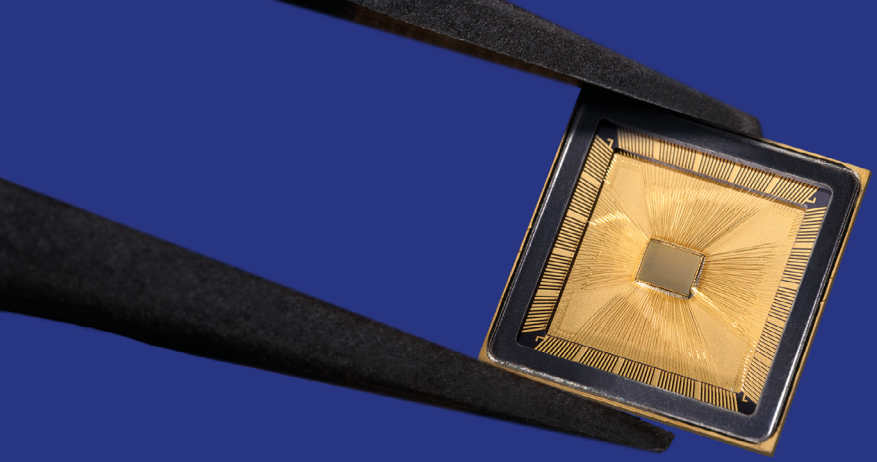
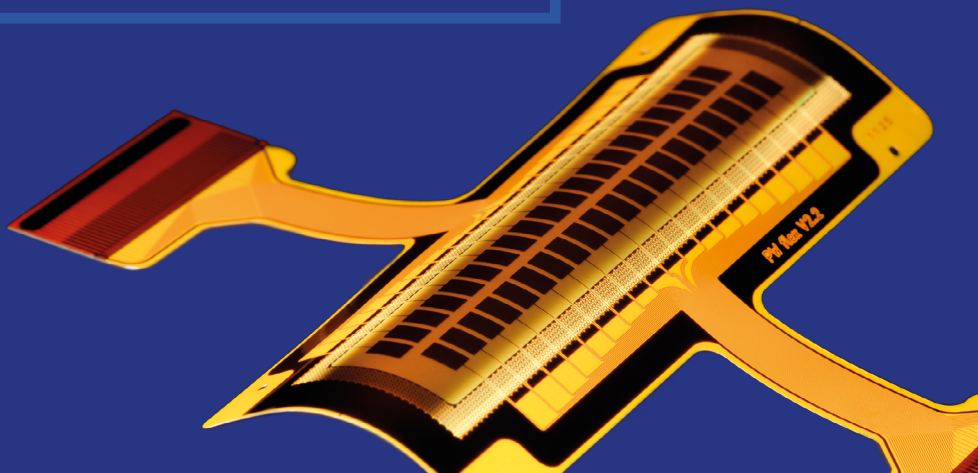


Holst Centre
by imec & TNO

Celebrating 20 years

Sparking New Industries



2025

Executive Report

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Message from the Managing Directors

The breakthrough technologies that will define 2045 are being developed today. Flexible and 3D-printed electronics, neuromorphic computing, edge technologies, photonic integrated circuits, and quantum technologies. At Holst Centre, we provide the spark for the industries of tomorrow.

For 20 years, we've done what few others can: transform complex R&D into thriving businesses. Through spin-offs like FononTech and LionVolt, we fill value chain gaps and create entirely new markets. Axelera AI and eyeo, amongst others, are set to do the same.

Our Gen2 Edge AI chips enable IoT applications that were impossible before. Glass interposer technology will reshape data centre efficiency at scale. Selective Peripheral Nerve Stimulation (sPNS) and smart wound care will revolutionise healthcare management and patient care. Each of these represents both our technical achievement and the infrastructure that companies will build upon.

The combined strength of imec and TNO makes it happen. The ability to move from concept to commercial reality faster than conventional paths allow. When our partners find the cost and complexity too prohibitive to tackle alone, they turn to us. And we offer more than R&D expertise – we offer certainty. We are building the technologies the next generation will depend upon.

Twenty years in, and we're just getting started.

Ton van Mol
Managing Director, TNO at Holst Centre

Jesse Robbers
Managing Director, imec at Holst Centre

> 'Sparking new industries isn't just what we do – it's who we are. We turn complex innovations into thriving industries. As national strategies take shape, Europe will need organisations that can deliver on the ambitions within them.
> **We've been doing exactly that for 20 years.'**

Facts & Figures 2025

21
Collaborations
in the Netherlands

39
Total number of
Partnerships

183
Dutch Partnerships within
funded projects (EU and national)

78
Submissions
to EU-funded calls

60.5
Turnover (in m€)

73
Ongoing
funded projects

Talent and ecosystem growth metrics

10
Part-time
Professors

280
FTEs

44
Master's students
& interns

4
PhD students

49
Publications
(Peer-reviewed)

33
Patent
filings

General Highlights

Holst Centre photonics lab opens

In 2025, Holst Centre opened its dedicated photonics laboratory, strengthening its capabilities in photonic integrated circuit design, testing and system integration. The new lab supports faster prototyping and closer collaboration with partners across the photonics value chain, reinforcing the Netherlands' position in integrated photonics.

Read more about the Holst Centre photonics lab opening

Innovation Day 2025

Innovation Day 2025 brought together industry, academia and public stakeholders to explore how collaboration accelerates technological impact. The event highlighted cross-domain innovation at Holst Centre and reinforced the importance of open ecosystems in addressing societal and industrial challenges.

Read more about Innovation Day 2025

ChipNL Competence Center

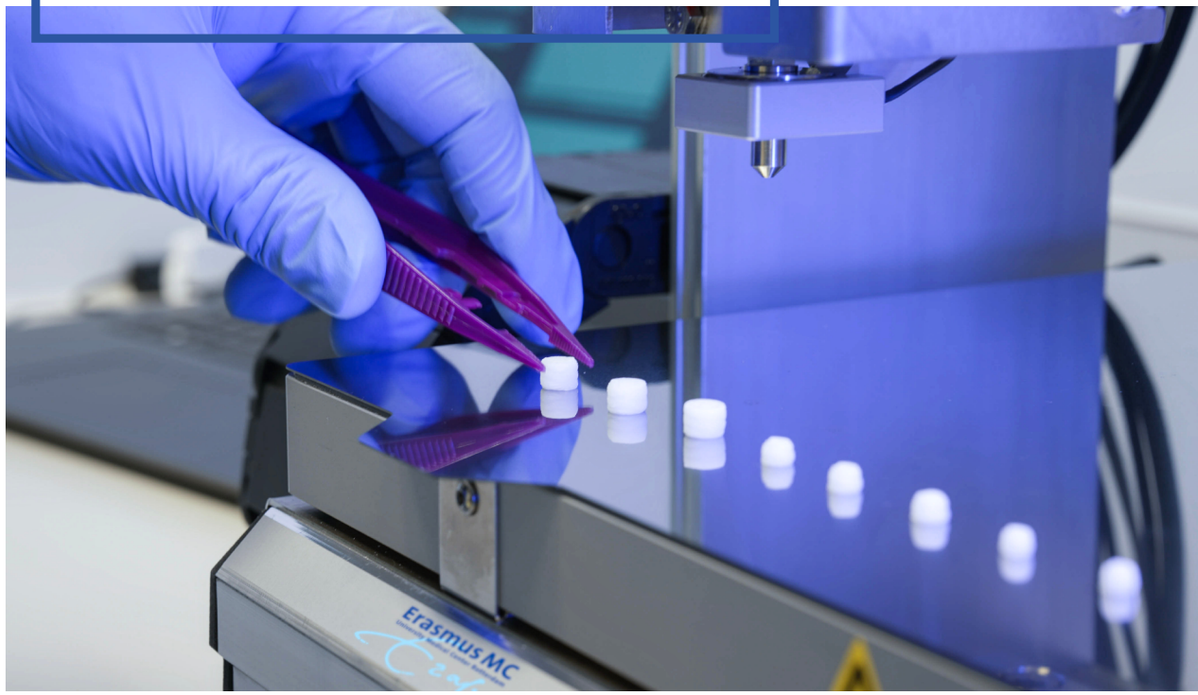
Through the ChipNL Competence Center, imec (IC-Link by imec) and TNO continued to support the Dutch semiconductor ecosystem. The center strengthens national capabilities in chip design, advanced packaging and heterogeneous integration, connecting research excellence with industrial needs.

Read more about ChipNL Competence Center

3D pharma printing

TNO at Holst Centre is advancing 3D pharmaceutical printing to enable more precise, flexible, and patient-specific drug delivery systems. This advanced system reduces pharmacy burden and enables swift preparation of medications tailored to individual patient needs. It supports a shift toward personalised treatments, where dosage and formulation can be adapted rather than standardised. A printer was installed at Maasstad Ziekenhuis in Rotterdam, and patient trials are expected to begin in mid-2026.

Read more about 3D pharma printing



Imec at Holst Centre and Feinstein explore novel interferential stimulation

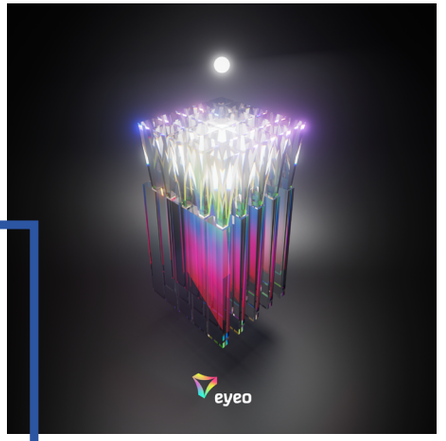
Imec at Holst Centre and the Feinstein Institutes explored a novel interferential stimulation approach, combining advanced electronics with biomedical research. This collaboration opens new pathways for non-invasive neuromodulation and future therapeutic applications.

Read more about Feinstein interferential stimulation

Launch of eyeo spin-off

Imec launched eyeo, a spin-off that reimagines image sensing through breakthrough nanophotonic technology. Instead of conventional color filters, which discard up to 70% of incoming light, eyeo's vertical waveguide architecture splits light directly into individual pixels, tripling sensitivity and doubling native resolution. In May 2025, eyeo raised €15 million in seed funding to develop evaluation kits and scale manufacturing of its first sensor product.

Eyeo strengthens Europe's deep-tech ecosystem by accelerating commercialisation and turning long-term research into tangible market impact.



Read more about the eyeo spin-off

EU Chips Act pilot lines: NanoIC and PIXEurope

The Chips Joint Undertaking is accelerating Europe's semiconductor capabilities through advanced pilot lines. PIXEurope focuses on photonic chip technology, enabling high-speed data processing for communications, computing, and quantum systems.

In parallel, the NanoIC pilot line strengthens Europe's position in nanoelectronics, supporting the development of next-generation integrated circuits with improved performance, efficiency and scalability.

Together, these pilot lines cover full innovation chain, from design to fabrication, testing, and system integration. With contributions to the NanoIC pilot line from imec in Leuven and the PIXEurope pilot line from TNO in Eindhoven, these pilot lines enable faster prototyping, reliable validation, and a clear path toward industrial-scale production in Europe.

Read more about NanoIC

Read more about PIXEurope

Dai Nippon Printing joins Holst Centre

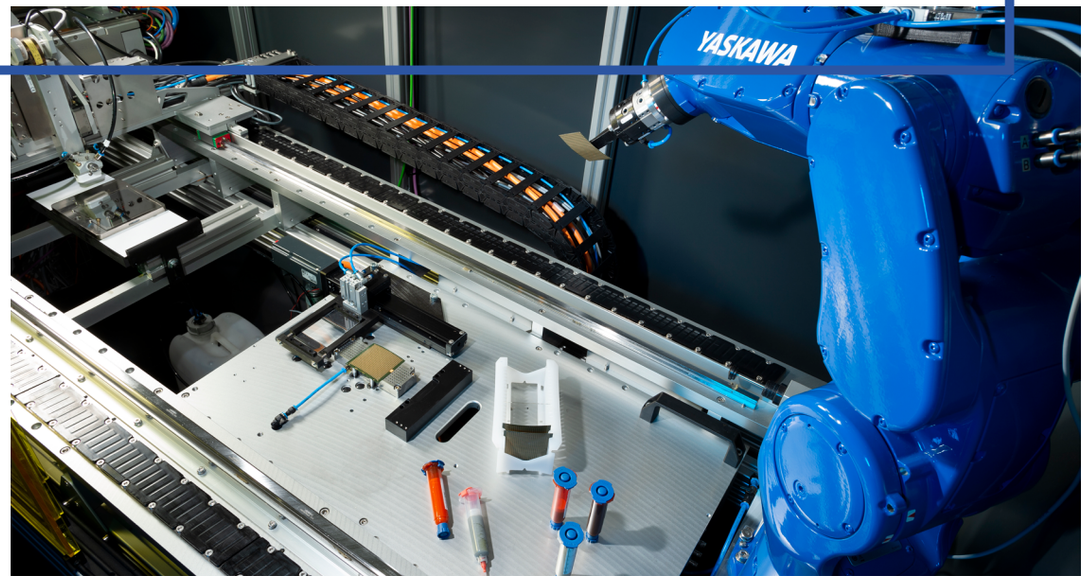
In a new partnership with TNO at Holst Centre and the Photonics Integration Technology Centre (PITC), DNP is advancing ultra-fast data processing with reduced energy consumption. By combining DNP's expertise in microfabrication and coating with TNO's applied research and PITC's integration capabilities, this collaboration forms a strong innovation engine for sustainable economic growth, pushing the boundaries of co-packaged optics for faster, more energy-efficient semiconductor applications. This development highlights the strength of the Dutch integrated photonics ecosystem and reinforces the Netherlands' position as a global innovation hotspot.

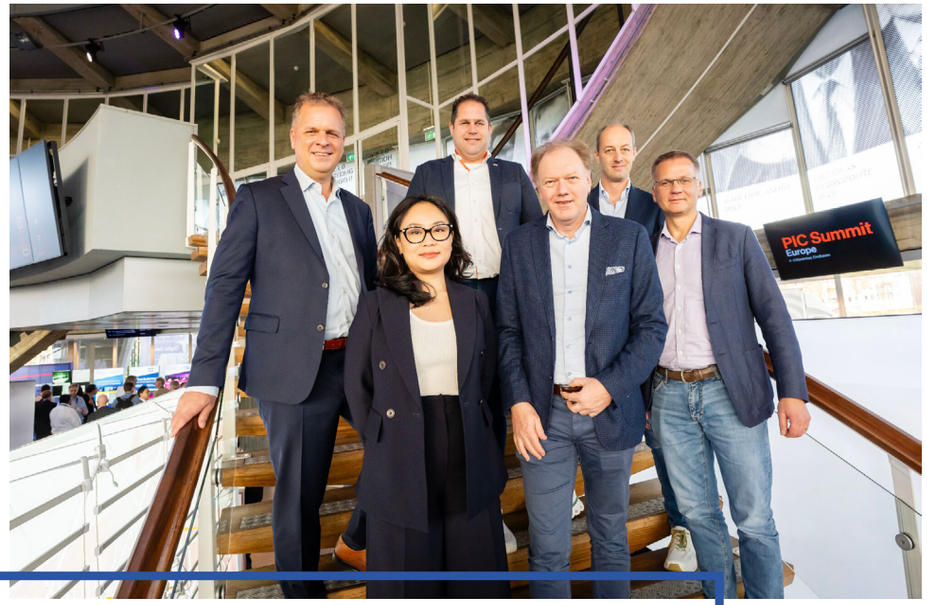
Read more about Dai Nippon Printing

FononTech's Impulse Printing Technology

Read more about FononTech

Last year, TNO spin-off FononTech successfully transitioned from research to commercialisation. The company delivered its first Impulse Printing™ system to a major semiconductor customer, demonstrating industrial viability and clear market demand. This milestone confirmed the scalability of its technology and marked the start of revenue generation. Supported by strong early customer interest and €8.5 million in seed funding (including imec.xpand), FononTech has established a solid foundation for growth in advanced semiconductor packaging solutions.





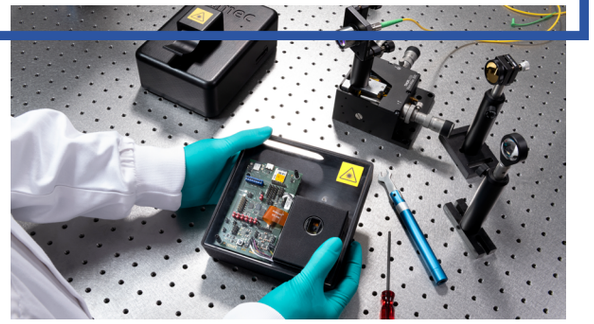
PHIX collaboration with imec and PhotonDelta

Through this collaboration, we take another step toward scalable, volume manufacturing of photonic modules, combining imec's R&D strength with PHIX Photonics Assembly's packaging know-how and PhotonDelta's ecosystem coordination. By aligning design, integration and manufacturing expertise, the partnership accelerates time-to-market for photonic applications.

Read more about the PHIX collaboration

Imec at Holst Centre receives USD 5 million grant for photonic-based speckle sensing

Imec at Holst Centre receives a USD 5 million grant from the Gates Foundation to accelerate the real-world impact of photonic-based speckle sensing for vital sign monitoring. Over the next two years, the focus is on translating this technology into a reliable solution for underserved healthcare settings. Photonic-based speckle sensing enables accurate monitoring of key vital signs, such as blood pressure and heart rate, across diverse populations. Current sensors do not perform well on certain skin tones. By addressing this gap, the technology supports more inclusive and reliable health monitoring. This development improves access to earlier detection, continuous monitoring, and better clinical decision-making in regions where traditional solutions are often not viable.



Read more about photonic-based speckle sensing

Honoring Holst's Legacy

Gilles Holst (1886-1968), renowned physicist and the first director of Philips' NatLab, believed in a multidisciplinary approach, open collaboration, and full utilisation of scientific expertise in all its forms. He championed the balance between scientific discovery and market application for the betterment of society.

Today, in the centre that bears his name, Holst's legacy lives on. The principles that guided his work are still relevant today. The innovations developed within Holst Centre blend multidisciplinary expertise, cross-over application and international collaboration. Together, we are sparking industries Holst only dreamed of, and building a future of which he would be proud.

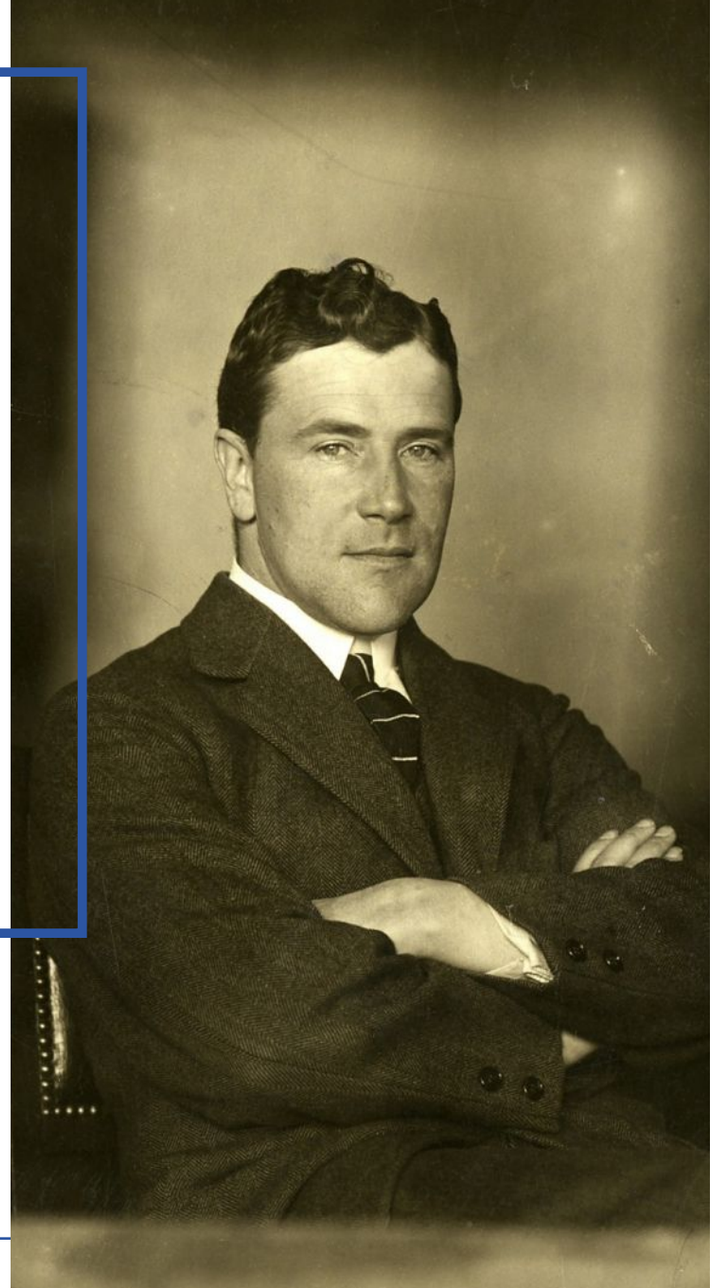


Photo: Royal Philips

Celebrating **20 years**

The Ten Commandments of Gilles Holst

1. Recruit clever researchers, possibly young, but with experience in academic research.
2. Do not pay too much attention to the details of the work they have done.
3. Give employees a lot of freedom and accept their peculiarities.
4. Have employees publish and participate in international scientific activities.
5. Avoid an organisation that is too rigid. Let authority be based on real expertise.
6. Do not divide a laboratory into different disciplines, but form multidisciplinary teams.
7. Give great freedom in the choice of work, but let the leading figures, in particular, be aware of their responsibility towards the company.
8. Don't budget an industrial laboratory per project and do not allow manufacturing departments to have budgetary control over research programmes.
9. Promote the transfer of skilled older researchers from the laboratory to product development and production.
10. The choice of research projects should not only be determined by market opportunities, but also by the state of academic research.

2005

Start Holst Centre at High Tech Campus Eindhoven

Initiated by Philips and with support from the Dutch government, Holst Centre is founded as a joint open-innovation hub bridging:

- Nanoelectronics (imec) and applied research (TNO)
- Wireless sensor technologies (imec) and flexible electronics (TNO)
- Academic knowledge and industrial applications

First Managing Directors: Jo De Boeck and Jaap Lombaers

2006

Visit from Prime Minister Balkenende

Prime Minister of the Netherlands, Jan Peter Balkenende, visits Holst Centre at its first location at The Strip on the High Tech Campus Eindhoven

2007

Flexible OLED

TNO at Holst Centre develops flexible OLED signage with record-breaking stability for application in mobile phones

Move to HTC 31

After a few short-term moves due to rapid increase in employees, Holst Centre moves to its permanent address: High Tech Campus 31 in Eindhoven, where it is still located today

Visit from Queen Beatrix

Queen Beatrix of the Netherlands and the mayor of Eindhoven, Rob van Gijzel, visit Holst Centre at its new location

2008

Low power wireless / UWB

Worlds first low power Ultra Wide Band (UWB) radio developed by imec at Holst Centre for worldwide standard in consumer, automotive, and industrial applications

2010

Solliance

Imec & TNO at Holst Centre started R&D institute dedicated to solar cells.

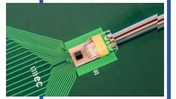
At 330 km/h: Fastest OLED in the world

First OLED ever integrated in a car during the 24 hour race in Le Mans

2011

Low power wireless / Bluetooth

Imec at Holst Centre and Panasonic presented the world's lowest power Bluetooth transceiver for IoT (Internet of Things)



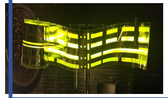
2012

Qolpac Smart Blister

TNO at Holst Centre develops first smart blister package, commercialised by Qolpac to enhance pharmaceutical compliance

Roll-to-roll barrier tool

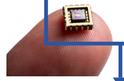
TNO at Holst Centre develops highest-performing barrier tool to protect OLEDs from airborne moisture and oxygen



2013

Reliable nitrogen dioxide (NO_2) sensor to pilot-line production

Imec at Holst Centre develops a small NO_2 sensor with low power consumption in the mW range for air quality monitoring



2014

Retractor with integrated light

TNO at Holst Centre invents retractor with integrated LED for use in surgeries

Samsung Smart Watch

First prototype smart watch for Samsung with chip and sensor design from imec and flexible electronics from TNO

2015

Roll-to-roll flexible electronics ready for production

Roll-to-roll flexible electronics reaches production-ready level, enabling industrial-scale prototyping for flexible sensors, wearables and smart packaging

First Roll-to-roll OLED

TNO at Holst Centre produces first roll-to-roll OLED

MUSEIC chip

Imec at Holst Centre develops MUSEIC chip, used today in a variety of healthcare wearables

2016

World's first solid-state multi-ion sensor for IoT

Imec at Holst Centre debuts a miniaturised sensor that simultaneously determines PH and chloride levels in fluid

Visit from Belgian royal couple

King Filip and Queen Mathilde of Belgium visit Holst Centre

First medical-grade, flexible X-ray detector

Flexible X-ray imager from Holst Centre qualifies for medical applications, offering more robust X-ray

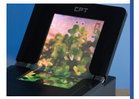
2017

First IGZO-based NFC

Imec and TNO develop cost-effective way to produce NFC tags for e.g., contactless payment

Flexible display with CPT

Imec and TNO collaborate with industrial partner CPT to realise foldable display for smartphones



EEG headset

Imec at Holst Centre collaborates with Japanese manufacturer Nihon Kohden to develop a wireless EEG headset for brain monitoring of ER and ICU patients

2018

Start OnePlanet Research Center

Imec founds OnePlanet Research Center with Wageningen University & Research, Radboud University and Radboudumc

Start CITC

Start of Chip Integration Technology Centre (CITC), an advanced packaging collaboration between TNO at Holst Centre, Delft University of Technology

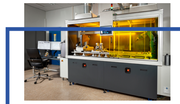
2019

Strategic shift to off-body health sensing

TNO at Holst Centre starts development of a smart sensor mat to monitor heart rate and breathing of babies and elderly

Impulse printing demonstrator for 3D electronics

TNO at Holst Centre introduces new high-resolution printing technology to apply metal tracks to substrates with high-speed additive manufacturing



2022

Organ-on-Chip

Development of Organ-on-Chip (OoC) using TNO at Holst Centre display technology and imec at Holst Centre multi-sensor chip

Visit of King Willem-Alexander

King Willem-Alexander of the Netherlands visits Holst Centre and PhotonDelta

2023

Philips Healthdot sensor

Imec and TNO contribute to the development of health patches, amongst which the Philips Healthdot sensor for remote vital sign monitoring

Start PITC

Collaboration between TNO at Holst Centre, TU Eindhoven, University of Twente and PhotonDelta on integrated photonics technology

NeuroGyn pelvic neurostimulation

Imec at Holst Centre collaborates with NeuroGyn to develop a next-generation implantable device for peripheral nerve stimulation in the pelvic region

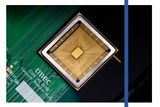
2021

Opening Workplace Vitality Hub at High Tech Campus Eindhoven

Use of Holst Centre technologies in smart office environments

Edge AI neuromorphic chip

Imec at Holst Centre designs a Gen2 Edge AI chip for neuromorphic sensing and computing that mimics the human brain, using less energy than classic AI accelerators



2024

Fully circular electronics

TNO at Holst Centre realized a fully circular LED foil, based on printed electronics technologies and recycled materials.

Opening Battery Lab

TNO at Holst Centre opens Battery Lab at High Tech Campus 21 in Eindhoven, enabling the Dutch/European battery industry to validate new prototypes

Bluetooth Channel Sounding becomes global standard (Bluetooth 6.0)

Imec at Holst Centre contributes to new Bluetooth Channel Sounding standard enabling accurate distance measurement for digital car key and item trackers

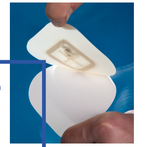
2025

Novel UWB and Edge AI

Imec at Holst Centre presents world's first IP for new UWB standard and Edge AI exploring new applications in robotics and health

Smart Wound Care platform

TNO at Holst Centre develops new Smart Wound Care platform to help patients recover faster and more comfortably from severe wounds



Photonics grant

Imec at Holst Centre receives a grant from the Gates Foundation to advance photonic-based research for vital sign monitoring in low- and middle-income countries

Opening Photonics lab

Imec and TNO launch the Holst Centre Photonics Lab at High Tech Campus 11 in Eindhoven

LiDAR

Imec at Holst Centre realises the first shoebox-sized LiDAR demonstrator, capable of measuring its surroundings in 4D, for automotive applications

Spin-offs

Since 2023

TOUCHWAVES

‘Holst Centre dares to view innovation differently. From the multidisciplinary approach to the cross-over application, the focus is finding solutions that work for the industries that need them.’

- Charlotte Kjellander, CEO, Touchwaves

Since 2014

bloomlife

‘During my time at imec and Holst Centre, I had the opportunity to explore the frontiers of wearable technologies for health and wellness, in an environment that uniquely combines deep scientific expertise with a strong drive for real-world impact. The interdisciplinary collaboration, access to cutting-edge research, and entrepreneurial mindset at Holst Centre were instrumental in shaping the vision behind Bloomlife and translating early ideas into a tangible solution for maternal health.’

- Julien Penders, CoFounder & COO, Bloomlife

Since 2018

SPARKNANO

‘Holst Centre continues to be a valuable partner in advancing our R&D, helping us accelerate development and shorten our time to market.’

- Paul Poodt, CTO, SparkNano

Since 2020

AIKON

‘Holst Centre’s breakthroughs in dry electrode technology and flexible hybrid electronics created the technological foundation for AIKON’s wearable heart failure monitoring patches. The collaborative ecosystem accelerates innovation from laboratory discovery to real-world healthcare impact.’

- Thiru Kanagasabapathi,
CEO and Founder, AIKON Health

Since 2015

LIFESENSE GROUP

‘Holst Centre bridges deep technology and real-world impact. Its ability to translate advanced research into scalable platforms was instrumental in turning LifeSense Group from innovation into a global digital health business.’

- Valer Pop, CEO, LifeSense Group

Since 2025

eyeo

‘Imec gave us something most deep-tech startups never get: a running start. Years of fundamental research by a team of engineers who had already solved fundamental challenges. By the time eyeo was incorporated, our technology was not a concept on paper, it was proven. That is an exceptional foundation to build a company on.’

- Jeroen Hoet, CEO and Co-founder, eyeo

Since 2020

LIONVOLT

‘Holst Centre has been a valuable innovation partner in helping LionVolt accelerate the development of next-generation battery technology for a more sustainable energy future’

Since 2019

KEIRON

‘Our collaboration with Holst Centre has played an important role in accelerating the development of Keiron’s next-generation digital manufacturing technology for the electronics industry.’

Since 2016

AMSYSTEMS

‘TNO and Holst Centre have actively matured their process for bringing new, high-tech, innovation-driven companies to the market. This not only boosts our economy in the Netherlands, but also drives new ecosystems with global impact.’

- Roeland Brugman, CEO, AMSystems

Since 2022

FononTech

‘The unique combination of state-of-the-art facilities and a broad, collaborative ecosystem make Holst Centre an exceptional innovative place to greatly impact the electronics industry with new technological concepts.’

- Rob Hendriks, CEO at FononTech

Since 2017

onera

‘Brainport in general, and Holst Centre in particular, provided the fertile ground Onera Health needed to flourish, with the perfect balance of deep technology, biomedical expertise, and exceptional talent to take innovation to the next level.’

- Ruben de Francisco, Founder & CEO, Onera Health

Since 2021

tracXon

‘For 20 years, Holst Centre has pioneered innovation in printed electronics. As a key orchestrator, it brings value chain partners together and enables strong collaboration and shared innovation. This accelerates application-oriented development and mainstream adoption. This is, for me, Holst Centre’s biggest value add. It helped create the robust printed electronics ecosystem, and TracXon is now benefitting from it.’

- Ashok Sridhar, CEO, TracXon

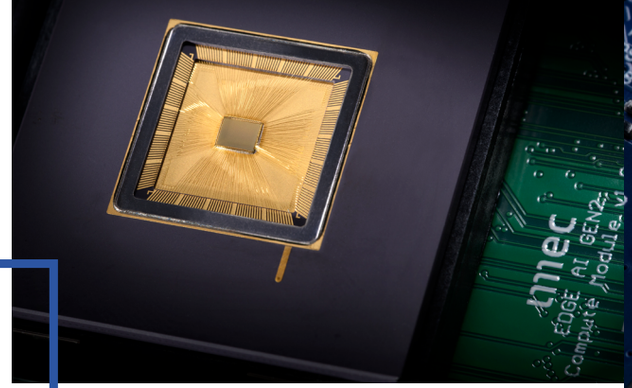
Since 2021

AXELERA ARTIFICIAL INTELLIGENCE

‘Imec’s unique position at the intersection of academia, industry, and cutting-edge research makes them an invaluable ally for any company pushing the boundaries of what is technologically possible. For Axelera AI, that means access to world-class infrastructure and expertise but also a role in a broader ecosystem committed to shaping the future of semiconductors and AI.’

- Fabrizio Del Maffeo, CEO, Axelera AI

Technical Highlights



Edge AI

For neuromorphic sensing and computing

When AI processing occurs directly on devices instead of in the cloud, both performance and energy consumption improve. User privacy is also preserved. Yet general-purpose Edge AI chips are often too power hungry for battery-powered devices.

In 2025, imec at Holst Centre taped out a general-purpose, Gen2 Edge AI chip that does it all. Designed for hybrid classic convolutional neural networks (CNN) and neuromorphic computing that mimics the human brain, the chip uses significantly less energy than classic AI accelerators. As opposed to a classic CNN AI accelerator, this hybrid CNN-neuromorphic chip enables various use cases and different compute modalities with minimal adaptation.

We de-risk novel neuromorphic computing for partners and demonstrate the chip's application in robotics, sensors, industrial smart devices, and more. We are also exploring new markets and applications, such as in the EU-funded DistriMuSe project.

The neuromorphic sensing + computing market is expected to grow to 8.4 billion USD by 2034. [Yole, 2024]

Neuromorphic computing can improve energy efficiency up to 10-100 times compared to classic computing.

Read more about Edge AI

The UWB market is expected to grow by 15% to 20% every year for the next 5 years, and is projected to reach 1.4 billion devices per year by 2030.

Wireless Technologies

Ultra-low-power UWB

Our fourth-generation UWB chip consumes one-tenth of the power of the current state-of-the art.

The use of Ultra-WideBand (UWB) wireless technologies is growing exponentially. With ranging, sensing, and localisation capabilities, UWB's low power consumption and high accuracy are key differentiators.

Imec at Holst Centre stands at the centre of this growing ecosystem. We explore new architectures and building blocks to optimise UWB power consumption and enable new capabilities. Our fourth-generation UWB chip is pre-compliant with the upcoming IEEE 802.15.4ab standard and consumes only one-tenth of the power of current state-of-the-art. With application-specific demonstrations, we de-risk the industry roadmap for new applications of UWB technology.

In addition to helping develop digital keys, automotive in-cabin sensing and smart buildings, we also focus on the future. As Bluetooth, WiFi, UWB, and other wireless technologies begin to converge in the same frequencies, we aim to develop a unified transceiver that supports them all.

Read more about ultra-low-power UWB

Integrated photonics

Glass Interposer Technology

Data centres are crucial to our technological future, and require more processing power every day. Yet the tremendous amount of energy they consume is a major concern. Holst Centre's expertise in glass panel displays is contributing to a solution.

TNO at Holst Centre is developing a way for data centres to reduce energy consumption, yet ensure high bandwidth and high signal integrity. Namely, co-packaged optics comprising glass interposers with photonic integrated circuits on one side, electronic chips on the other, and short interconnects. Using Holst Centre's display technologies, production of co-packaged optics on glass interposers can enable scaling to square metres and reduce cost.

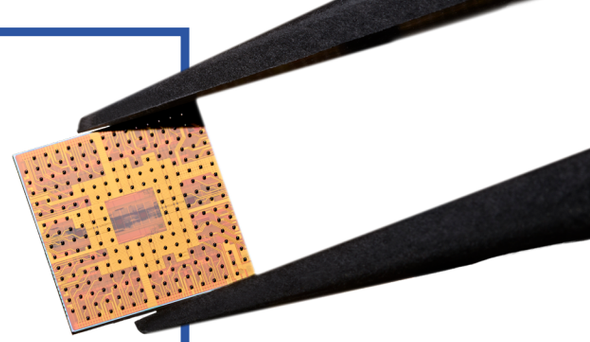
The solution also offers an easy way to couple a standard optical fiber to the photonic chip. This will allow data centre operators to plug and unplug their components with minimal downtime.

> Glass interposers enable miniaturised and dense multi-chip packaging, so that you minimise energy consumption for high-speed data traffic, at low manufacturing cost."
>
> - **Gerwin Gelinck,** Principal Scientist, TNO at Holst Centre

Read more about integrated photonics at Holst Centre

Advanced Medical Technology

Selective Peripheral Nerve Stimulation



Neuromodulation can effectively treat issues ranging from rheumatoid arthritis to depression, from epilepsy to chronic pain to anxiety disorders. Yet modern Peripheral Nerve Stimulation (PNS) lacks selectivity and controllability and can cause adverse side effects.

A multi-disciplinary team of imec at Holst Centre experts has developed and validated the building blocks for the next generation of selective PNS (sPNS) technologies. The third generation of the novel ASIC chip, as well as improved iterations of the supporting technology and algorithms, are now in development.

The solution uses intermittent interferential current stimulation (i_2CS) to specifically target relevant fibres, reduce side effects and enable energy-efficient and highly effective control of neural activation. Positive results of preclinical testing in large animals were recently published in Nature Communication.

Read more about sPNS, and download the Nature Communications journal article

> The active implantable medical devices market is projected to grow by 9.1% yearly, with a value of $47.27 billion by 2031. Europe is expected to claim roughly 25% of this. Our sPNS solution can be a head start for commercial companies. sPNS can be used for a wide range of disorders, and will position Holst Centre as a key player in this value chain."
>
> - **Nicolò Rossetti,** Senior Researcher, imec at Holst Centre

Thin-film Ultrasound Electronics

PillarWave™

Ultrasound's capability has applications far beyond medical imaging. But current ultrasound is rigid, expensive, and needs a professional to operate.

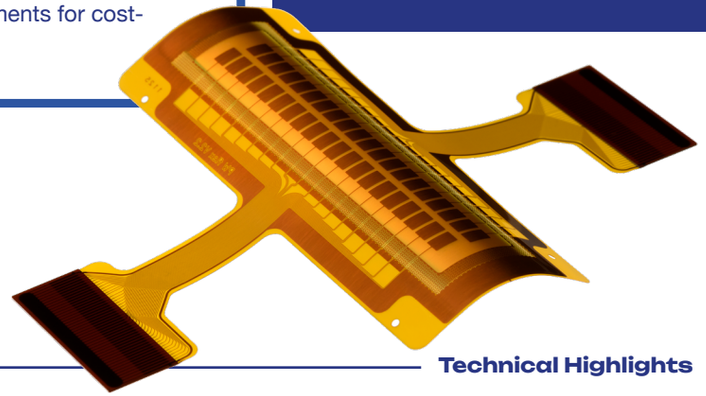
With Holst Centre's thin-film electronics and TNO's ultrasound expertise, the patented PillarWave™ technology eliminates these barriers and enables use in medicine, industry, and defence. Instead of a rigid, costly PZT transducer, PillarWave™ is flexible and ultra-thin. It can be cost-effectively produced in any shape and size and does not require specialised operators.

PillarWave™ is open to civil or defence organisations aiming to use ultrasound for critical sensing and imaging needs. Applications include flow monitoring in industrial pipes, long-term health monitoring, underwater security, and portable medical imaging, to name a few. Whatever the application, we can define the algorithmic and electronic requirements for cost-effective industrial production.

6 times higher transducer sensitivity than current PZT state-of-the-art, with excellent pulse-echo efficiency.

Enables first-of-its-kind application in industrial, defence, or underwater settings, with transducers up to one square metre, in any shape.

Read more about PillarWave™



Smart Wound Care

Hybrid Printed Electronics

Read more about Smart Wound Care

Healthcare resource scarcity, antibiotic-resistant infections, and even geopolitical tensions are driving demand for sustainable, efficient wound care. The next generation of dressings must promote healing and/or communicate crucial information.

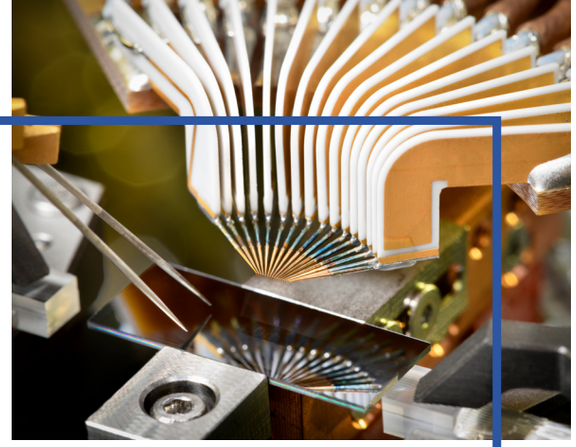
TNO at Holst Centre translates research into deployable solutions, delivering validated smart wound care components, research platforms and application demonstrators ready for real-world impact. Our medical wearables support both civilian and defence settings, integrating monitoring, therapeutic functionality and user-centred design to accelerate adoption and empower informed care.

The technical building blocks for next-generation wound care are here. Now, TNO at Holst Centre is forging the partnerships needed to bring them to market. Through strategic collaboration, sufficient clinical data can be collected to prove their value and enable a new industry of products that promote better, more effective patient care.

> **Holst Centre is uniquely positioned to accelerate innovation by grounding development in real-world needs. We are engaging industry and the medical community early, while integrating novel technologies to advance materials and applications within smart wound care."**
>
> **- Shavini Stuart-Wijesuriya,**
> Programme Lead and Senior Scientist,
> TNO at Holst Centre

Application-Specific Integrated Photonics

For automotive, robotics, security and more



Tomorrow's technology will run on photonic integrated circuits (PICs). But designing chips for application is costly and complex. Imec at Holst Centre aims to offer scalable, affordable PICs for a variety of use cases.

Production is underway for our solid-state LiDAR chip. We aim to quadruple this PIC's processing power every two years, for sustainable scalability. Our systems integration approach was key to design success. By applying complex algorithms, we achieved laser line widths that would be impossible with hardware alone. The chip was designed for precision sensors in autonomous vehicles, but the technology is applicable to robotics, security, agrifood, and more.

We are also developing ultra-high-speed photonic link technologies with minimal Digital Signal Processing (DSP). These will give AI data centres ever-scalable processing power, while reducing energy consumption. In this way and others, our PIC expertise will help power the future.

> Our new generation of LiDAR photonic chips will remain the same size, yet quadruple in processing power every two years, enabling rapid development of new sensing technologies."
>
> - **Dongjae Shin,** Scientific Director, imec at Holst Centre

Read more about our solid-state LiDAR chip

New Manufacturing Technologies

Laser-Induced Forward Transfer (LIFT)

Read more about LIFT here

One of TNO at Holst Centre's strengths is our ability to repurpose validated innovations for application in new domains. Our expertise in display technologies is now gaining traction in advanced packaging.

Laser-Induced Forward Transfer (LIFT) technology was first developed to enable rapid, selective, and accurate placement of extremely small LED dies and interconnects for microLED displays. The validated technology was then repurposed for integrated photonics.

Today, the LIFT team is advancing LIFT's unique capabilities for advanced packaging, targeting selective assembly with 200nm accuracy at throughputs significantly exceeding current state-of-the-art. This non-contact, non-intrusive, gentle assembly process is well-suited to placing thin, fragile, uniquely shaped components essential to photonics, 3D integration and semiconductor packaging technologies. The team is exploring multiple industrialisation pathways and new applications for LIFT.

> We have succeeded in expanding LIFT capabilities to address key challenges in several crucial domains, including integrated photonics and semiconductor packaging. The fundamental advantages of LIFT technology may impact and shape the future of integration and assembly in advanced packaging."
>
> - **Gari Arutinov,** Program Manager, TNO at Holst Centre

Funded Projects

In 2025, Holst Centre further solidified its position as a leader in innovation, overseeing more than 73 high-impact research projects. To illustrate our current trajectory, we have selected four recent breakthroughs that showcase our latest advancements in the field.

DistriMuSe: Advancing autonomous navigation with neuromorphic sensing

Read more about DistriMuSe

ProDrive uses AGVs (Automated Guided Vehicles) on their factory floors to perform automated tasks. Currently, the main limitation is the restricted level of automation in these AGVs. Imec at Holst Centre is developing a sensor-fusion-based neuromorphic solution for detecting humans in robots and humanoids. We are testing and deploying our solution, featuring our upcoming Edge-AI Gen-2 neuromorphic chip, on ProDrive's AGVs. With advanced sensor fusion techniques, these AGVs will be able to navigate factory floors without any human assistance.

SPARCLE: Next-generation implantable bioelectronics for chronic care

Read more about SPARCLE

SPARCLE is a European research initiative developing next-generation, miniaturised, battery-less implantable pulse generators for managing chronic and lifestyle-related diseases. By fusing bioelectronics, flexible materials, and AI-driven modeling, we aim to transform healthcare delivery and patient outcomes. The project aims to create a microelectronic chip and a small, flexible form factor for an implantable pulse generator. Imec at Holst Centre contributes its expertise in flexible electronics, chip development, and system integration to develop the miniaturised implantable bioelectronic device at the core of the SPARCLE project. This technology will serve as a universal neuro-stimulator platform to be applied in treating chronic diseases such as neuro-based cancer, severe migraines and spinal cord injuries.

Ecotron: Creating value with responsible electronics

The Ecotron project addresses growing environmental pressures from rising demand for integrated electronics and shorter product lifetimes. As conventional electronics are rarely recycled, the need for sustainable alternatives is urgent. Ecotron advances flexible, organic and printed electronics to enable responsible production and circular value chains. Bringing together expertise in biobased materials, printing, recycling and regulation, the project demonstrates that printed electronics can be recyclable, renewable, and even compostable. Four use cases—packaging, wearable, medical and lighting—show improved life cycle performance and strong commercial potential.

SonoSkin: Wearable 3D ultrasound innovation

At TNO at Holst Centre, the SonoSkin project develops fully integrated, miniaturised MEMS-based scanning ultrasound systems for wearable applications. Two key use cases are targeted: lung monitoring and musculoskeletal health. The project also delivers an innovative reference design for wearable 3D ultrasound devices. By combining edge AI, musculoskeletal modelling and 3D data acquisition, SonoSkin supports optimal device placement and enables extraction of clinically relevant information, advancing accessible, real-time health monitoring solutions.

Funded EU Projects:

- Critical
- IoN
- Weet wat er leeft
- E-construct
- LEARN
- REBECCA
- CoRaLi-DAR
- SUPERIOT
- KIDNEW
- Artificial Organs
- Organ on Chip
- BIO-CURITY
- PreventCKD
- NEUROKIT2E
- NerveRepack
- LoLiPOP
- STIMULUS
- InShape
- SpikeZip - ERC Grant
- VITAL
- RealCare
- iCARE4CVD
- EClectic
- 6G - FNS
- UNLOOC
- EU-TRAINS
- DistriMuSe
- REMPOWER
- TIRAMISU
- LADYWISE
- NEHIL
- SPARCLE
- ProActif
- Rigoletto
- Chip NL CC
- KidNEW Booster Ares
- Nimble AI
- NextArc
- NeAIXT
- Fennel Phantom
- HELENA
- SPRINT
- Cleanhypro
- UNICORN
- ECOTRON
- CIRCUITS
- SUSTRONICS
- NEWLIFE
- PERSIMMON
- PhotonMed
- DOLORES
- 3DOP
- MID4Automotive
- Intellectuals
- Bloeddrukmeting (B-Patch)
- Patch Factory
- HeartlinQ

Partnerships

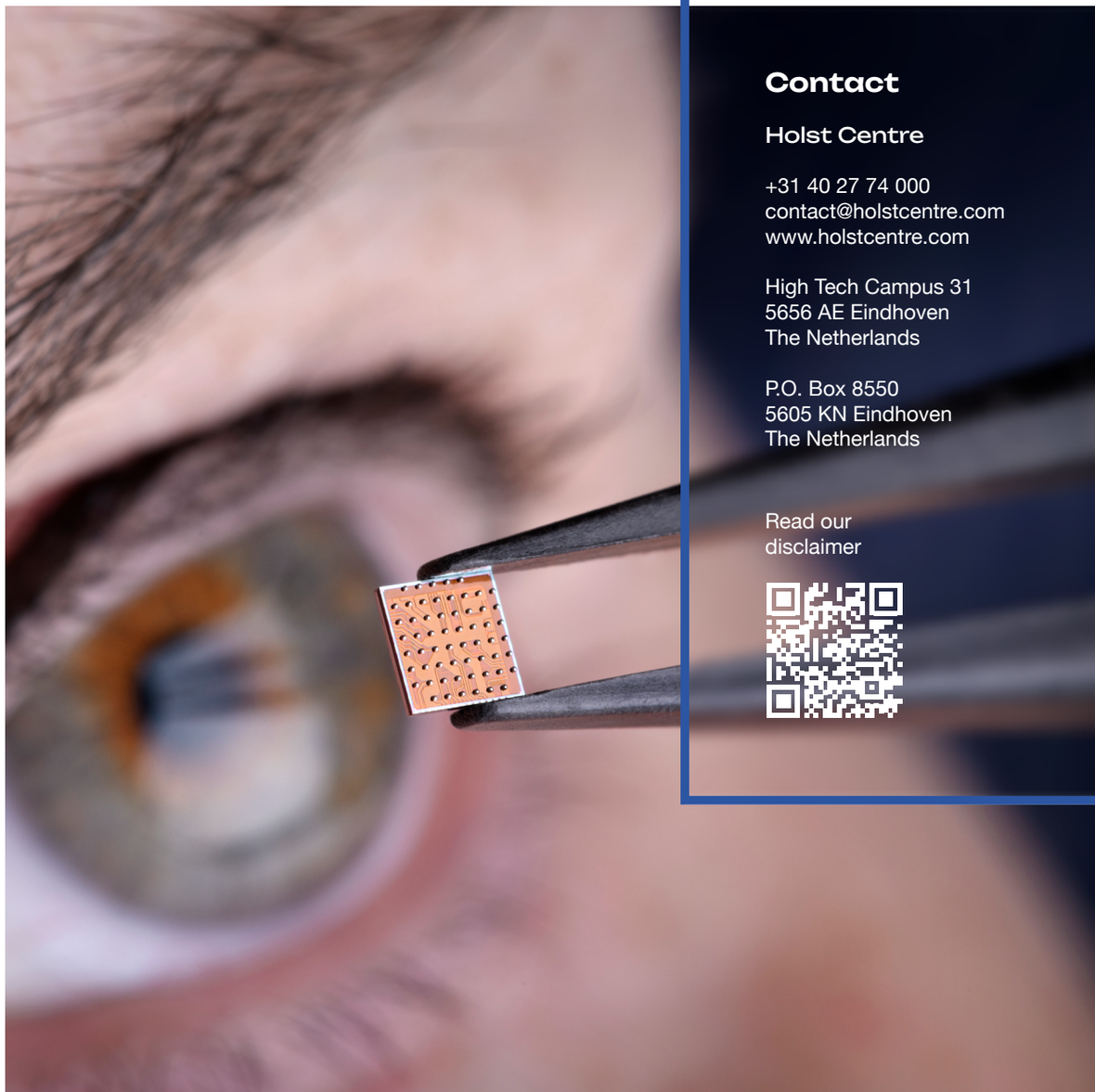
We collaborate with several partners within the ecosystem. Below is a selection of partner logos.

Future Sparks

‘There is increasing demand for organisations that can turn complex R&D into market reality. As national and international strategies take shape, innovation and flexibility will be crucial. We remain committed to our partners – helping them secure positions in emerging value chains and turn technological breakthroughs into thriving businesses. Proven capabilities like ours will secure Europe’s position in the industries that will define the future. The innovations that will define 2045 are being developed today, and we are the engine making them work.’

Jesse Robbers & **Ton van Mol**
Managing Director
imec at Holst Centre

Managing Director
TNO at Holst Centre



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Read our
disclaimer

Holst Centre

Founded in 2005 as a partnership between imec and TNO, Holst Centre bridges the gap between academic research and industrial application. We de-risk complex innovations and accelerate their path to market. We develop the foundational technologies that will define the next generation of healthcare, automotive, manufacturing and climate solutions. More than 250 innovative minds, representing 30 nationalities, come together at the High Tech Campus in Eindhoven to solve the major technology challenges of our time. Through strategic licensing, venturing activities and spin-off companies, we transform technological breakthroughs into economic impact.

by imec & TNO