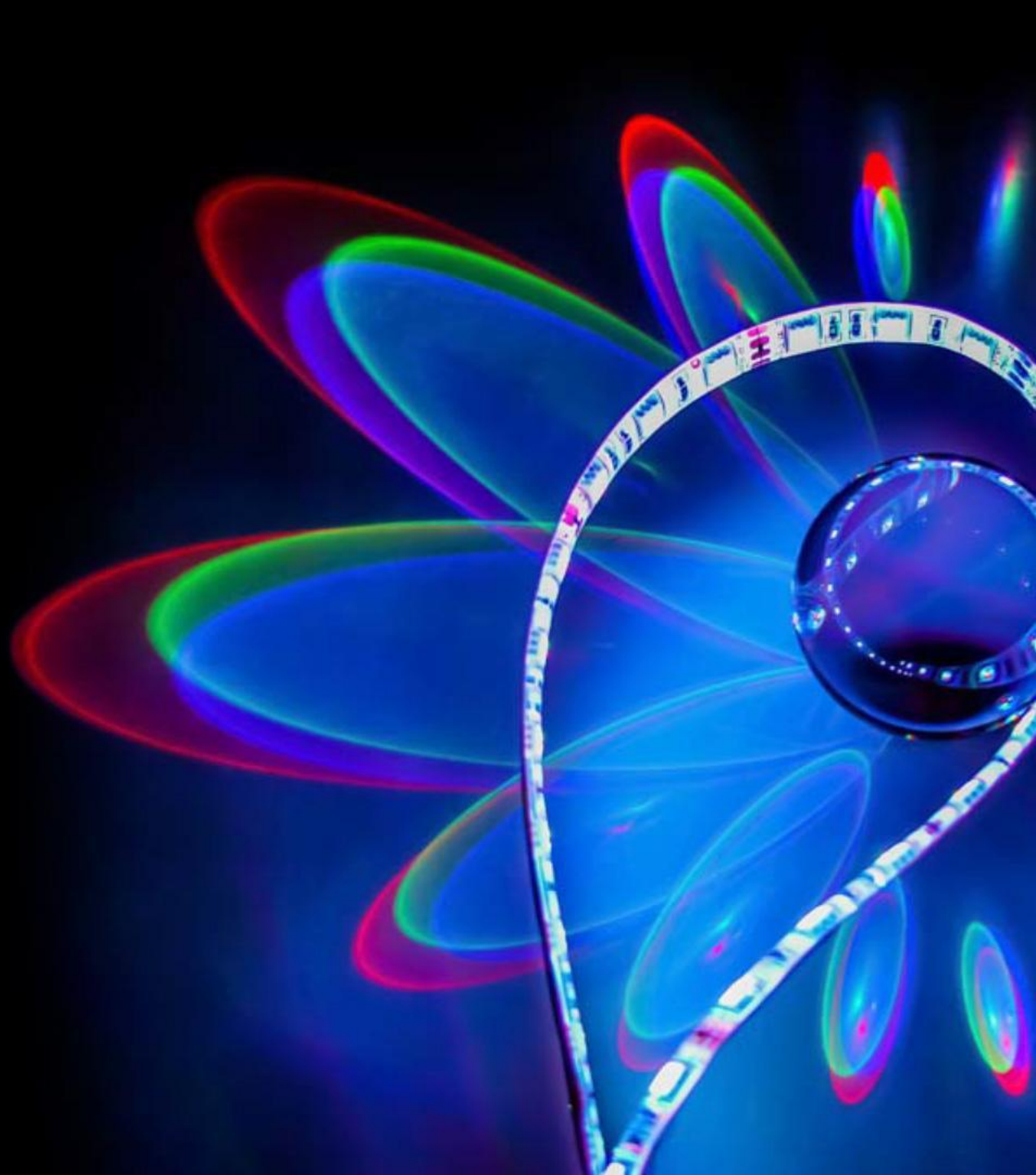
OPTICA
Advancing Optics and Photonics Worldwide
Formerly OSA

Lighting our Future - The Impact of Optics and Photonics on a Global Economy



Ulrike Woggon
12 May 2023

We unite over
533,000 individuals
from **183** countries

Optica Programs

We advance optics and photonics worldwide through:

- Individual & Corporate Membership
- Awards and Honors
- Diversity, Equity & Inclusion
- Publications
- Events
- Global Policy & Affairs
- Optica Foundation

Proud partners and collaborators with the Photonics Society of Poland

OPTICA
Formerly OSA

PHOTONICS SOCIETY OF POLAND
PSP

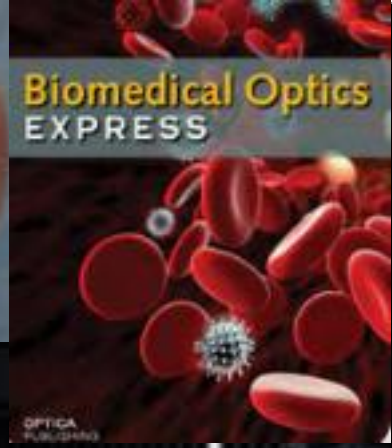
“For the rest of my life I want to reflect on what light is.”

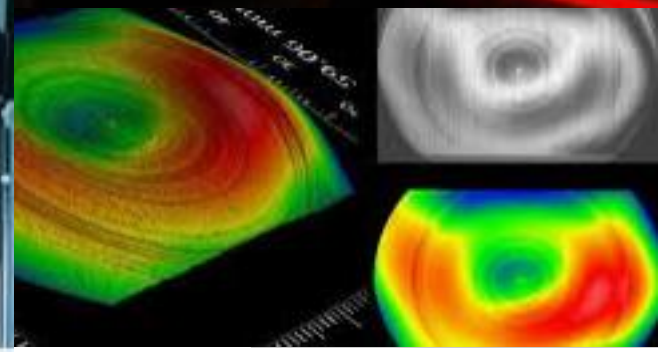
Albert Einstein--said after the initial formulation of the General Theory of Relativity

Optics & Photonics help power the global economy

Examples of optics and photonics action…

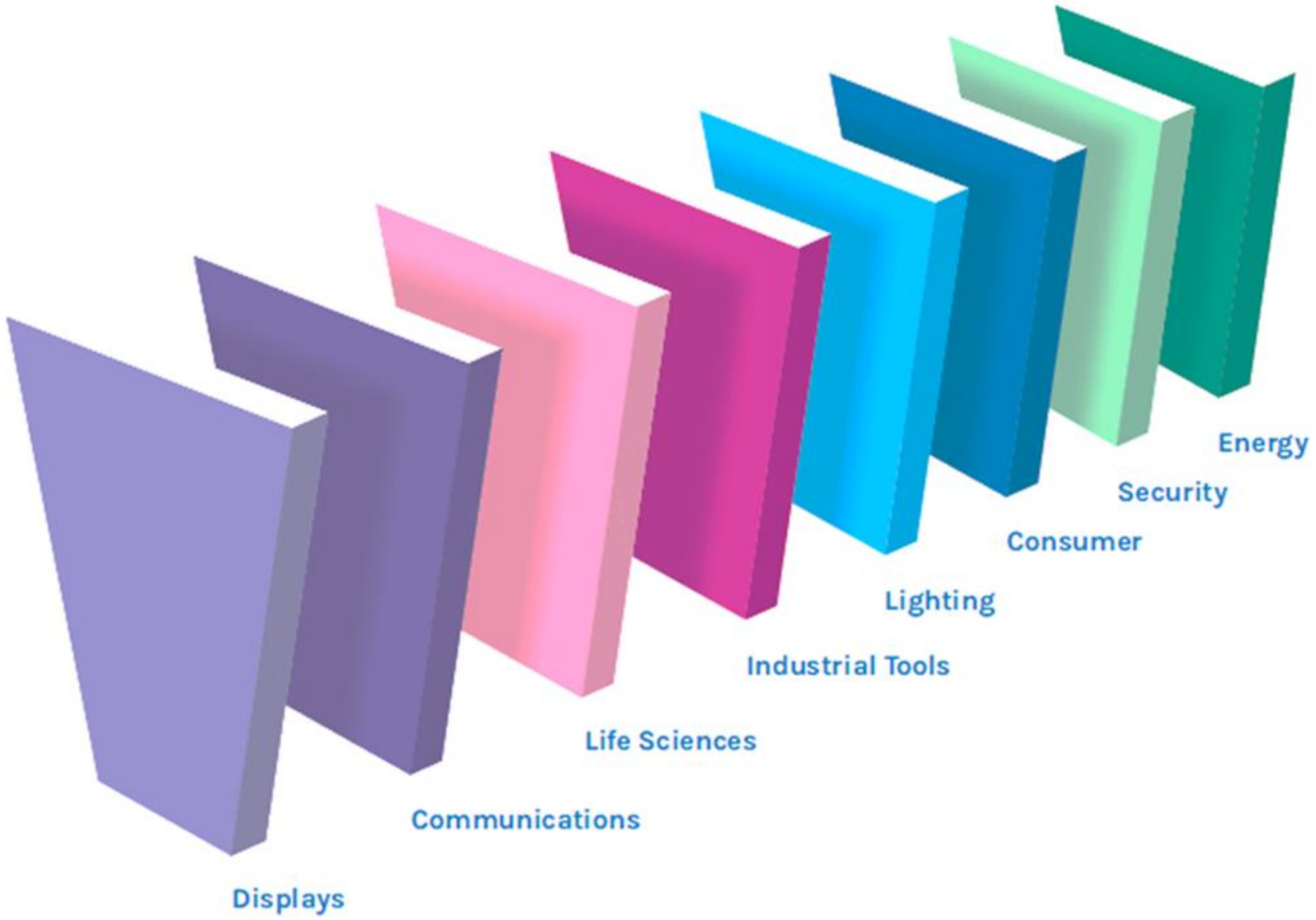
Biophotonics
Microspheres
Superconducting
Technology Material Quantum
applications systems devices
components
Machinery Electronic Energy
Mesoscopic Telecommunications
Advanced Automotive Medical
Solar Information Space
Lasers Engineering Imaging
Packaging
Microscopic





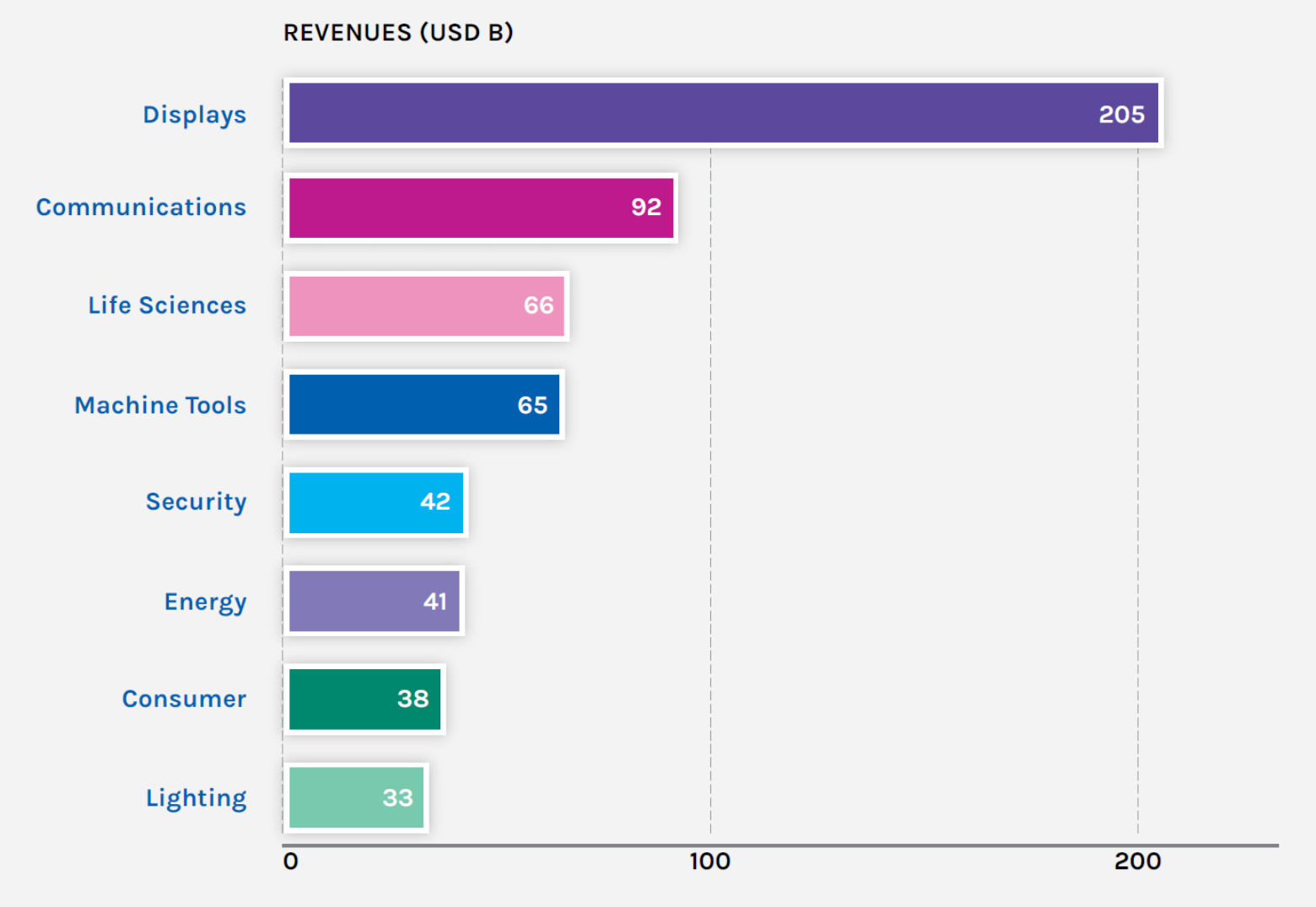
According to a report by Markets & Markets the **global photonics market was valued at €615 billion in 2020**, and it is projected to reach **€866 billion by 2025**, with a compound annual growth rate (CAGR) of 7.1%. This indicates that the optics and photonics industry is growing at a significant pace and will continue to contribute to the global economy.

Optics & photonics power the global economy



Source: *Optica brochure "Optics and Photonics—The Impact on a Global Economy"*

Optics & photonics power the global economy

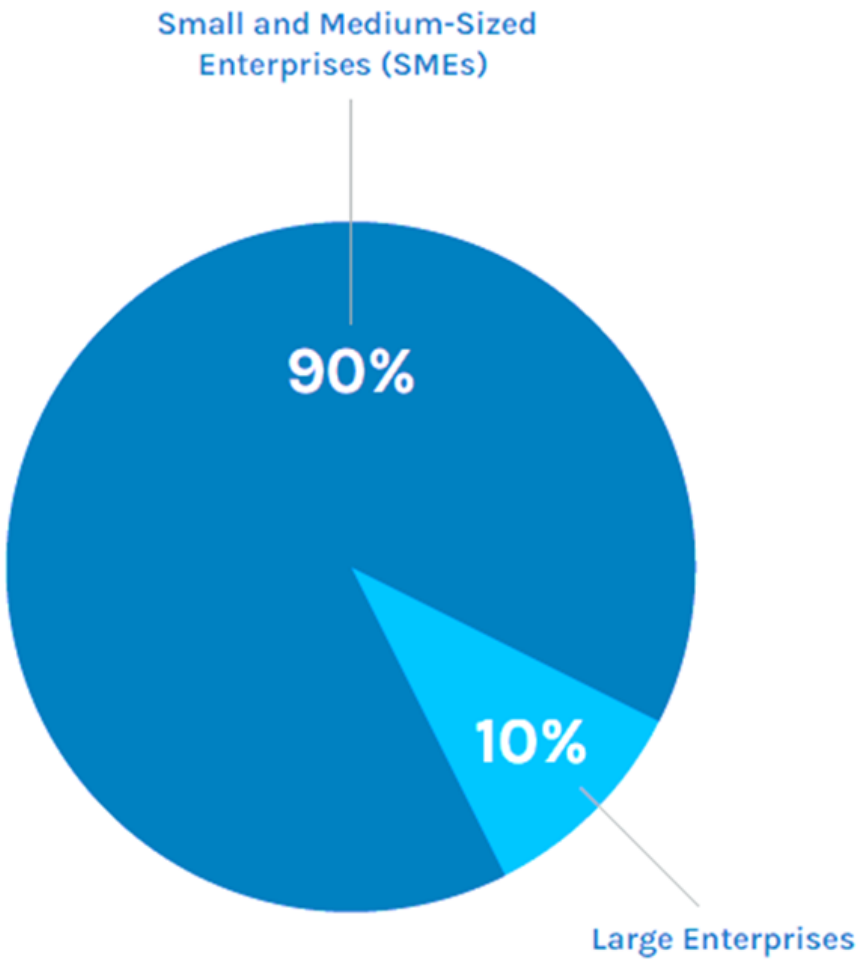


Source: OPTICA brochure Optics and Photonics – The impact on a global economy

Companies small and large

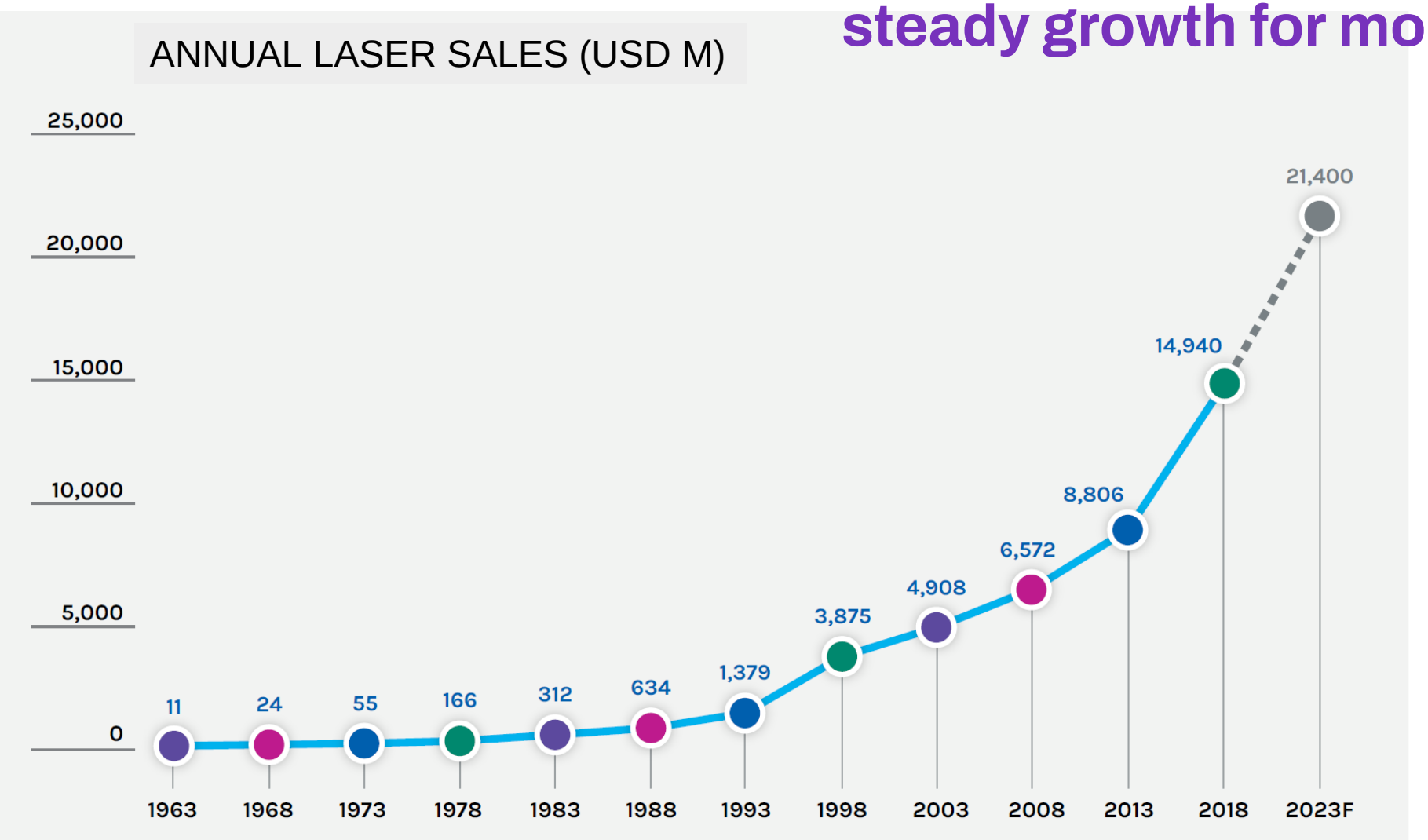
Source: *Optica brochure "Optics and Photonics—The Impact on a Global Economy"*

Small companies serve an essential role



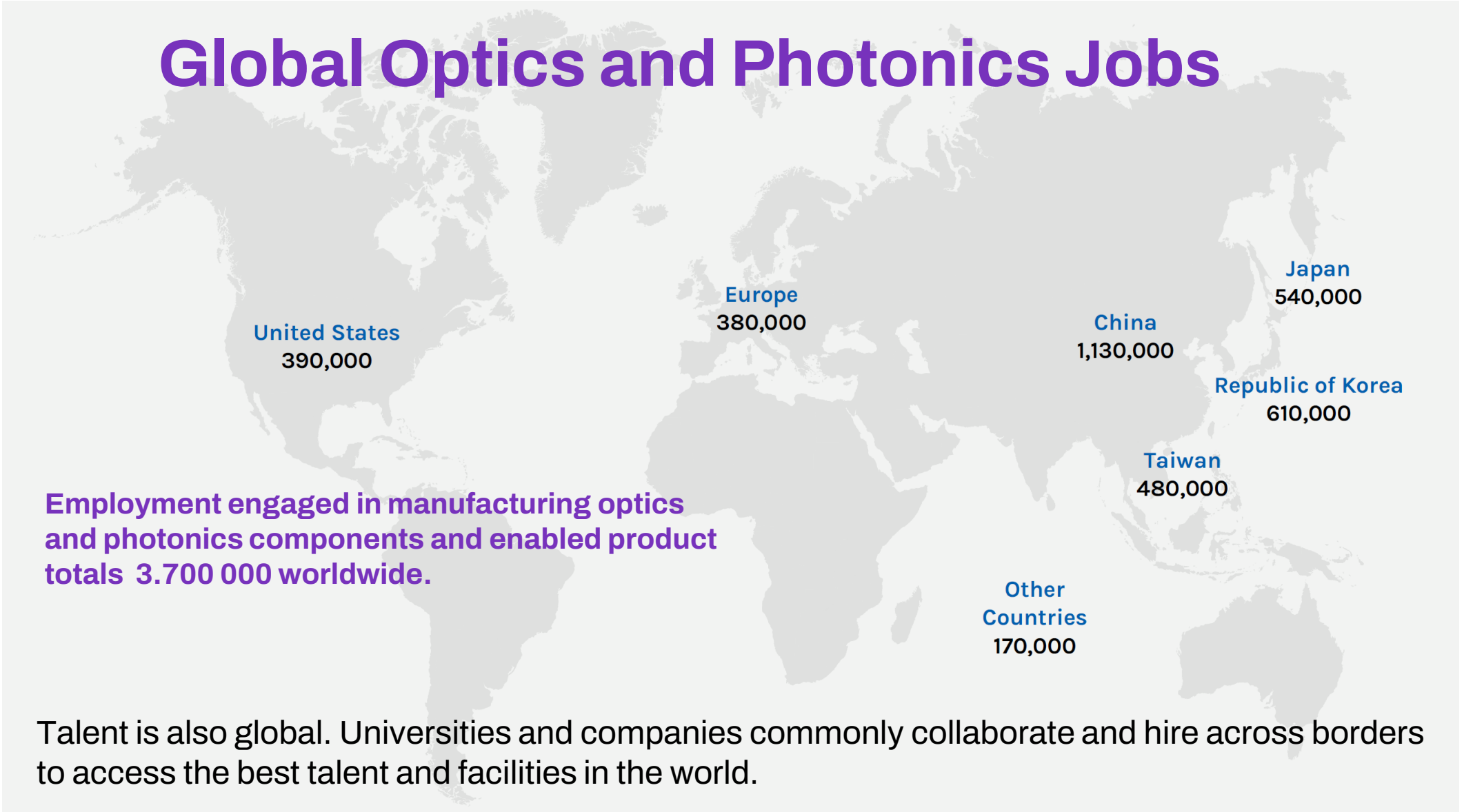
Source: Optica (2021).

Demand for innovation has driven steady growth for more than 50 years



Source: Laser Focus World (2021)

Global Optics and Photonics Jobs



Employment engaged in manufacturing optics and photonics components and enabled product totals 3.700 000 worldwide.

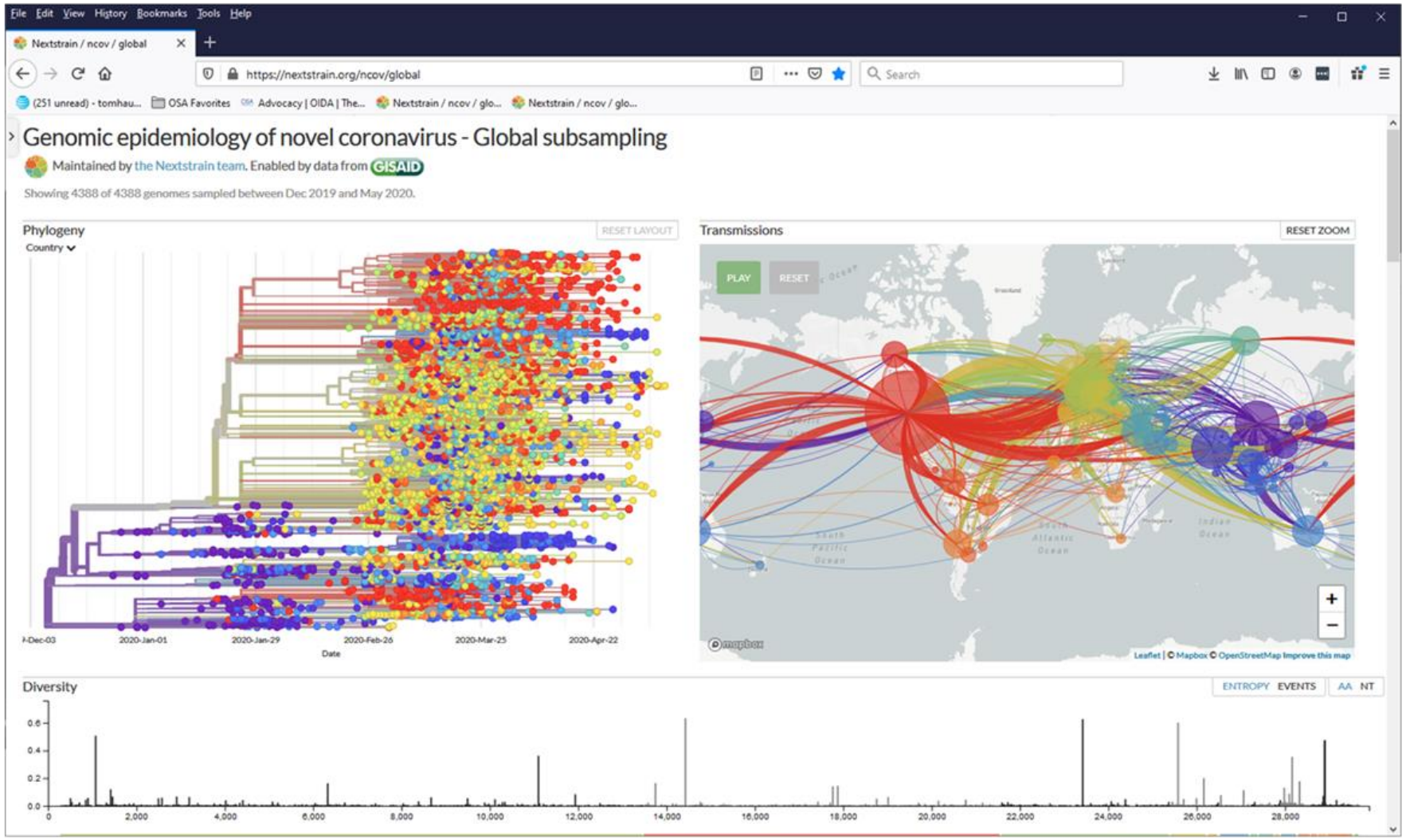
Talent is also global. Universities and companies commonly collaborate and hire across borders to access the best talent and facilities in the world.

Source: OPTICA brochure Optics and Photonics – The impact on a global economy

Example: Viral mapping and ancestry

modern
gen sequencing
techniques

to identify the
corona virus



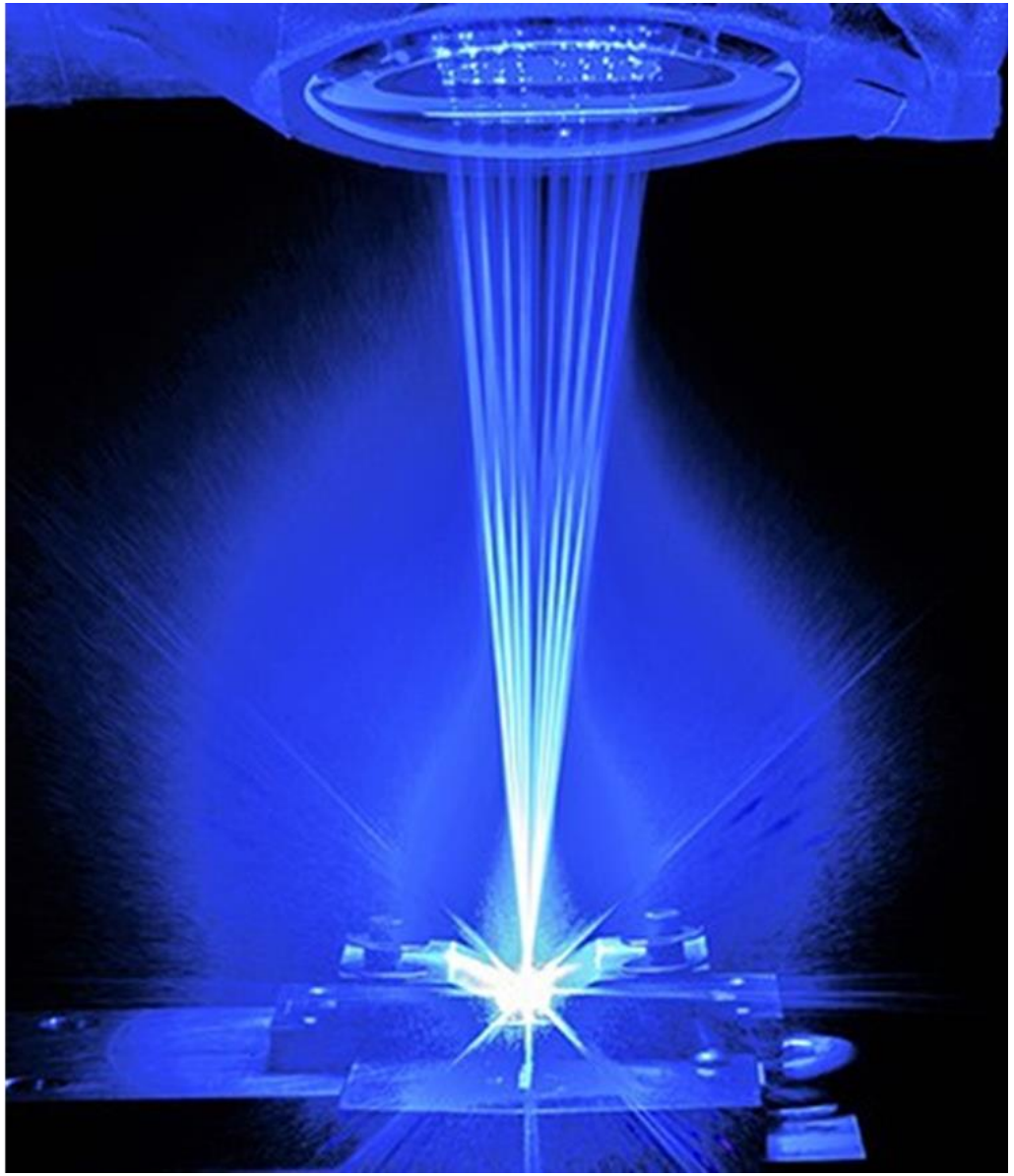
Source: nextstrain.org

Sources: Trumpf, Fraunhofer IWS cutting 100 holes in 1.17 seconds

Blue lasers

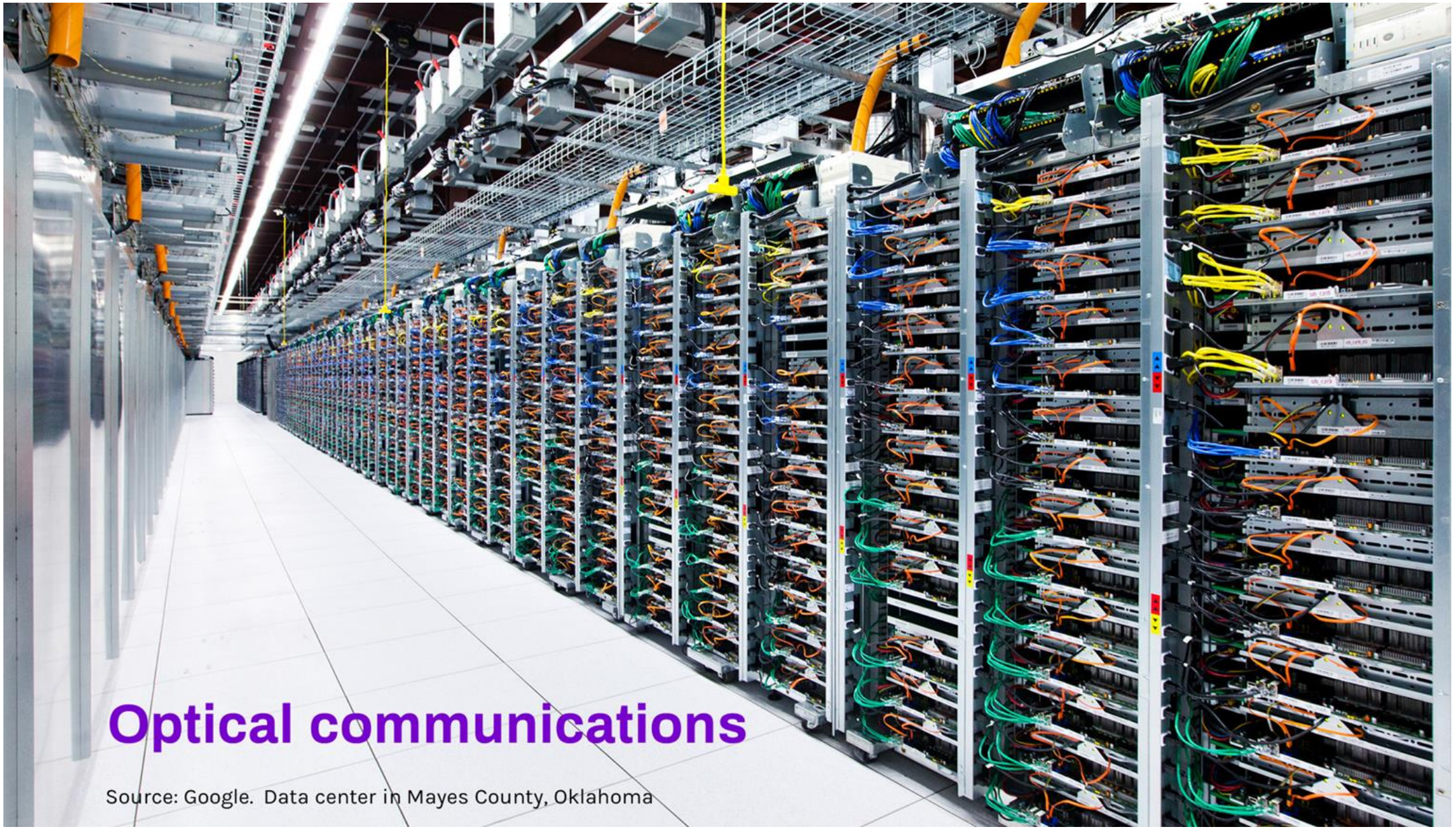
1.5 kW blue diode laser using 450-nm GaN-based bars for welding of copper to 1.5 mm depth.

Source: Nuburu, in Optica *Optics & Photonics News*, Oct. 2020.



Extreme UV (soft x-ray) lithography

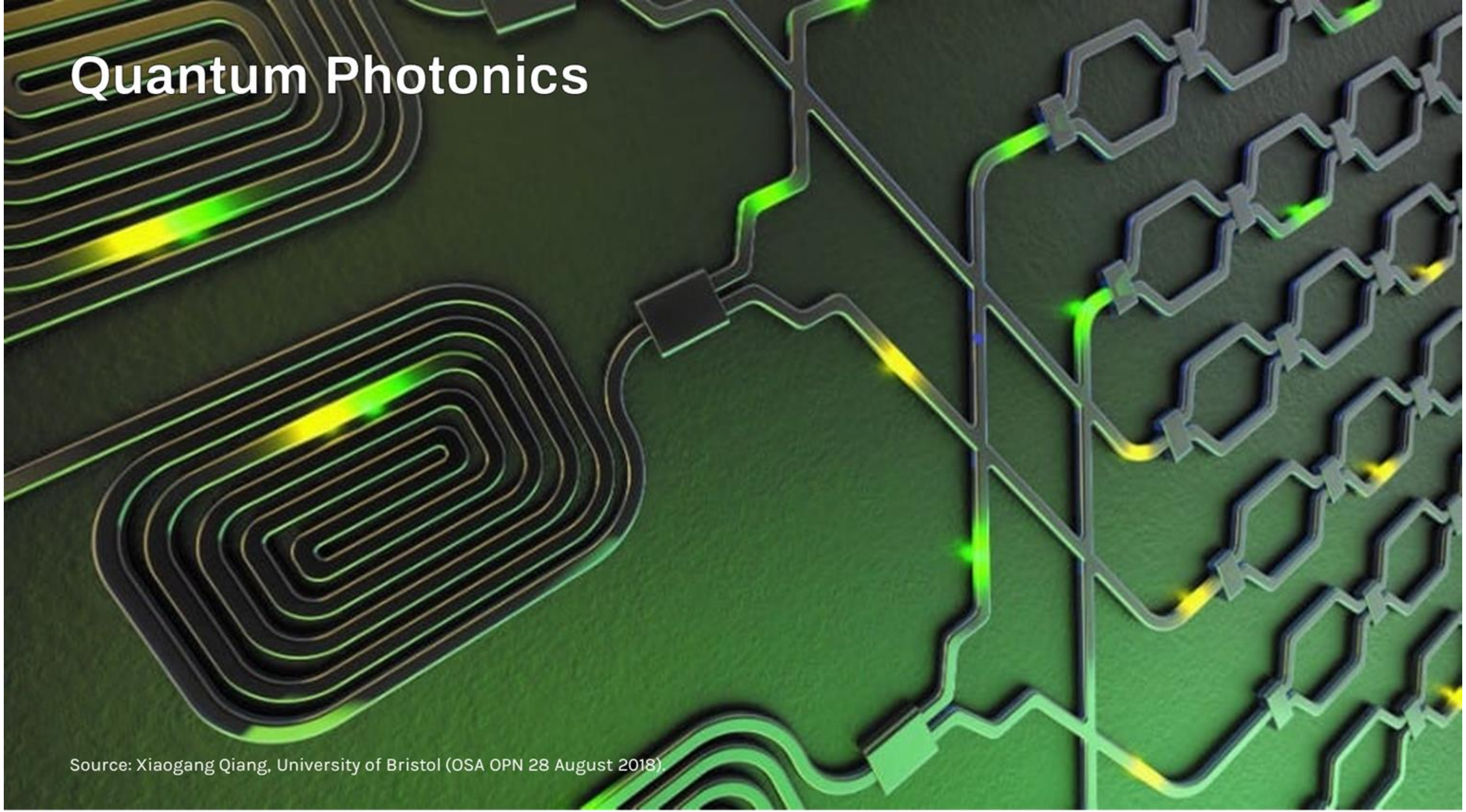
Sources: ASML TWINSCAN NXE: 3350B 13.5-nm EUV projection system.
The ASML NXE:3400B model operates to the 7- and 5-nm nodes.



Optical communications

Source: Google. Data center in Mayes County, Oklahoma

Quantum Photonics



Source: Xiaogang Qiang, University of Bristol (OSA OPN 28 August 2018).

OSA Industry Development Associates

OIDA QUANTUM PHOTONICS ROADMAP

Every Photon Counts

March 2020

EXAMPLE MARKET APPLICATIONS

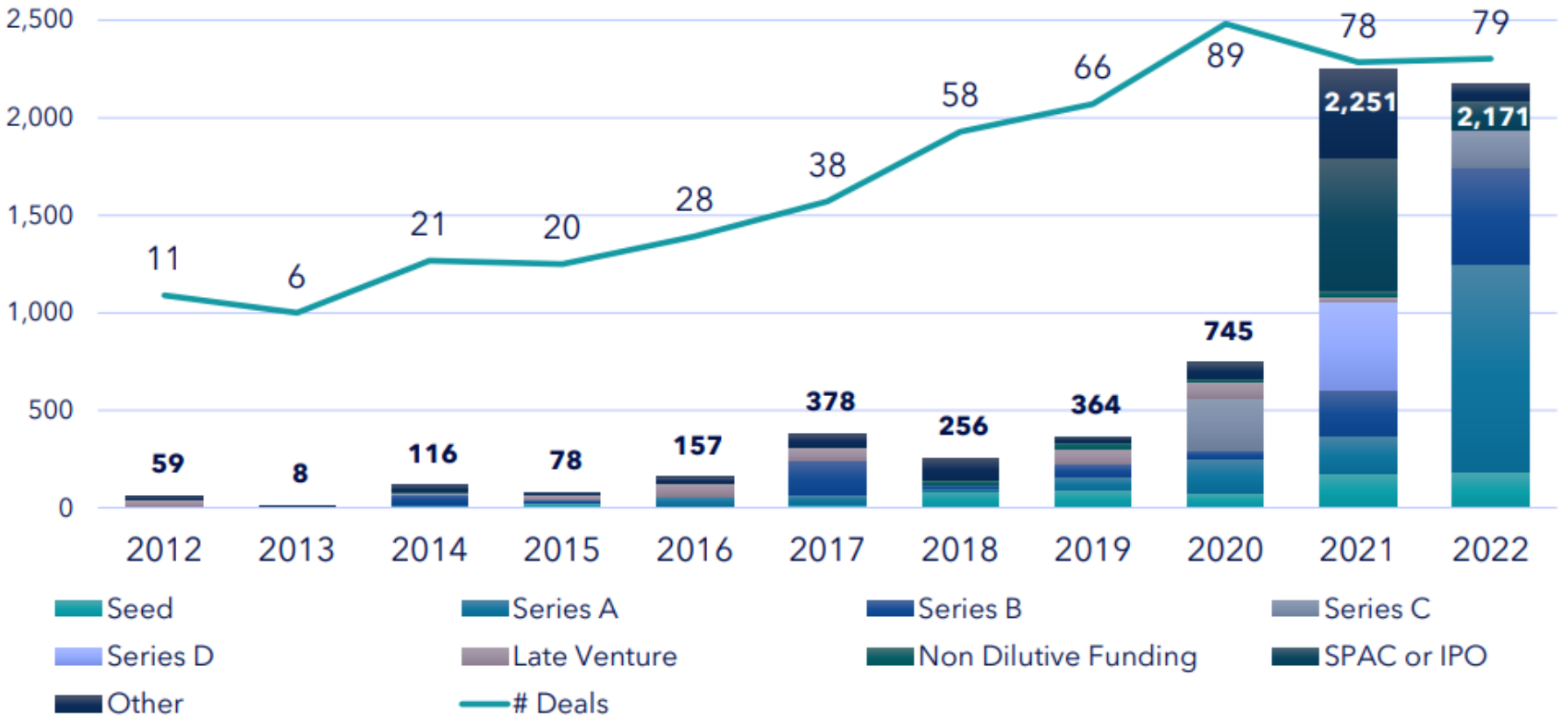
OSA Industry Development Associates

TELECOM	Clocks for Synchronization	Cryptography	Network Optimization
MEDICINE	Improved Brain Imaging	Protecting Patient Data Long-Term	Drug Discovery
OIL & GAS	Through-ground Imaging	Protecting Critical Infrastructure	Drilling Location Analysis; Oil Distribution Logistics
FINANCE	Clocks for Trade Timestamping	Secure Transactions	Portfolio Management
TRANSPORT	GPS-Aided or GPS-Free Navigation; Quantum LiDAR	Cryptography for Connected Vehicles	Battery Material Simulation; Traffic Optimization

OPTICA Industry Development Associates (OIDA) report 2020

Total private investment in Quantum Technology over the past 10 years

Total Quantum Investment by Stage; in $ millions

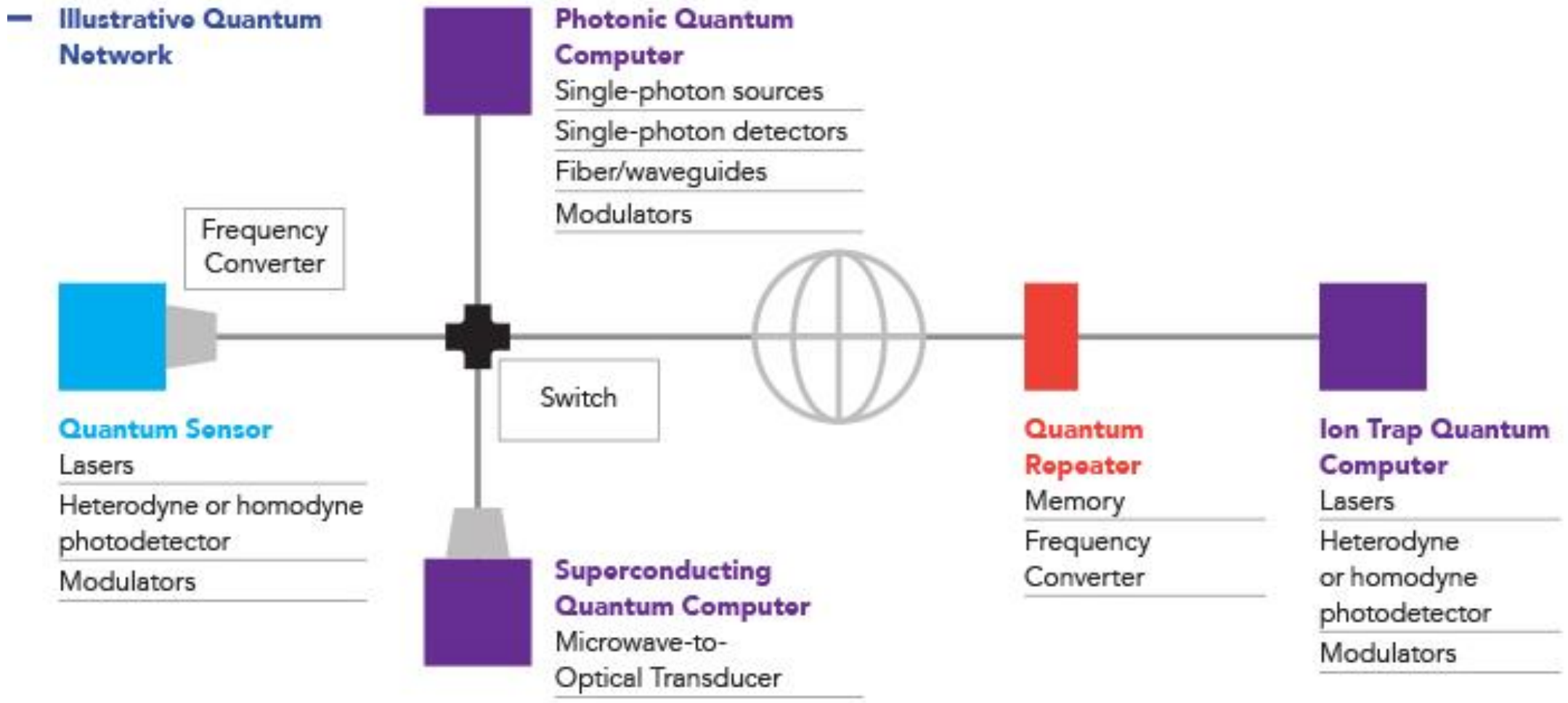


Private investment into Quantum Technology has continued to increase over the past few years, with record high funding of $2.3bn in 2021 and $2.2bn in 2022.

The spike in activity in 2021 was SPAC driven; 2022 was driven by growing Series A and B, as companies outside of the US received larger funding rounds.

These figures are expected to represent the lower bound of quantum investment as many companies do not disclose funding.

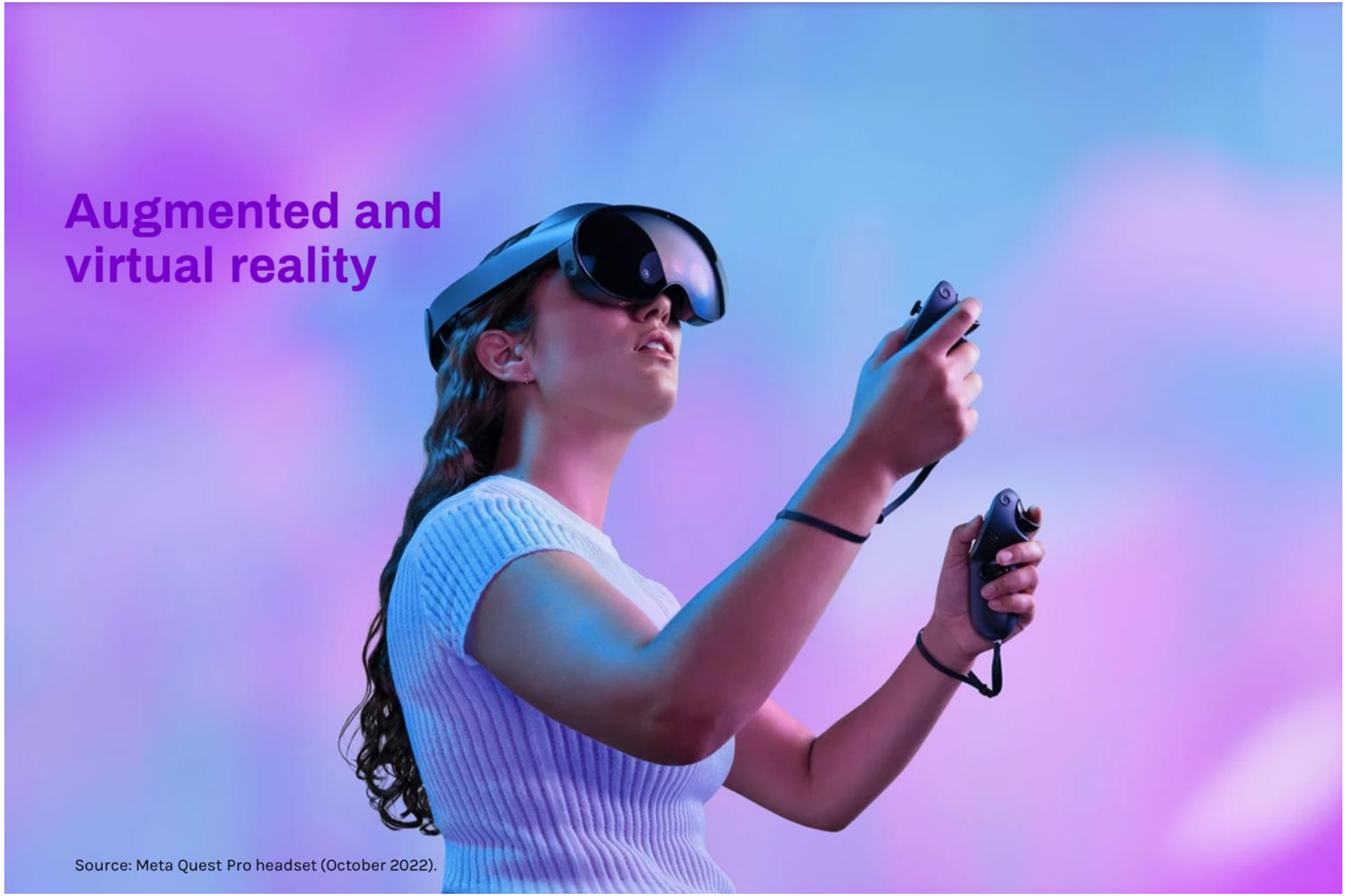
Source: The Quantum Insider Intelligence Platform


Illustrative Quantum Network
Photonic Quantum Computer
Single-photon sources
Single-photon detectors
Fiber/waveguides
Modulators
Frequency Converter
Switch
Quantum Sensor
Lasers
Heterodyne or homodyne photodetector
Modulators
Superconducting Quantum Computer
Microwave-to-Optical Transducer
Quantum Repeater
Memory
Frequency Converter
Ion Trap Quantum Computer
Lasers
Heterodyne or homodyne photodetector
Modulators

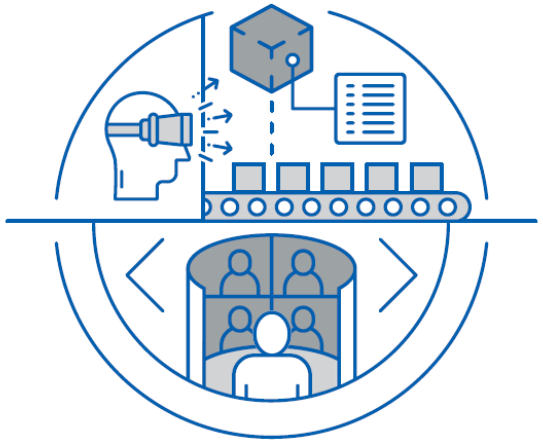
There's a great future in sensors.

- LIDAR and self-driving cars, aircraft, & submersibles
- Gesture recognition & "touch free" 3D imaging
- Virtual and augmented reality
- Face recognition and other biometrics
- Robotic surgery and label-free imaging
- Robot caregivers
- Internet of Everything
- Wearables
- Quantum photonic sensors, atomic clocks, gravitational sensors
- Light field imaging and computational imaging
- Environmental sensors
- Photoacoustic imaging
- Breathalyzers, saliva detectors, sweat detectors
- Vision implants

Augmented and virtual reality



Source: Meta Quest Pro headset (October 2022).

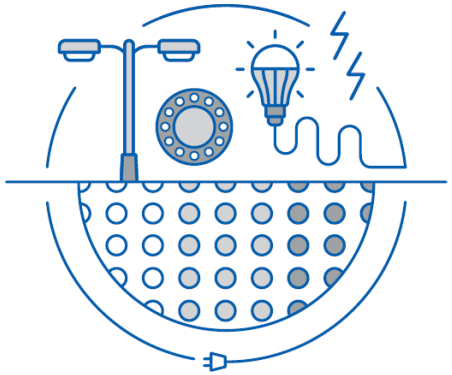


Photovoltaic energy

Top left: Solar farm in Datong County in Northern China. Getty Images (2018).

Lower right: 40 MWpeak floating photovoltaic plant in Anhui Province, China, using Hanwa Q CELLs. It was China's largest floating PV plant at the time, with plans to build 70 MW and 150 MW plants in the same region. (pv-tech.org, July 2017)

LED lighting



Top left: OLED light from LG Display (2016).
Bottom right: Old span of Oakland Bay Bridge.

Big Science

Source: Pluto photo from NASA.

2020 Nobel Prize in Physics

The Supermassive Black Hole Discovery Enabled by Adaptive Optics

The observations of Genzel and Ghez were enabled by infrared speckle imaging and, subsequently, adaptive optics.

Andrea Ghez is the fourth woman to win a Nobel Prize in Physics.

2018 Nobel Prize in Physics

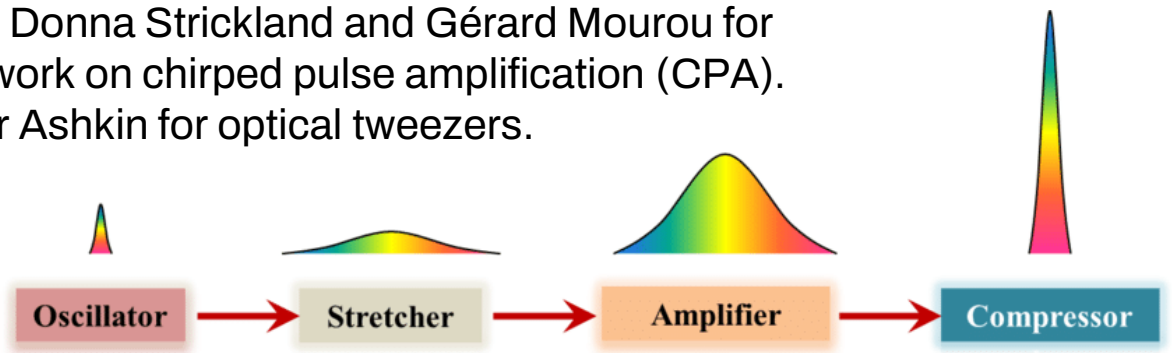
For ground breaking inventions in the field of laser physics

Nobel Laureate and
2013 OPTICA President
Donna Strickland

@University of Waterloo

Donna Strickland was the third women after Marie Curie, 1939 and Maria Goeppert Mayer in 1963 to win a Nobel Prize in Physics.

2018: Donna Strickland and Gérard Mourou for their work on chirped pulse amplification (CPA).
Arthur Ashkin for optical tweezers.



Over the course of our history, **41 OPTICA members** have been awarded a Nobel Prize in Physics, Chemistry or Physiology/Medicine.

https://www.optica.org/en-us/history/optica_nobel_laureates/

Responsible and sustainable –

Use photonics. Find a solution. Change the world.

Search for exceptional ideas to leverage optics and photonics and drive new, impactful scientific discoveries with the potential to transform our world.

Optica Foundation Challenge

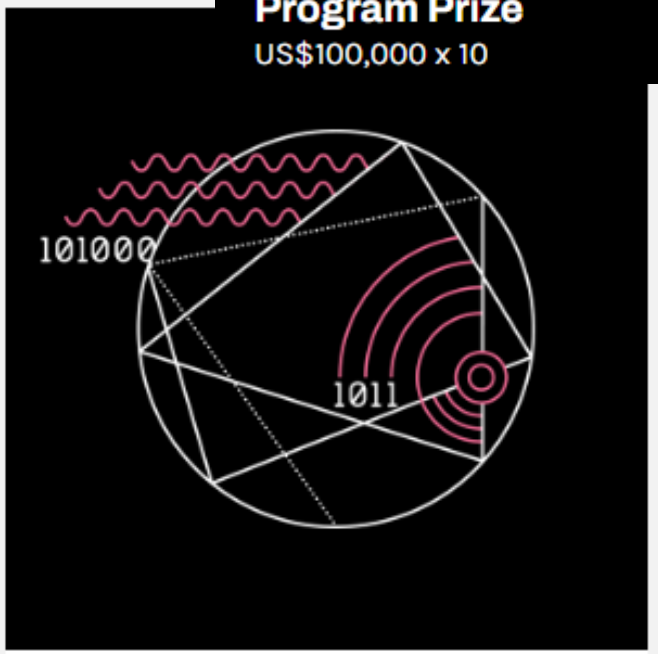
Use photonics. Find a solution. Change the world.

Application Dates
16 May 2023 - 21 Jul 2023

Program Prize
US$100,000 x 10

ENVIRONMENT

HEALTH



INFORMATION

Lighting our future –

We are only at the beginning of what optics technology can do!

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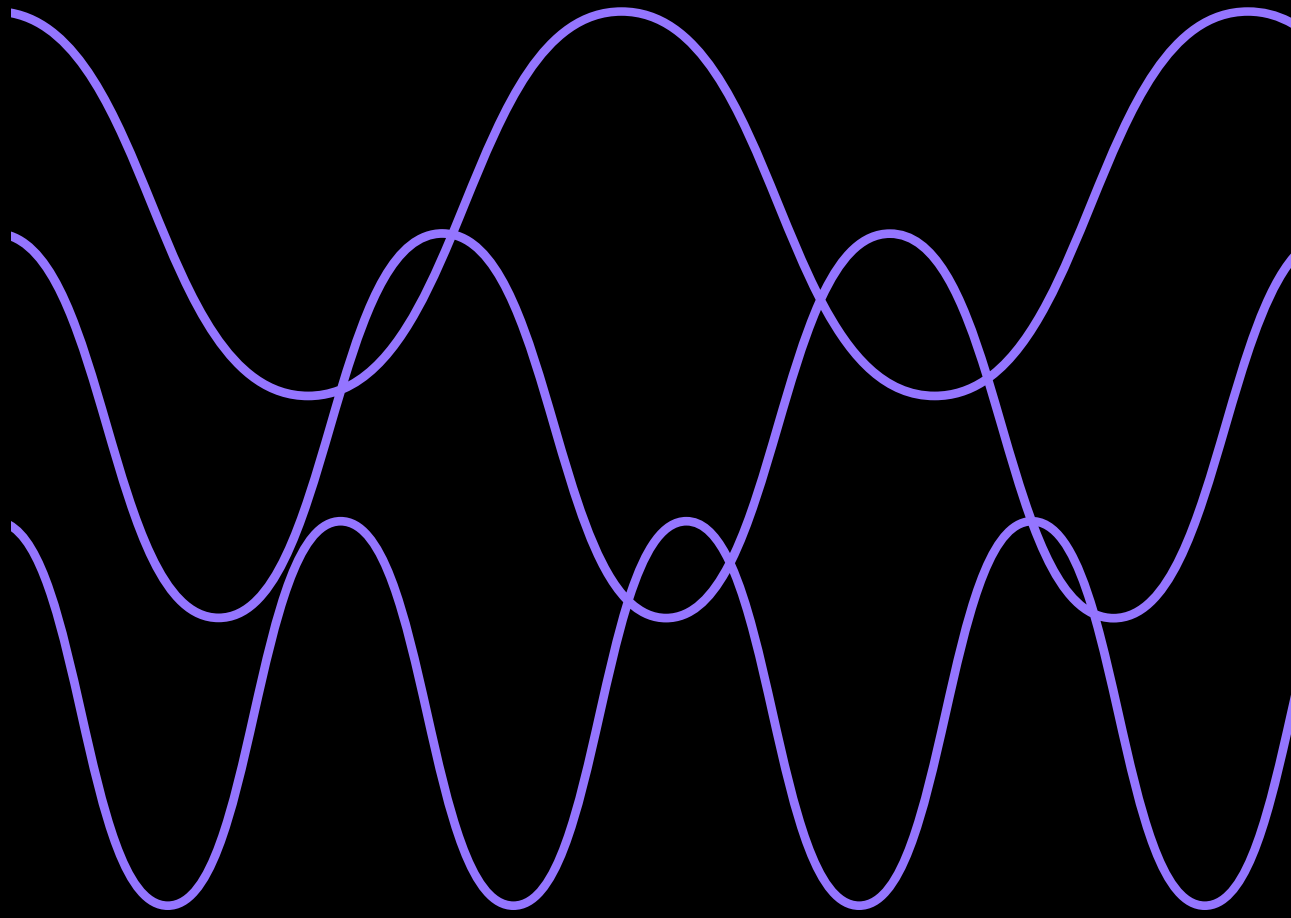
Formerly OSA

Thank you!



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