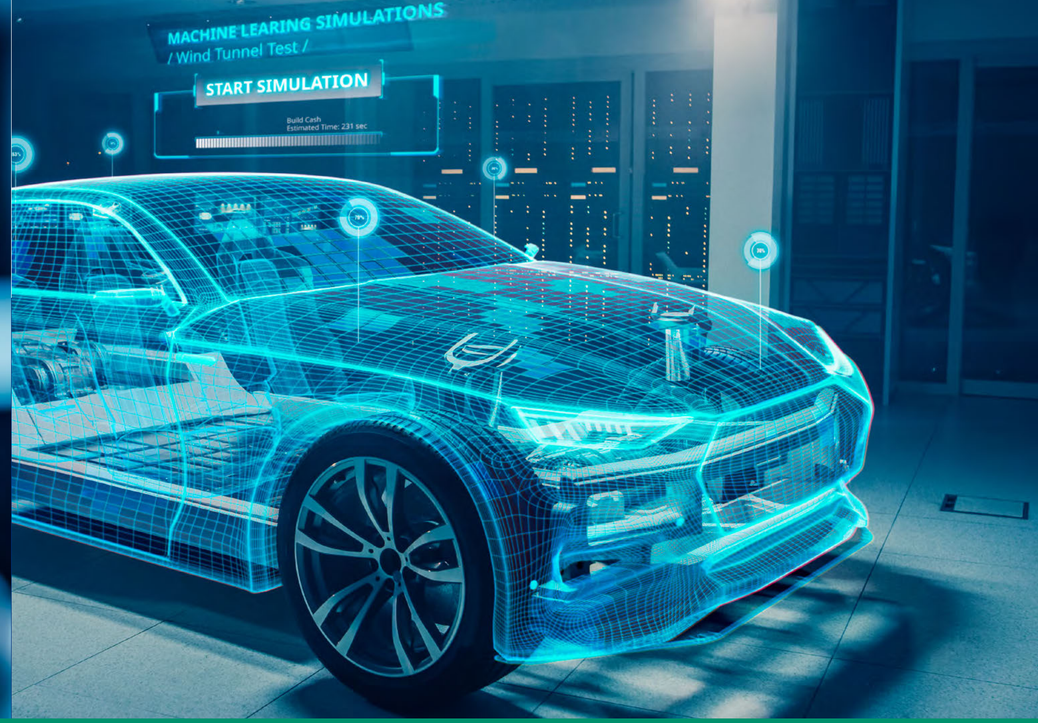

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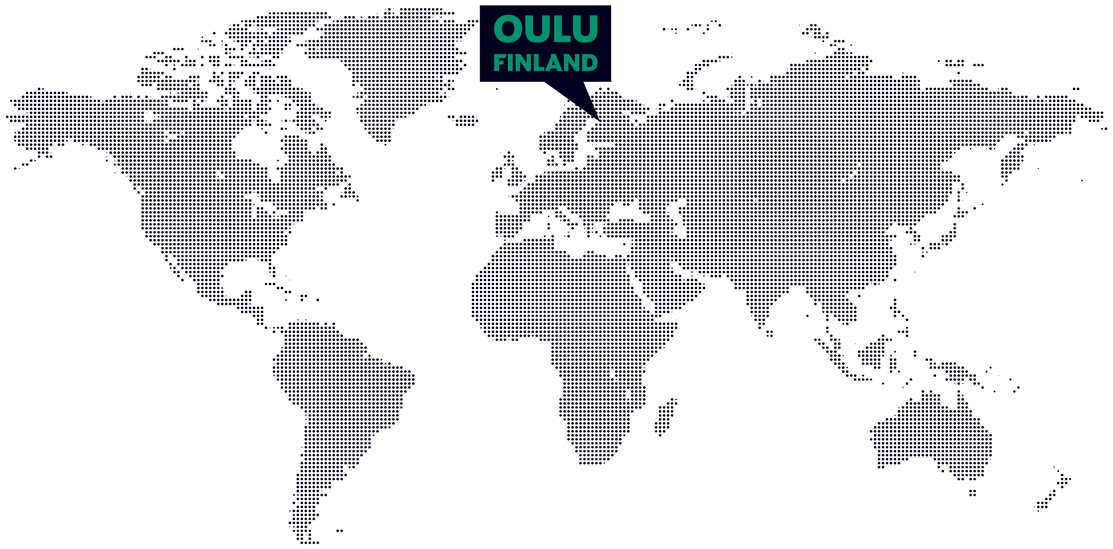
OULU FINLAND | CITY ON THE EDGE



Oulu – City on the Edge

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CITY ON THE EDGE

OULU OFFERS THE OPTIMAL ECOSYSTEM FOR CUTTING-EDGE ICT INNOVATION AND EXPERTISE. DURING OUR DECADES OF GLOBAL ICT LEADERSHIP FOCUSED ON TECHNOLOGICAL BREAKTHROUGHS AND SUSTAINABLE GROWTH, WE HAVE LEARNED THAT **OUR EDGE DOES NOT CUT – IT CREATES.**

WELCOME TO OULU – CITY ON THE EDGE.

OULU – EXCITING FUTURE OF ADVANCED INNOVATION

BALANCED **ON THE EDGE**

Oulu has pioneered cutting edge innovations across a broad range of technologies for decades. It has developed world-changing technologies in everything from all generations of cellular networks, self-powered locking systems, and fitness tracking technologies to the world's smallest processor and paying for things with your phone.

City of only 200,000 people, on the edge and surrounded by pristine nature. Of course, being on the edge is never just about the location. It is always an active journey – one requiring careful attention to balance and a constant awareness of shifting environmental forces. Oulu led the global development of 5G technology and is already spreading the future of 6G.

FOUNDATION **FOR SUCCESS**

The City boasts a 50-year history of **expertise in high technology** and working together to make things happen.

While Oulu's impressive record of innovation is often noted, the reasons for this success are not as well known, partly because they flow from a wide range of factors.

Oulu´s winning recipe combines major technical research universities, a thriving, highly collaborative ICT business sector, and a safe, affordable community that supports a healthy work-life balance. The recipe also includes a youthful spirit and optimistic vision for the future.

Today, Oulu's ICT sector is stronger and more vibrant than ever.

FOUNDATION **FOR SUCCESS**

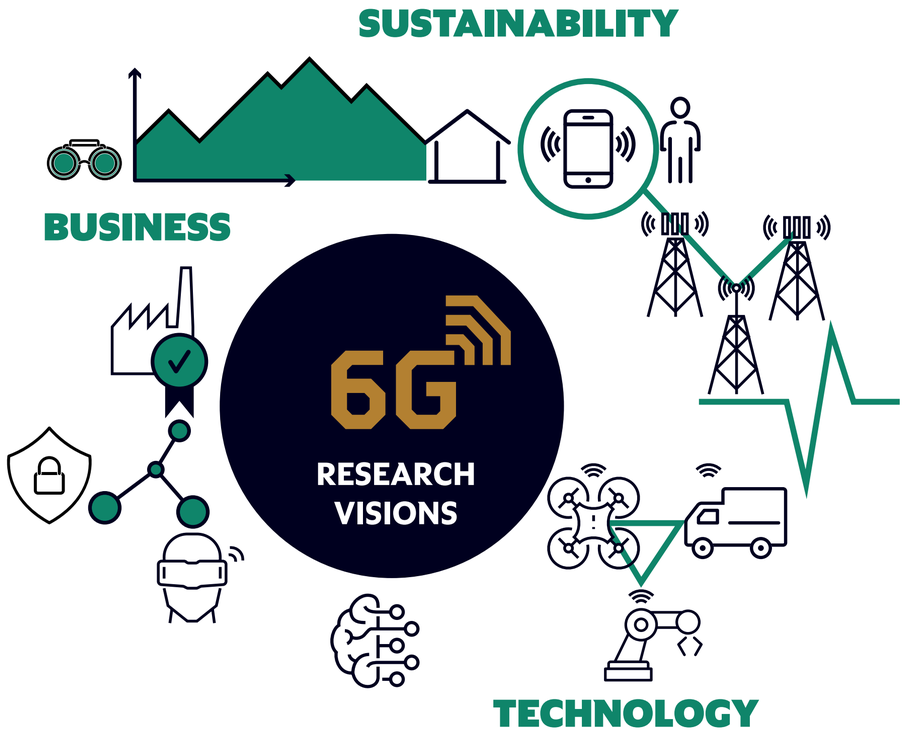
Right here novel ideas are developed into **market-ready products**. The innovations related to modems, chipsets, terminal devices, information systems, cloud services and artificial intelligence are based on 5G, the development of which Oulu led. And Oulu is already spearheading the future of 6G.

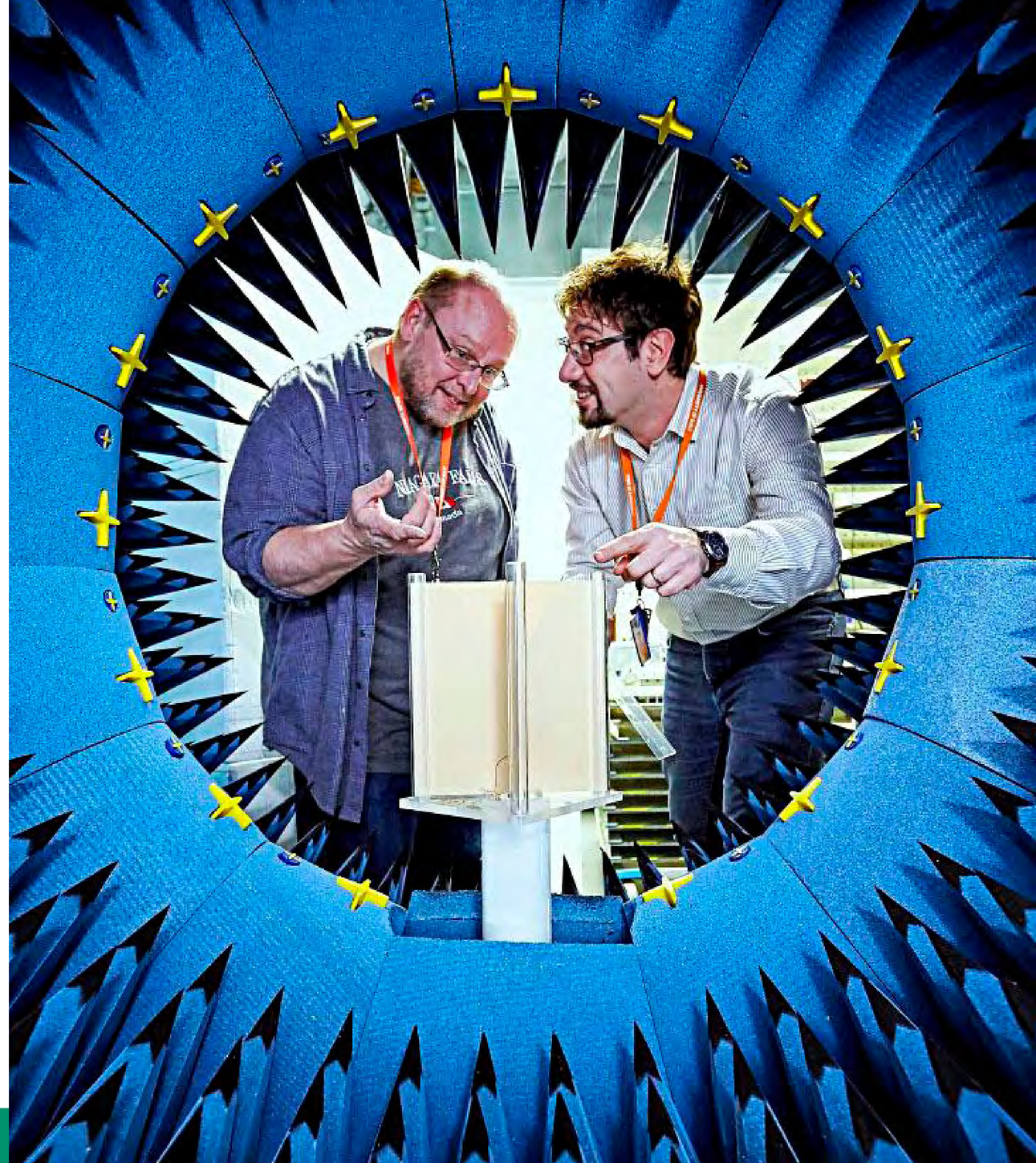
Looking toward the future, many predict Oulu will establish itself as a northern **hub of R&D** in the **automotive sector**, with a recent interest from several global players in the industry. Like in the past, we will have a leading role in the progress of global innovation in the future as well.

LEADING ROLE

in the progress of global innovation

6G ECOSYSTEM CREATES OPPORTUNITIES FOR NEW BUSINESSES THROUGH





INPUT: STRATEGIC RESEARCH AREAS AND 5G/6G TEST NETWORK

- Wireless Connectivity Solutions
- Device and Circuit Technologies
- Distributed Intelligent Computing
- Vertical Applications and Services

6G FLAGSHIP GOALS

- Support Industry in Finalising 5G
- Develop Fundamental Technology for 6G
- Speed Up Digitalisation of Society via 5G/6G

OUTPUT: 5G/6G COMPONENTS AND SYSTEMIC MODELS

IMPACT

SHORT TERM: Applications and Services in Verticals

- Health
- Industry
- Automotive
- Energy

LONG TERM: Business and Societal Well-Being

- 5G Driven Digitalization
- 5G Enabled Growth and New Jobs
- Commercial 6G by 2030

RESULTS

Science: >1,100 peer-reviewed publications, 46 doctoral degrees, 6G Wireless Summits, Global 6G Research Vision and 6G White Papers, sustainable 6G supporting UN SDGs.

Ecosystem: Global leadership in 6G research and ecosystem, >800 joint publications with collaborators, >130 new company collaborators, 85 companies investing in research portfolio.

VISION

Data-Driven Future Society Enabled by Near-Instant, Unlimited Wireless Connectivity.

6G FLAGSHIP
UNIVERSITY OF OULU

6G ECOSYSTEM CREATES OPPORTUNITIES FOR NEW BUSINESSES THROUGH

www.6gchannel.com/6g-white-papers/

World's first 6G White Paper

5gtn.fi

Testing facilities for future wireless technologies and solutions

6Gflagship.com

University of Oulu is implementing the world's first 6G research program – **6G Flagship**

www.oulu.fi/6gflagship/joinecosystem

Global 6G Flagship collaborator **ecosystem** – welcome to join!

Matti Latva-aho
6G Flagship Director
Academy Professor, Professor of Communications Engineering

OULU'S WINNING RECIPE COMBINES

Major **Technical Research Universities**

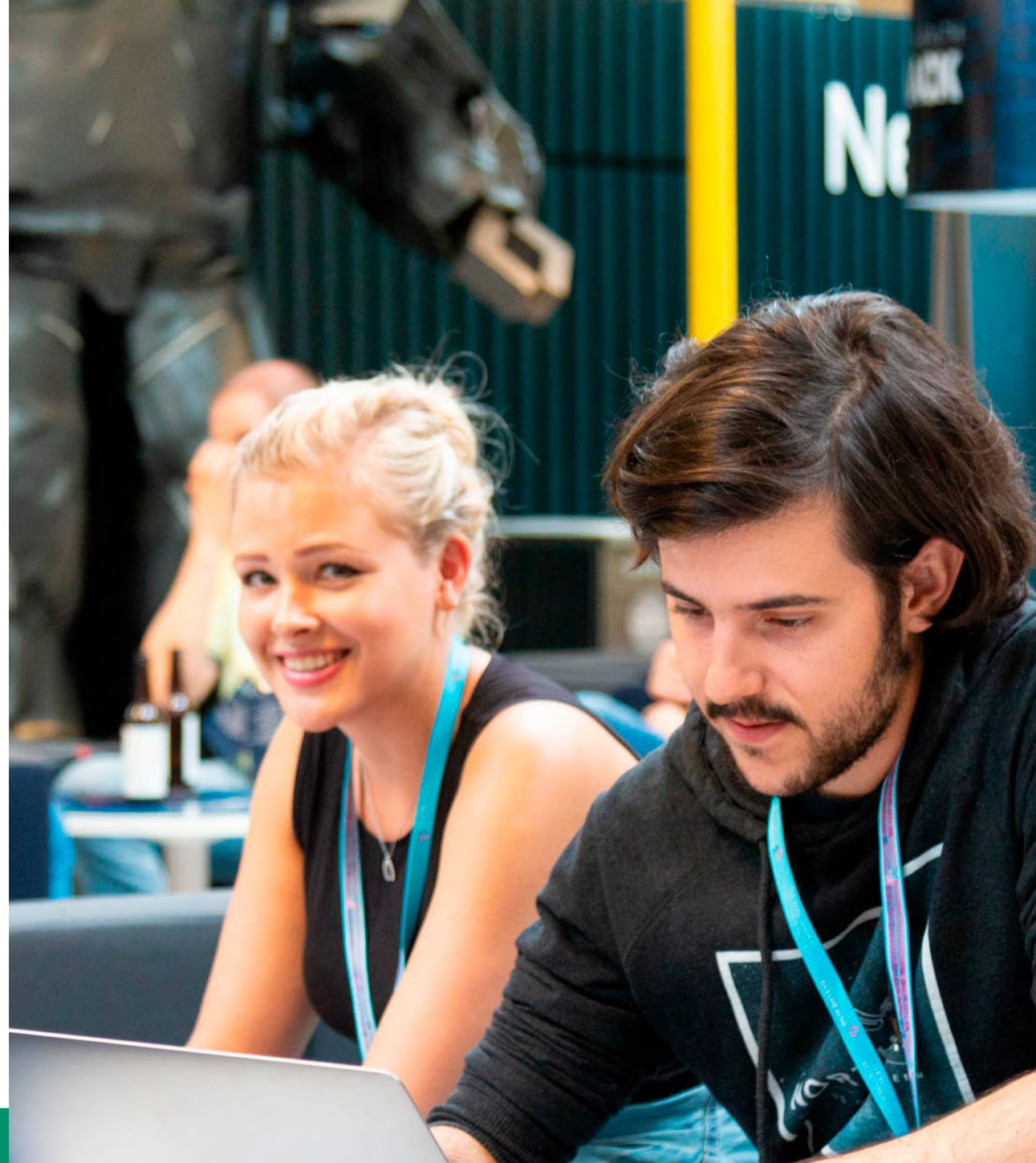
A Thriving, Highly **Collaborative ICT Business Sector**

A Safe, Affordable Community that Supports a Healthy Work-Life Balance

An **Optimistic Vision of the Future**

A **Youthful Spirit**

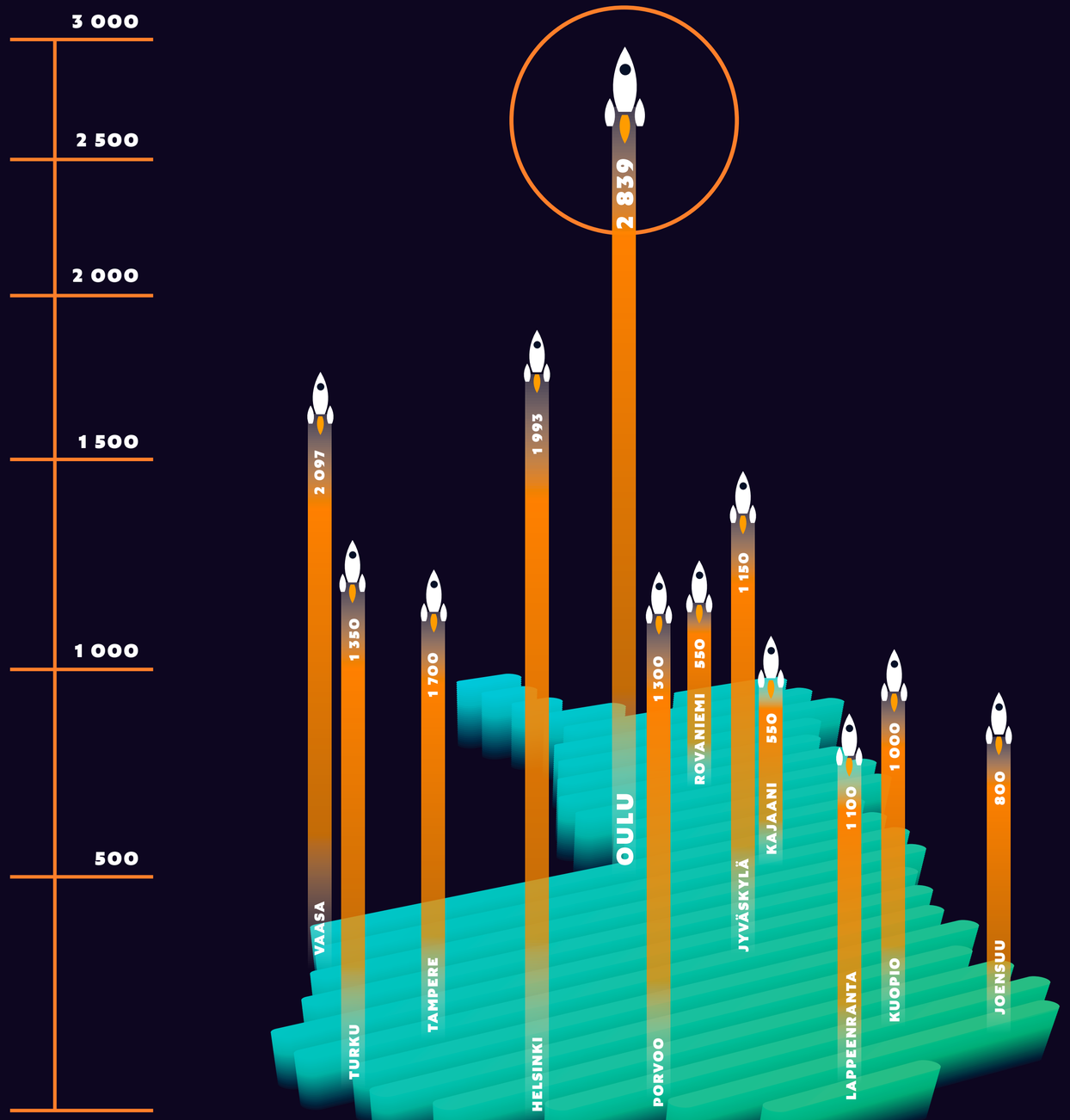
Global surveys routinely name Finns as **"the happiest people in the world"**, and Oulu currently has one of the youngest populations of any city in Europe.



BALANCED **ON THE EDGE**

Oulu stands at just the right distance from big city traffic, distractions and costs, allowing to focus effectively on technological breakthroughs and long-term business strategies.

Being on the edge is never just about the location. It is always an active journey – one requiring careful attention to balance and a constant awareness of shifting environmental forces.



#1 IN FINLAND, R&D EXPENDITURE PER CAPITA IN 2018

Oulu	2 839
Vaasa	2 097
Helsinki	1 993
Tampere	1 700
Turku	1 350
Provoo	1 300
Jyväskylä	1 150
Lappeenranta	1 100
Kuopio	1 000
Joensuu	800
Rovaniemi	550
Kajaani	550

OULU:
Finland

3-hour drive to
the Arctic Circle

Surrounded by
pure nature

3-hour flight
to Central Europe

The fastest route
from Europe to Asia

Oulu Metropolitan Area:
250 000 people, 120 nationalities

#1 in R&D investments in Finland,
among the top in the EU

1 in 3 people
with a university degree

50-minute flight from/to Helsinki
#2 in Finnish airport traffic

300–400 million EUR city centre
development projects

710 M€ will be invested in the infrastructure
development by the City of Oulu in the coming years

37.6 is the average age of the people in
Oulu – that is one of the youngest in Europe

OULU'S TRACK RECORD IN WIRELESS WORLD

1981
FIRST **NMT** NETWORK

1982
EUROPE'S LARGEST **TECHNOLOGY PARK**

1991
FIRST GSM PHONE CALL; FIRST REMOTE PAYMENT SYSTEM FOR PUBLIC TRANSPORT

1992
WORLD'S FIRST **GSM** BASE STATION

1993
NEW **MENU-DRIVEN USER INTERFACE** FOR MOBILE PHONE

1996
FIRST **WCDMA** TELEPHONE CALL

2001
FIRST **SECURITY PRODUCTS** FOR MOBILE PHONES

2002
FIRST **SECURITY OTA SERVICES** FOR MOBILE PHONES

2003
FIRST **FREE** URBAN AREA **WLAN NETWORK**

2004
FIRST COMMERCIAL **EDGE** HIGH-SPEED NETWORK

2005
FIRST PUBLIC **NFC** USER

2007
LAUNCH OF **MOBILE WIMAX** TEST NETWORK

2008
FIRST **PEDESTRIAN NAVIGATION** PHONE

2009
FIRST **CLOUD BASED** MOBILE SECURITY SERVICES

2010
LINUX PHONE LAUNCH; WORLD FIRST **COGNITIVE RADIO NETWORK** PHONE CALL

2011
WIFIUS – HIGH CAPACITY NEXTGEN **COGNITIVE RADIO SOLUTION**

2012
WORLD'S FIRST IN **PRINTED INTELLIGENCE**

2013
THE FIRST **UBIQUITOUS INDOOR** POSITIONING SOLUTION

2014
FULL IMPLEMENTATION OF **LI-FI**; THE FIRST **TWO-FRONT SMART PHONE** WITH INBUILT ELECTRONIC PAPER DISPLAY

2015
PLANNING AND IMPLEMENTATION OF TWO **5G TEST NETWORKS**

2016
TRANSFORMING **HEALTH CARE WITH 5G**

2018
6G FLAGSHIP
251 M€ FUNDING
FOR 2018-2026

2019
ESTABLISHED **AUTOMOTIVE** CLUSTER

2020
6G
FLAGSHIP
UNIVERSITY OF OULU

OULU

A SUPPORTIVE ECOSYSTEM

OULU HAS ONE OF THE YOUNGEST AND MOST HIGHLY EDUCATED POPULATIONS IN EUROPE:

37.6

YEARS IS THE AVERAGE AGE IN OULU

1/3

PEOPLE HOLD A UNIVERSITY DEGREE

A TRIPLE-HELIX **OF SUPPORT**

By trusting their proven strengths, Oulu's companies, universities, and city planners know how to pull together and work hard to support, nurture and continuously transform their local ICT ecosystem into something even better than what it was in past eras.

The crazy part? It works.

A triple-helix of support – the business sector, the local universities, and the entire community – has created a successful ICT business environment that many other cities envy.

ALREADY INVESTED IN OULU

What this means for a company investing in a new R&D facility in Oulu, or **for a start-up?**

They can **count on expert support and key resources** during their onboarding. There are highly successful programs that actively match companies with the right suppliers, subcontractors and collaborators.

In fact, a solid majority of ICT companies locating to Oulu continue to invest and grow their presence here.

NOKIA Qualcomm MEDIATEK SONY ARM

telenor NORDIC SEMICONDUCTOR KEYSIGHT TECHNOLOGIES TEXAS INSTRUMENTS Continental

POLAR KONICA MINOLTA ROHM SEMICONDUCTOR F-Secure SANMINA

TRUST IS THE KEY

Leading Taiwanese semiconductor maker MediaTek made the jump to Oulu just five years ago when they set up a major R&D facility here. Their easy-going, quietly insightful R&D director and site manager Ville Salmi has played a part in this successful initiative – every step of the way.

– Ville Salmi, Mediatek –

TRUST IS THE KEY

When asked about this journey, in his typically modest Finnish style Salmi puts the spotlight directly on the city he loves: “What we can count on from Oulu in one word is ‘Innovation’. The company invested here because they wanted to be where the best available talent and experience is. With Oulu, you have all the building blocks: the great tech universities that deliver the talent and relevant research – plus brilliant businesses providing end-to-end expertise in radio communication development.”

Salmi continues, “Our Oulu professionals are quite loyal, and of course the high retention rate is a big plus for us as well. Related to this, the level of trust and respect here is quite valued – which means professionals from different organisations trust and share more easily.” Of course, as Finns are also famously discrete, Salmi confirms that the lines of privacy between corporations are also respected: “Our engagement with other leading players here has been very positive and highly collaborative.”

Salmi is quick to point out that local collaboration extends well beyond just the corporate players in his community. “In Oulu, the public schools extensively collaborate with the city’s ICT sector. Over just the past two years, thirty local ICT companies and the University of Oulu have hosted almost 5OOO school kids to learn more about what a career in the ICT sector can be like.”

Bottom line? After arriving in Oulu just five short years ago, MediaTek feels fully integrated into the thriving local ecosystem – thanks partly to the efforts of one rather modest local guy – Ville Salmi. As he puts it himself, “Trust is the key.”

OULU

GATEWAY TO THE ENTIRE GLOBE

3 BILLION

EVERY DAY, 3 BILLION PEOPLE USE INNOVATIONS THAT HAVE BEEN DEVELOPED IN OULU, AND 60% OF GLOBAL MOBILE PHONE TRAFFIC UTILISES NETWORK TECHNOLOGIES DEVELOPED IN OULU.

GLOBAL MARKET SPRINGBOARD

As an established player in the world market, Oulu understands that its **location** on the northern edge of the Bay of Bothnia **is rather unique.**

But it is also well understood here that Oulu, with its wealth of export-based technology companies, shares a **common border** with the **entire world.** There is a strong spirit in Oulu that is easy to sense – the idea that all Oulu start-ups are “global-born”.

Of course, the results speak for themselves and Oulu´s impressively long record of export-oriented business success is where the city really starts to shine.

GLOBAL MARKET SPRINGBOARD

ICT companies with offices and factories in over 40 countries have now established a presence in Oulu, and this number continues to grow. All Oulu **start-ups are global-born**.

In fact, they will tend to bundle Oulu's edgy location with other local advantages, including overall costs that are lower than other tech hotspots, a strongly supportive ecosystem including the local universities, business, and political leadership, and **one of the cleanest, safest and best-run cities on the planet.**

POLAR
IndoorAtlas
Bittium
KNL
TACTOTEK
TOSIBOX
UROS
SPECIM SPECTRAL IMAGING
FINGER SOFT
iLOQ
ŌURA

REASONS TO CHOOSE OULU

A true globetrotting Finn, Jussi Harvela knows an innovative tech city when he sees one. After 25 years of working in some of the world's cutting-edge ICT hotspots – including ten years in Silicon Valley – Harvela is the CEO of Oulu-based TactoTek, the global leader in injection-moulded structural electronics mainly operating in the automotive sector.

– Jussi Harvela, Tactotek –

REASONS TO CHOOSE OULU **OVER ANYWHERE ELSE**

So, what are the reasons for choosing Oulu over any other place in the world? “For starters,” Harvela points out, “Oulu is one of the top three global hotspots for printed intelligence, and so you have an ecosystem providing the technical know-how crucial for our type of company. And it is more strongly oriented toward supporting companies than any city I have got to know. They even provide a platform for actively matching up local companies in ways that support their mutual success.”

Harvela highlights other key factors that seem sure to extend Oulu’s long record of global ICT leadership. “What I hear from many of the companies we work with is that when they come to Oulu it has everything they need, including a wealth of first-rate engineers – thanks to the number of advanced technology vendors locally, and our world-class technical universities and research organisations.”

While he’s a true global professional, Harvela is also true to the Finnish style of sometimes saying things a bit bluntly: “I think ’export’ is not the best term. Every company needs to think globally from the get-go. We are part of the global market, and there are beautiful technologies that need to be shared with the world. For many reasons – including but not limited to our deep experience and wealth of great engineers – Oulu is simply one of the best places from which to do the kind of technological development we do.”

SAFELY ON THE EDGE

ONE OF 13

LISTED AS BEING ONE OF 13 ‘BRAIN BELTS’ AROUND THE GLOBE, OULU HAS BECOME A HUB THAT ATTRACTS THE WORLD’S SMARTEST PEOPLE.

WAY OF **WORKING**

World-class ICT professionals are ambitious, and often will choose a more interesting position over one that provides less challenge.

They are also attracted to places that offer long-term opportunities fortheir skill sets. Another common trait is that they value efficiency, transparency, a minimum of bureaucracy, and a safe and peaceful community.

These characteristics are precisely what thousands of ICT professionals have found when **they relocated to Oulu**.

WAY OF **WORKING**

Finns can sometimes be quieter than folks from other regions. Yet, thanks to core Nordic values like **loyalty and trust**, once you get to know each other, you often have a trusted friend for life.

When you team this up with the unique Oulu spirit of pro-active entrepreneurship, and a real openness to engaging internationally – you have a winning combination.

Oulu is the place where you can develop something amazing that impacts the entire world:

WAY OF **WORKING**

In Oulu, professionals love to work hard, but they also embrace the importance of a healthy and dynamic **work-life balance**. Working hours tend to be shorter than in many other countries, and what Oulu ICT professionals do with their free time often involves the nature surrounding them.

Another Nordic value, which some suggest Oulu has raised to a new level, is a **vital sense of shared community** responsibility and success. Within the workplace, between companies, and in the larger community as a whole, there is a strong sense that “we’re all in this together”.

There is an understood basic respect for others; for their ideas, their privacy, their personal beliefs, and for the work they do.

WAY OF **LIVING**

The northern Finnish wilderness practically begins at one's doorstep, with lots of great options for outdoor activities – or simply lounging next to an idyllic lake on a long midsummer evening after a traditional Finnish sauna.

There are nearly **900 kilometres** of well-maintained cycleways in the city area, the vibrant university scene and youthful population keep things lively culturally, and Oulu's universities are known worldwide for promoting innovative programs in science and technology.

Oulu is a city in which you can get anywhere by bicycle in just **20 minutes.**

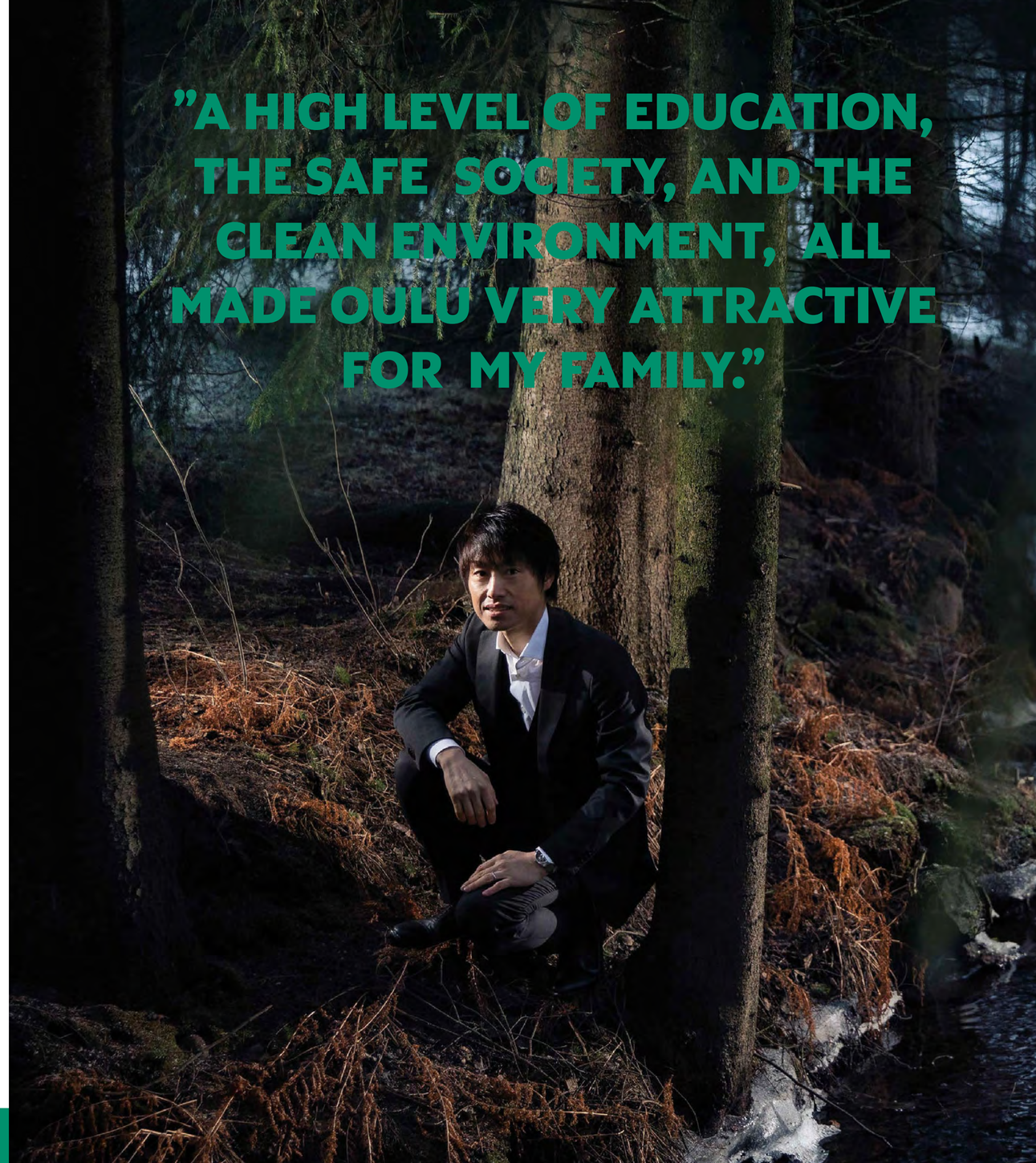
52.8%

OULU BOASTS AN ENVIABLE COST OF LIVING COMPARED TO OTHER TECH HOTSPOTS – IN SAN FRANCISCO IT IS 52.8 % HIGHER THAN IN OULU.

WORKING **GLOBAL** – FEELING **LOCAL**

It is often pointed out that Japanese and Finnish culture have certain things in common. Both tend to respect privacy, value nature, emphasize the collective good – and are world leaders in electronic innovation. Even so, moving with your wife and young family from Osaka – one of the largest cities in Japan – to Oulu, Finland requires some serious lifestyle adjustments.

– Koki Okada, ROHM –



REASONS TO CHOOSE OULU **OVER ANYWHERE ELSE**

Koki Okada, Director of ROHM Finland's Software Development Centre in Oulu not only made this professional move four years ago, he seems to have done so with impressive ease – and enjoyment. A consummate company man, Okada speaks easily and enthusiastically about how much Oulu offers a leading innovator like ROHM, pointing out, "Because of our role in the mobile communications industry, we already knew of Oulu's global reputation in the sector, including that there were many great, well-trained engineers. The productivity of Finnish engineers is good, even though their weekly work hours are lower than in many other countries. They are very efficient with their working time, so what they produce is as good – and often better – than in other places."

When it comes to his personal and family experience of Oulu, Okada is equally enthusiastic. "My wife and I both love it here! We value the quality of Oulu's schools for our two young daughters, who are now five and two. And the city is very clean and safe, with wild nature practically just out our front door." He enjoys travelling around Finland with his family, going to sauna and snowboarding, but confesses he has not yet tried ice swimming.

Regarding professional opportunities, while Okada makes it very clear he plans to continue his leadership role with ROHM in Oulu for at least another four years, he sees how many opportunities there are to evolve here professionally within a company and also by moving from one company to another – for those with the right skill sets.

Of course, there are always some challenges to raising a family far from home. "Some Japanese food is still hard to find in Oulu, so we do order some of our favourite delicacies from back home." Never one to dwell on the downside, Okada adds: "We've enjoyed spending time in a Finnish summer cottage – just like Finns!"

PAST, PRESENT & FUTURE

At the end of the 1980s, Finland welcomed one of the largest waves of refugees in its history, offering safe haven to around 800 Vietnamese boat people. Among them was a 6-year-old girl. Now, three decades later, that same girl is Head of Business Segment Core & Partner Products at Nokia Global Operations. This is the true story of success in the most unlikely of circumstances. Her name is Trang Vu, and Oulu is her home.

Oulu and Vu have a lot in common; both have deep ties to Nokia, and both have overcome challenges in the past to carve out exciting futures. Whilst success cannot be built on hopes and big dreams alone, Vu believes they have been essential for the city, "You have to be ready to work for it more than you hope and dream for it. In Oulu, we definitely have it." Reflecting on Nokia's change of strategy in 2014 and how it threatened to throw the city into turmoil, Vu praises the attitude of the people. "Success is always measured by how you rise," she says. "And when faced with disaster, you need to decide if you fall or rise. In Oulu, when it seemed Nokia were falling, people decided 'we will rise!' – this gave them the confidence to trust in the future because they have survived disaster."

"PEOPLE ARE SMART. THEY SEE, THEY HEAR... THEY FEEL. THE ATMOSPHERE IS VERY OPTIMISTIC FOR THE FUTURE OF OULU."

– Trang Vu, Nokia –

PAST, PRESENT & FUTURE

Finns are known to be introverts, small talk is not a strength here, but a small word is, ‘sisu’ – a word with no literal English translation that speaks of resilience and determination. This quality is what Vu believes has been essential to Oulu’s success, “We have great teams, [when Nokia faced a crisis] they went to restaurants to figure out what to do next. With great individuals, combined, this kind of story can be told... of how, because people came together, our ecosystem is now stronger than ever!”

Vu believes that actions speak louder than words and sees this being practised every day in Oulu, “Here, people perform instead of talking,” she says, then follows with some straight talk: “Some say ’it’s complicated.’ No, it’s not. We are all here, we are solving problems. We are solving problems with other people.” It is this unique atmosphere of cooperation and collaboration that Vu claims will be the foundation of future success, in Oulu, and beyond. “Alone we can do something, but together we will change the world!”

– Trang Vu, Nokia –

WHETHER YOU ARE A DEDICATED ENGINEER LOOKING FOR A WORLD-CLASS TECH ENVIRONMENT WITH PLENTY OF CHALLENGING OPPORTUNITIES,

A COMPANY LOOKING FOR THE PERFECT LOCATION FOR YOUR NEW R&D FACILITY,

OR A FIRM THAT WANTS TO EXPORT SEAMLESSLY THROUGHOUT THE WORLD

WELCOME TO OULU – THE CITY ON THE EDGE

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