

**Transformational Change:
Building a Collaborative Future**



TECHNOLOGY, SUSTAINABILITY & HUMANITY

27 & 28 OCTOBER 2025

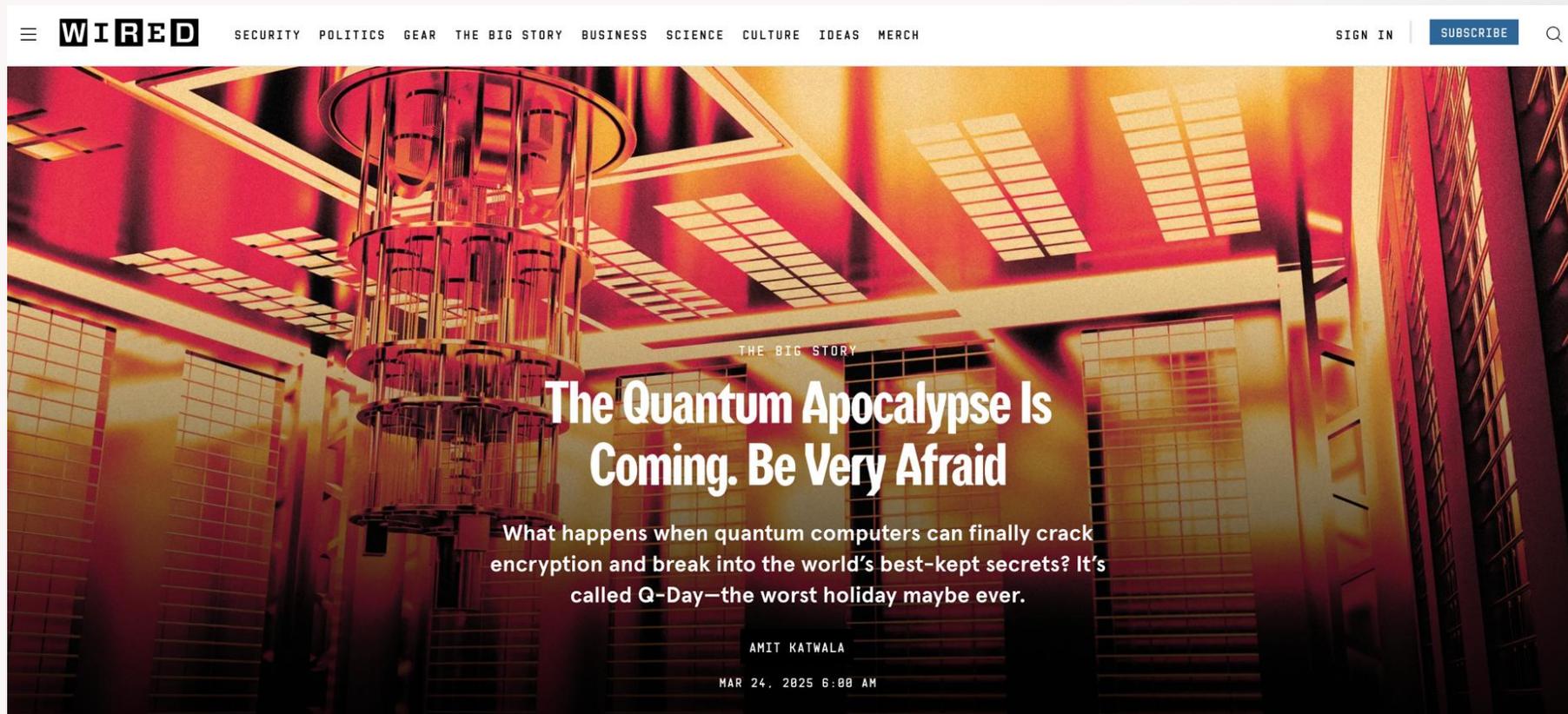
EUROSTARS TOWER

MADRID, SPAIN

QUANTUM TECHNOLOGIES

Addressing
Sustainability & Security Challenges
and
Wealth Generation/Distribution

The Quantum Apocalypse ...



FT's Looming Quantum Era

FT, August 21, 2025

☰ 🔍

FINANCIAL TIMES

HOME WORLD US COMPANIES TECH MARKETS CLIMATE OPINION LEX WORK & CAREERS LIFE & ARTS HTSI

Opinion **The FT View**

The world should prepare for the looming quantum era

New breakthroughs underscore the technology's potential and perils

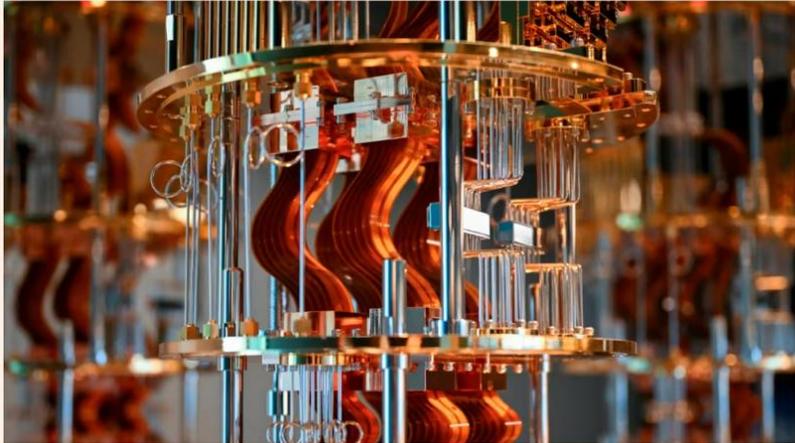
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Parts of the IBM Quantum System. There are still considerable engineering challenges with the technology to be overcome © Angela Weiss/AFP/Getty Images

The editorial board

Published AUG 21 2025

87



Tuesday, Oct 28th 2025
[12:00 am – 1:30 am]

Plenary 4

Quantum Technologies: Addressing Sustainability, Security Challenges & Wealth Generation & Distribution



TECHNOLOGY, SUSTAINABILITY & HUMANITY
27 & 28 OCTOBER 2025
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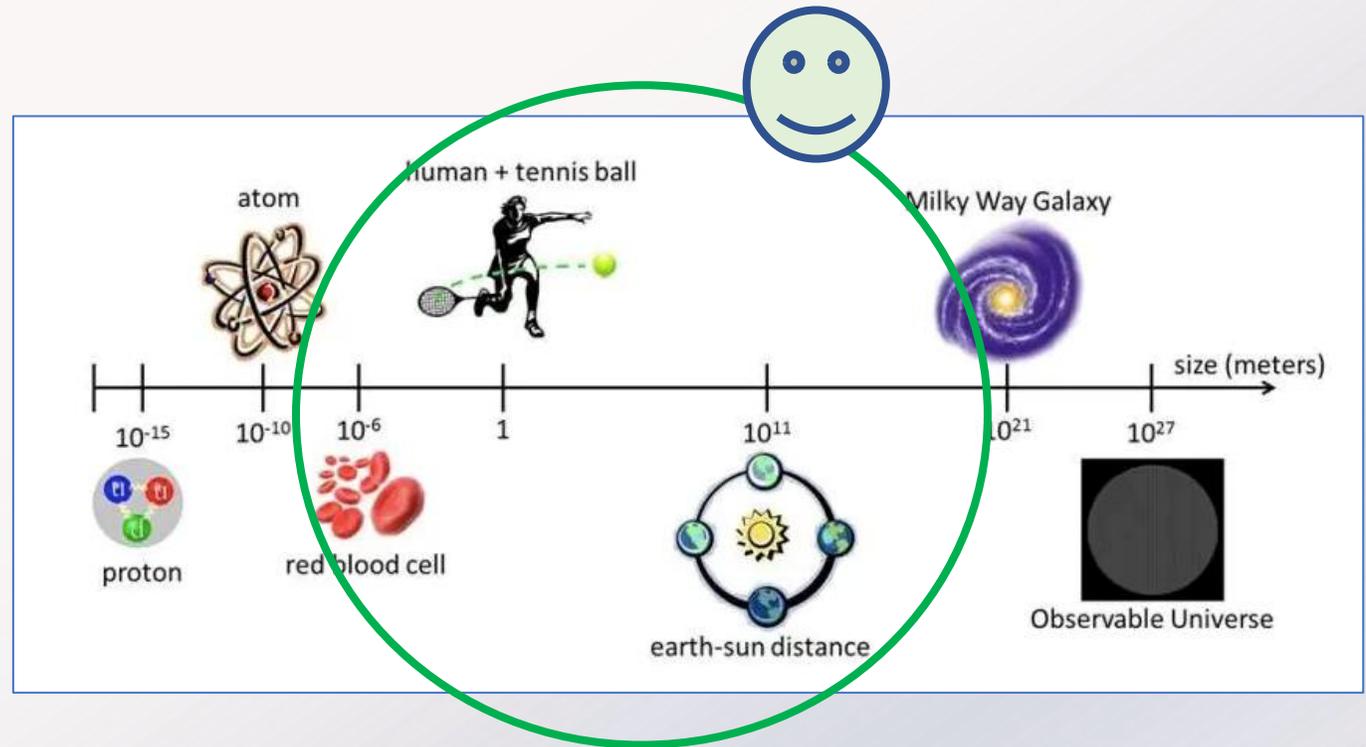
Quantum Scientist Associate
BBVA

globalforumstf.org/global-forum-2025

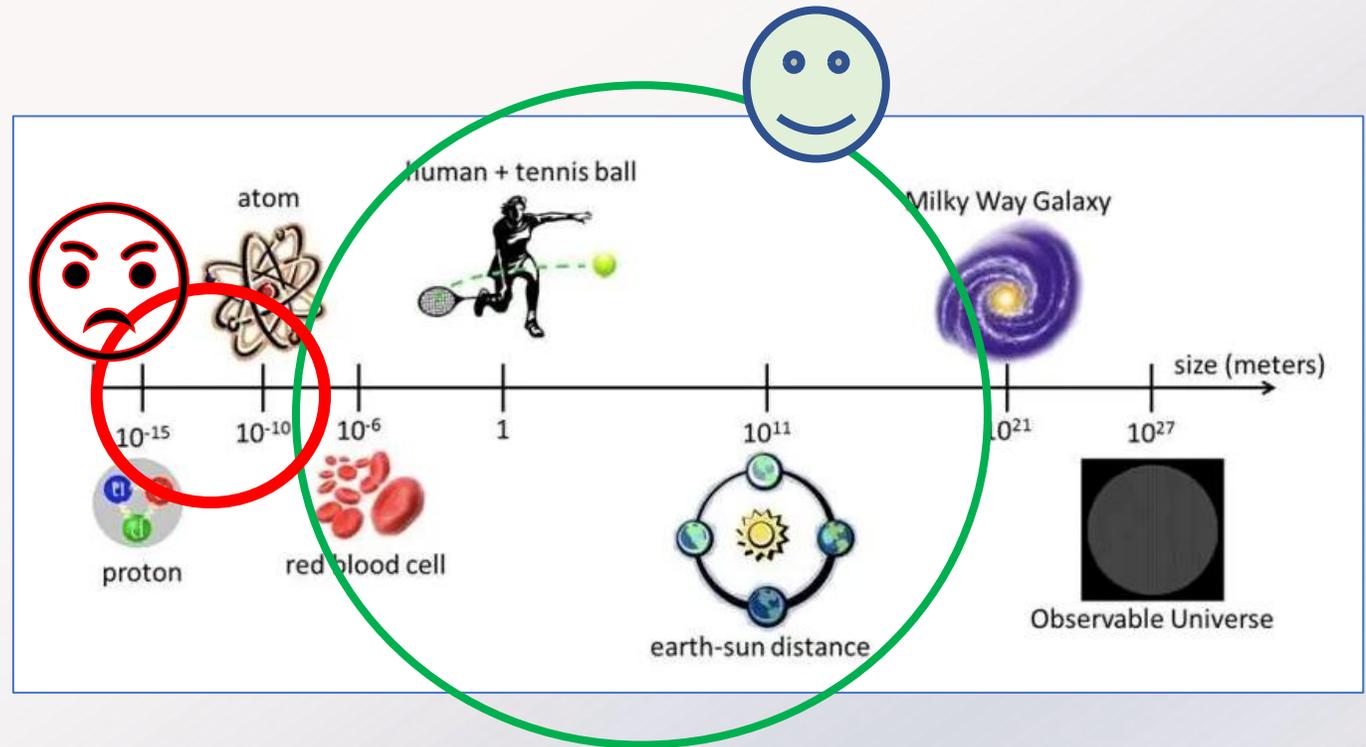


TECHNOLOGY, SUSTAINABILITY & HUMANITY
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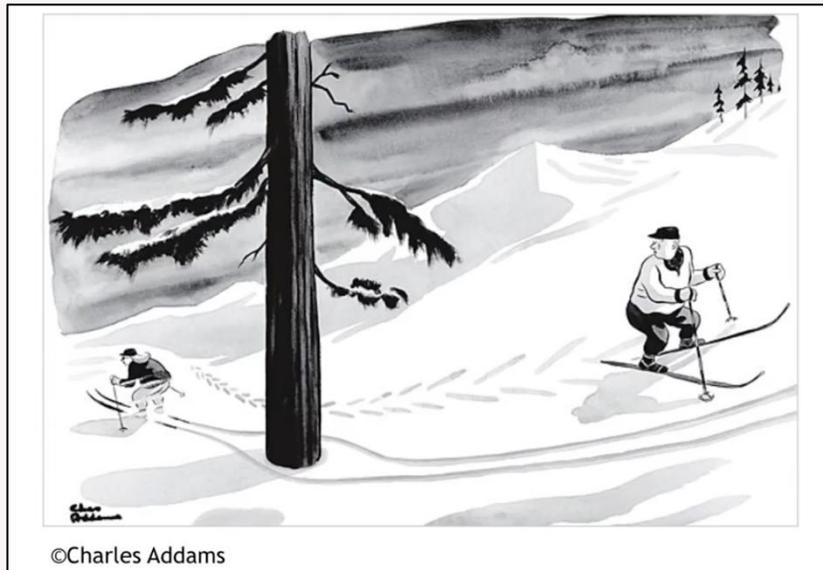
Science at 0,0000000001 m



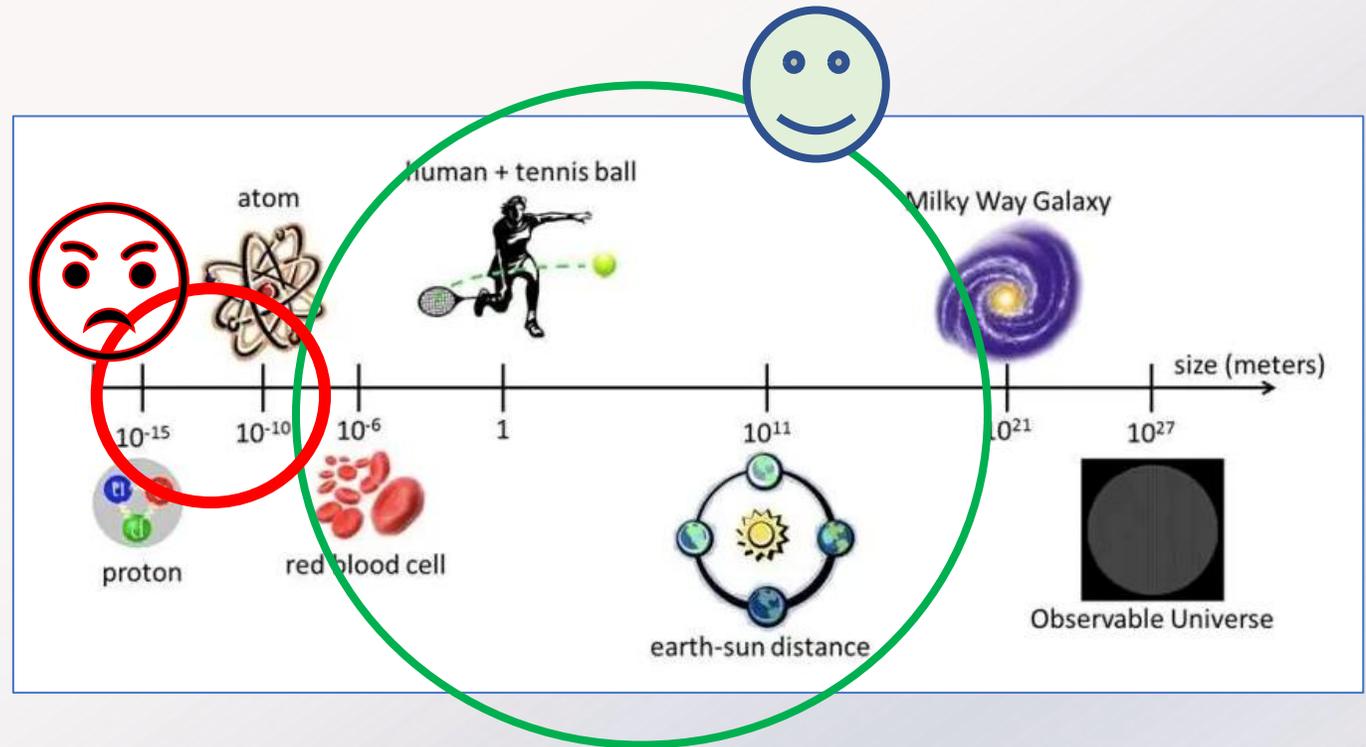
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Science at 0,0000000001 m



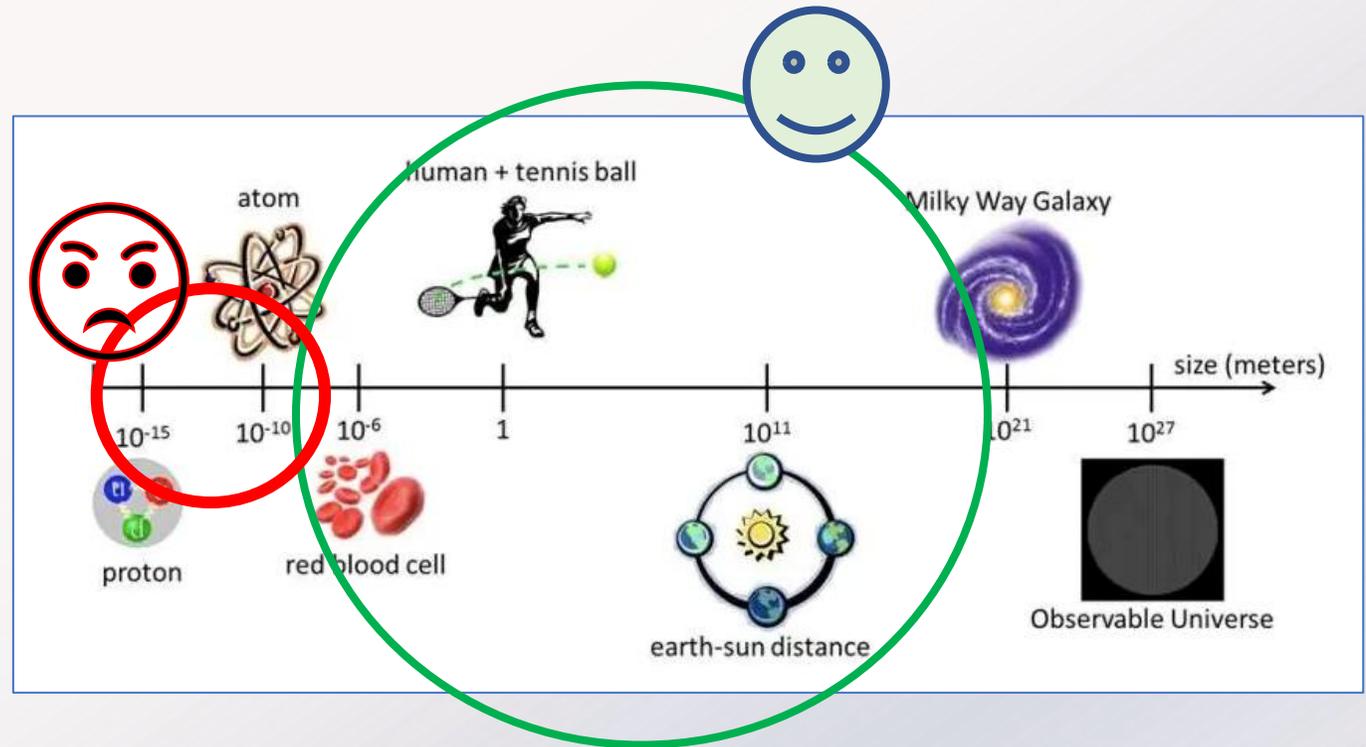
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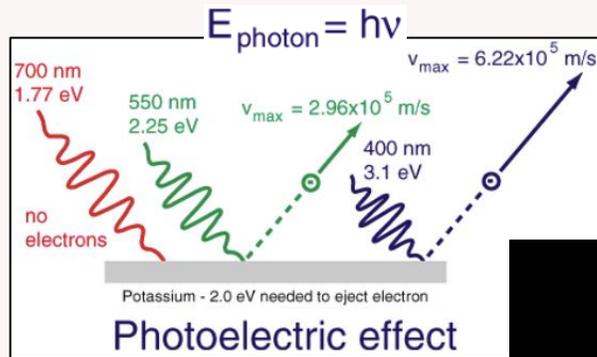
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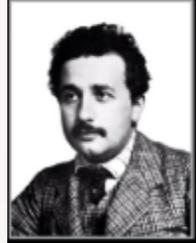
©Charles Addams



Light is a wave ... & is a particle



Reflection	✓	✓
Refraction	✓	✓
Interference	✗	✓
Diffraction	✗	✓
Polarization	✗	✓
Photoelectric effect	✓	✗



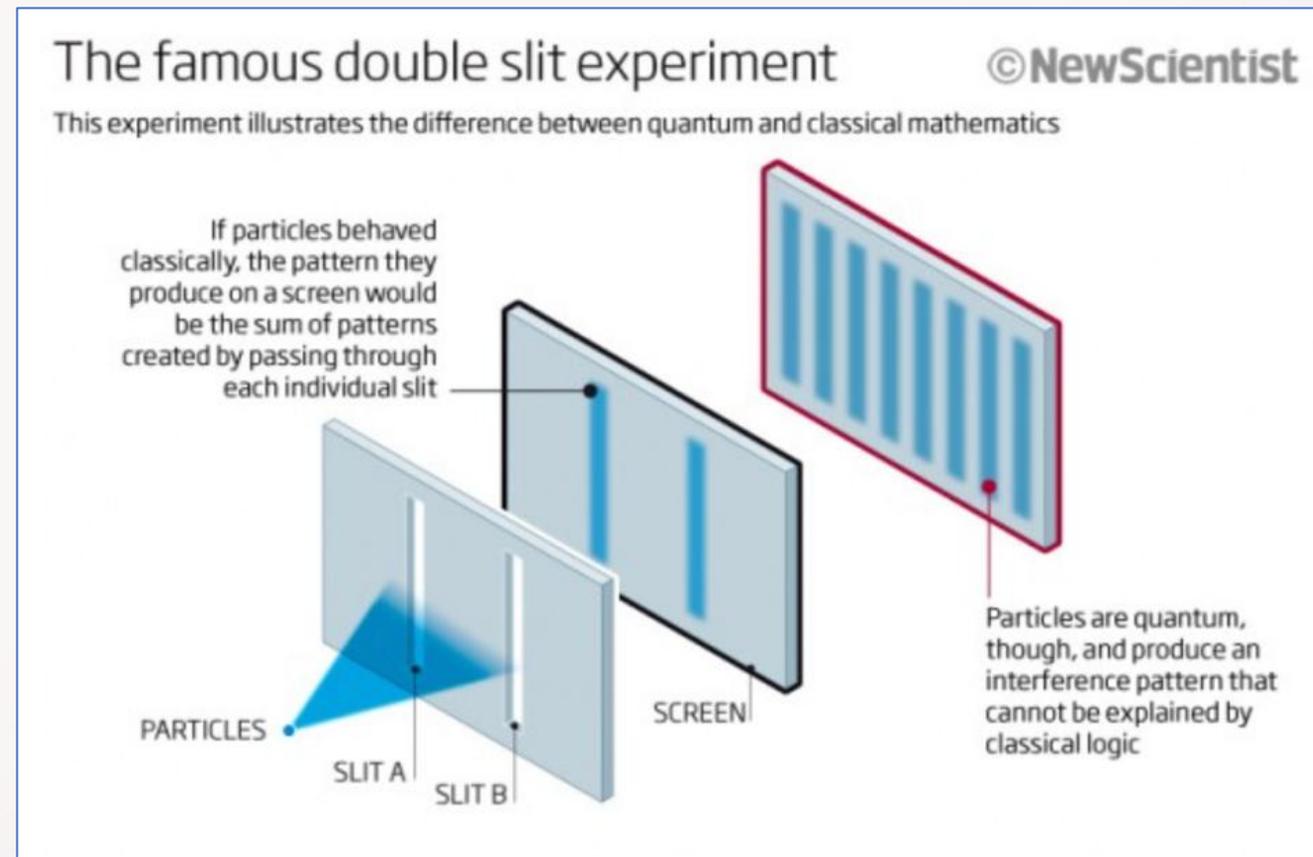
Wave Nature of Light
 The determining factor for a wave motion is the ability to produce an **interference pattern**. Given that light can form an interference pattern it must be considered a wave motion.

The Particulate Nature of Light
 The **photoelectric effect** - electrons being emitted from the surface of a metal given the incidence of radiation of a sufficiently high frequency - can only be explained in terms of light having a particulate nature.

Source: Bozeman Science July 2015

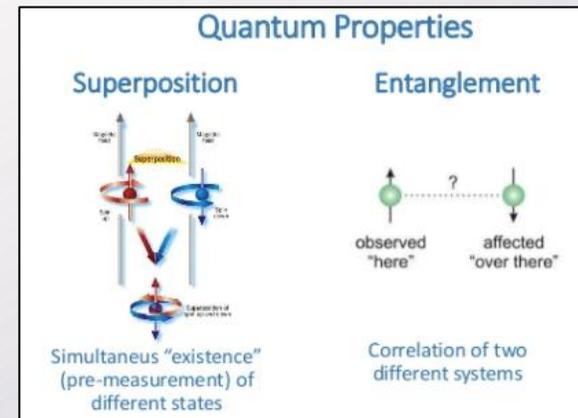


Matter are particles ... & are waves

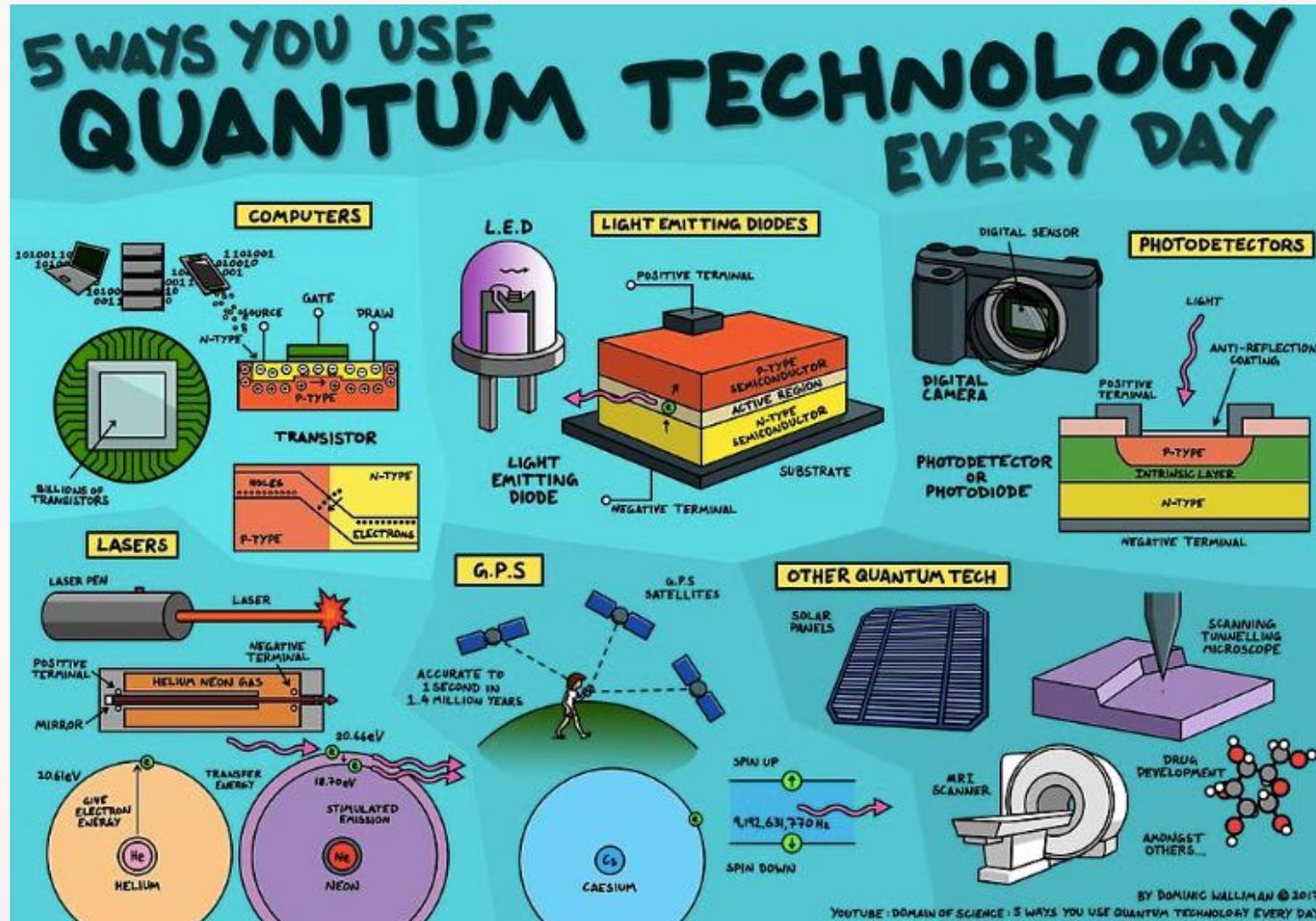


Quantum specials underpin the most accurate theory ever

- Wave-particle duality
- Uncertainty principle
- Impact of measurements
- It's all about probabilities
- SUPERPOSITION
- ENTANGLEMENT
- TUNNEL EFFECT



Today's quantum at work: collective quantum behaviours



D.Malliman, 2017



Big Tech invests in AI ...

D.Hassabis Google DeepMind & Nobel Prize:

**The difference here is, it's going to be
10 times bigger than the Industrial Revolution,
and maybe 10 times faster.**

**The Industrial Revolution was not plain sailing for
everyone,
but we wouldn't wish it hadn't happened.
Obviously, we should try to minimise that disruption,
but there is going to be change – hopefully for the better.**

D.Hassabis, The Guardian, August 2025



AI OpenAI's \$500 Billion
Stargate: The High-Stakes
Gamble to Revolutionize
Computational
Infrastructure

© January 24, 2025 HOT News

Hot News, January 2025

Big Tech invests in AI ... & in Quantum

TECH

Nvidia CEO says quantum computing is reaching an 'inflection point'

PUBLISHED WED, JUN 11 2025 6:02 AM EDT | UPDATED WED, JUN 11 2025 9:23 AM EDT

Ryan Browne
@RYAN_BROWNE_

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CNBC, June 2025

D.Hassabis, The Guardian, August 2025

Nvidia's involvement in the largest quantum funding rounds of 2025

PsiQuantum	\$1B	September	
QUANTINUUM	\$600M	September	
IQM	\$320M	September	
IQEra Computing Inc.	\$230M	February	
MULTIVERSE COMPUTING	\$215M	June	
QM QUANTUM MACHINES	\$170M	February	
SANDBOX AQ	\$150M	April	

dealroom.co

Dealroom, September 11, 2025



The AI & Quantum symbiosis

Figure 1: AI may be supercharged by quantum computing

Click sections below for details

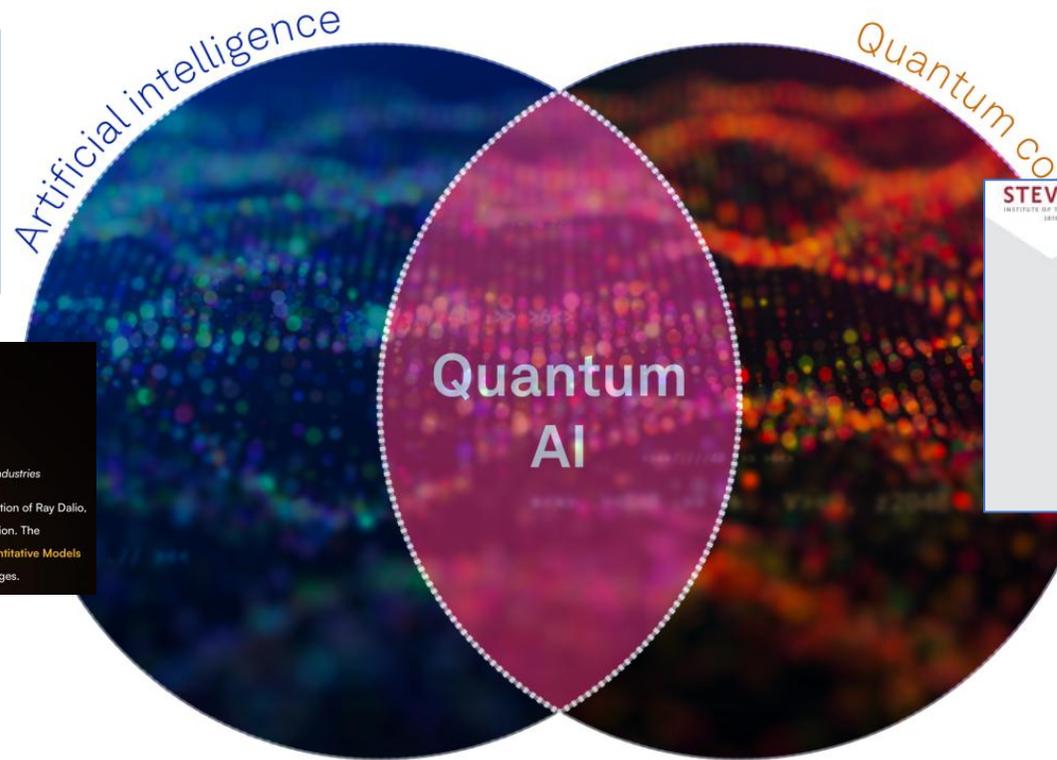


Press Release

SandboxAQ Closes Series E Round with Expanded Investor Base

New investments to accelerate SandboxAQ's innovation in quantitative AI and expand its impact across critical industries

Palo Alto, CA; April 4, 2025 — **SandboxAQ**, a global leader in enterprise quantitative AI, announced the addition of Ray Dalio, Horizon Kinetics, BNP Paribas, Google, and NVIDIA to its Series E funding round, which raised over \$450 million. The investments underscore the confidence in SandboxAQ's vision and the transformative power of its **Large Quantitative Models (LQMs)**, which are redefining how enterprises leverage AI to tackle complex scientific and quantitative challenges.



Campus & Community

Quantum and AI Are Our Next Problem-Solvers, Says IBM's Research Director

posted October 16, 2024

Source: S&P Global.
© 2024 S&P Global.



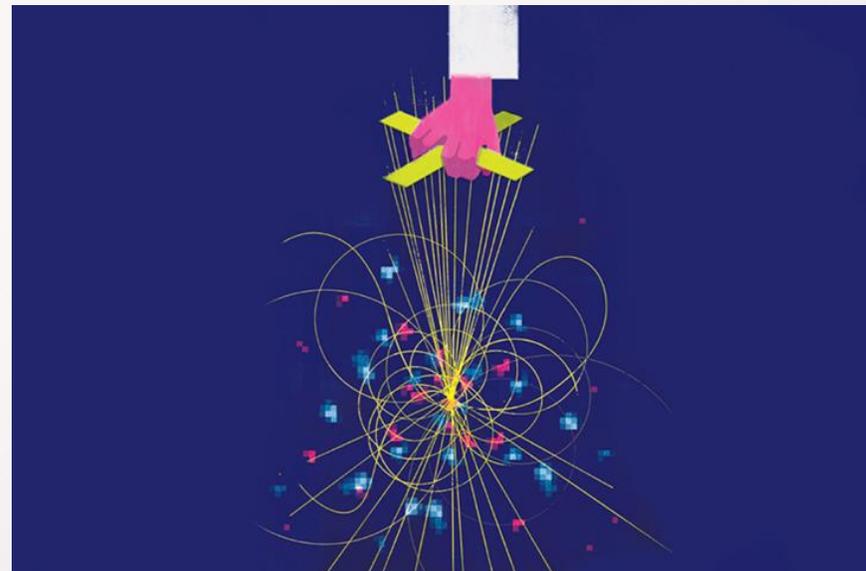
The next wave: single quantum behaviours

NOBEL 2012 Physics

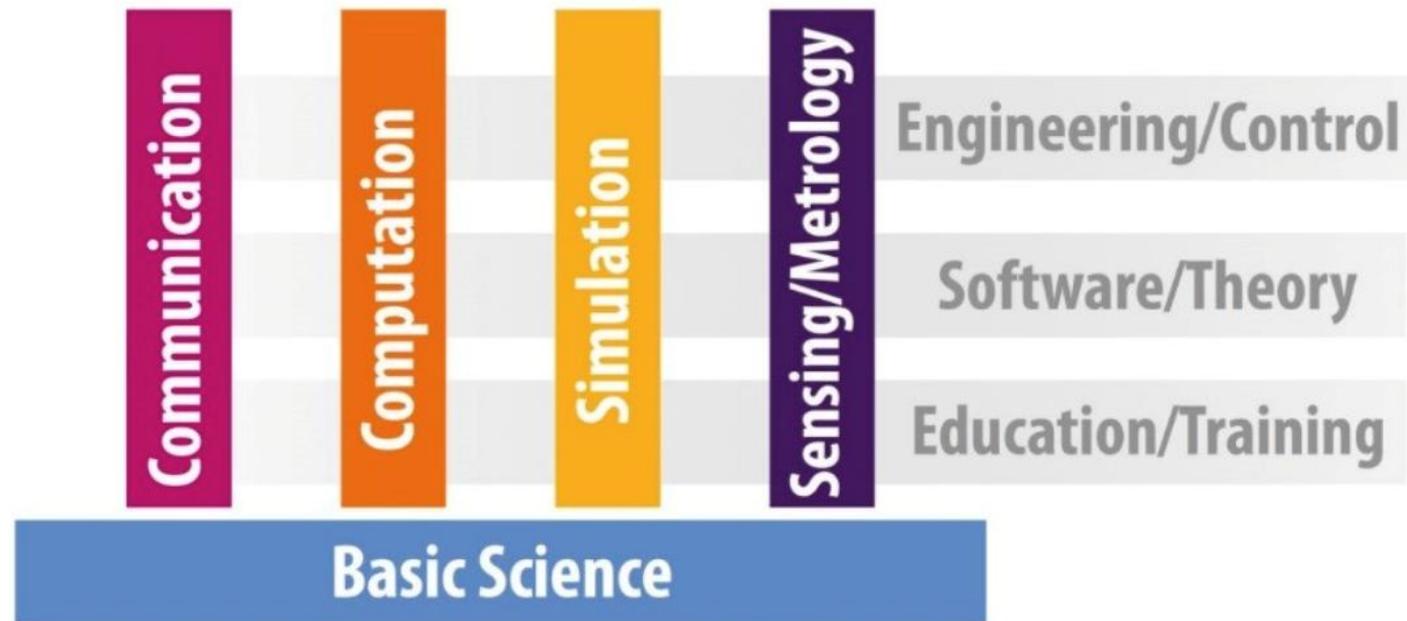
Manipulating individual quantum systems

[Ed Hinds](#) ✉ & [Rainer Blatt](#) ✉

[Nature](#) **492**, 55 (2012) | [Cite this article](#)

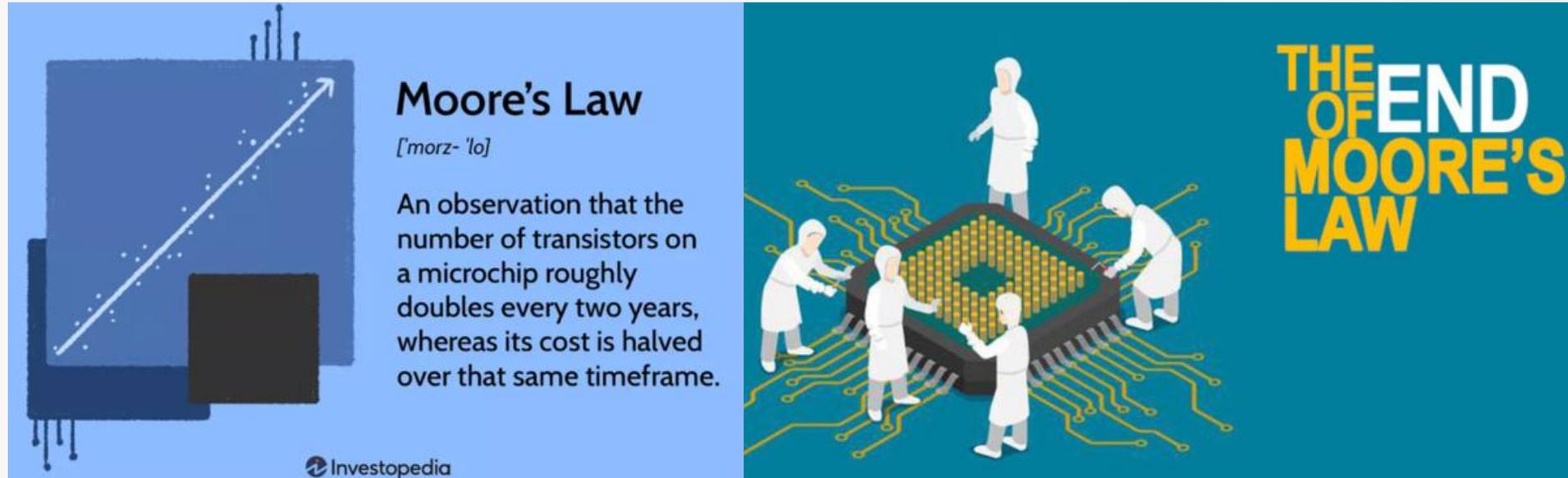


The new quantum technologies



Quantum Technologies's primary areas of work. © UE

The limits of the transistor miniaturisation run $< 2 \text{ nm}$!!??



Computing / Quantum computing

We're not prepared for the end of Moore's Law

It has fueled prosperity of the last 50 years. But the end is now in sight.

by **David Rotman** February 24, 2020

Computing / Microchips

The great chip crisis threatens the promise of Moore's Law

A shortage of microchips threatens to slow the decades of innovation fueled by the promise of ever faster, cheaper computing power.

by **Jeremy Hsu** June 30, 2021

Artificial intelligence / Machine learning

Training a single AI model can emit as much carbon as five cars in their lifetimes

Deep learning has a terrible carbon footprint.

by **Karen Hao** June 6, 2019



The limits of sustainability: a \$7 Trillion race to scale data centres

5 MIN • INFRASTRUCTURE

AWS buys data center running on nuclear power: smart sustainability?



 LAURA HERIJGERS
19 Mar 2024 at 09:40 CET

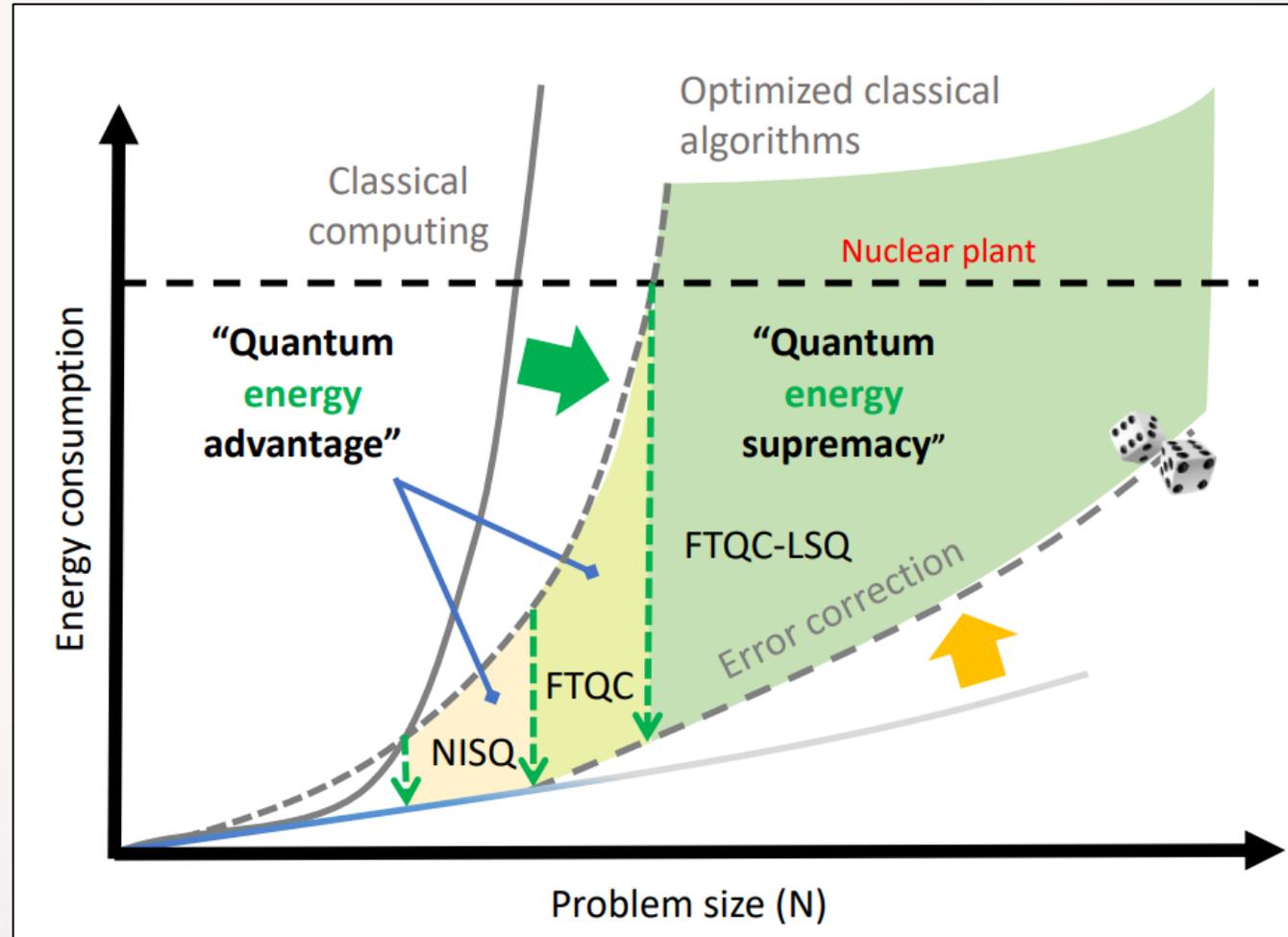
  

techzine.eu, 19 March 2025

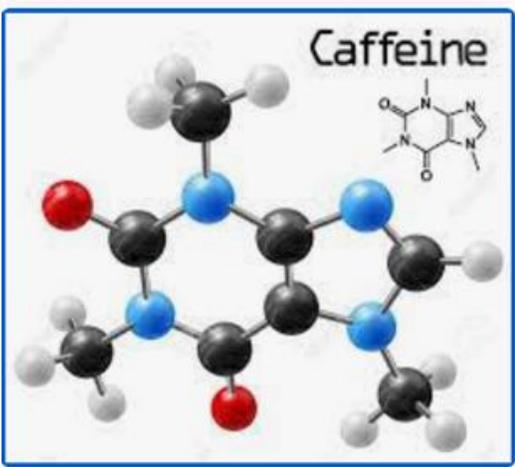


The quantum SUSTAINABILITY promise: exponential

Alexia Auffèves & Olivier Ezratty, 2022



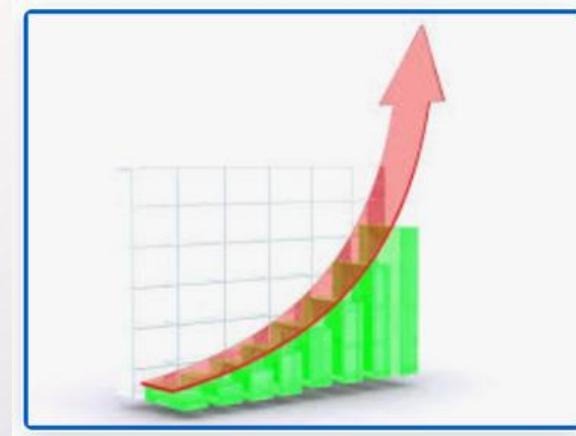
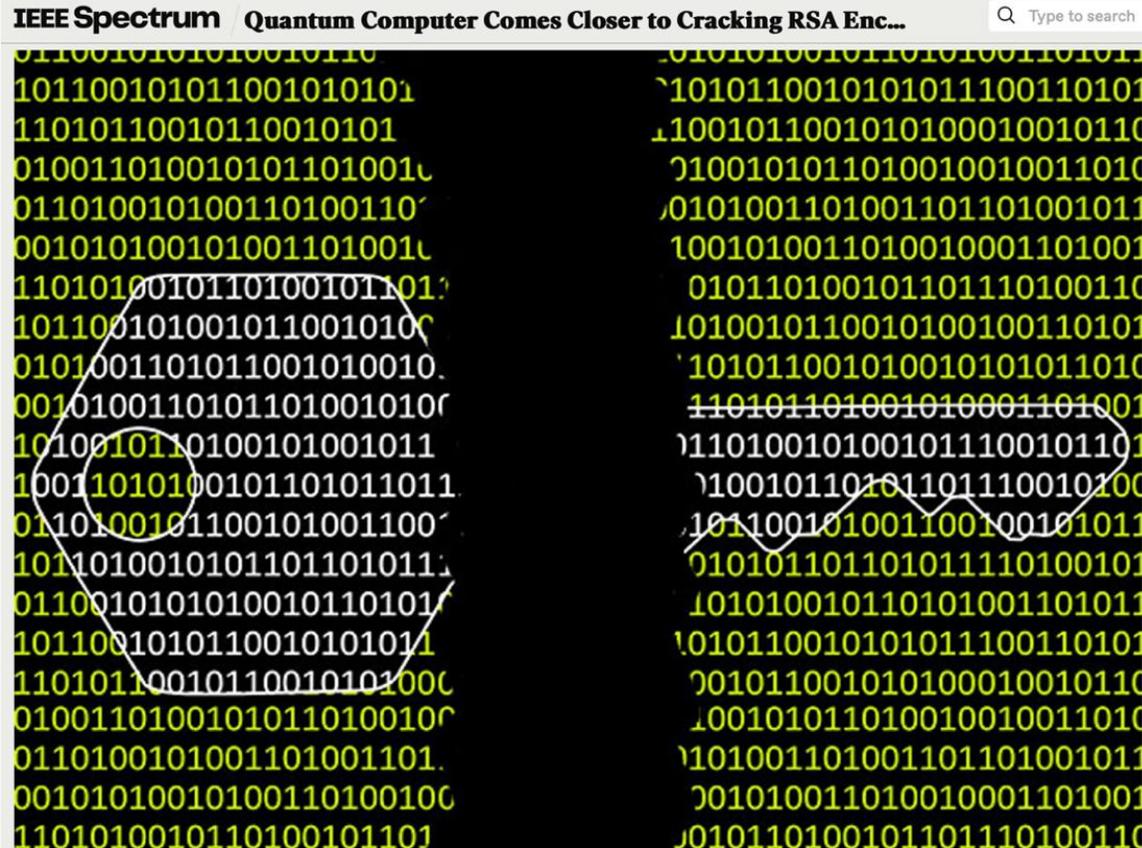
Today's unapproachable calculations #1



NOT ENOUGH RESOURCES

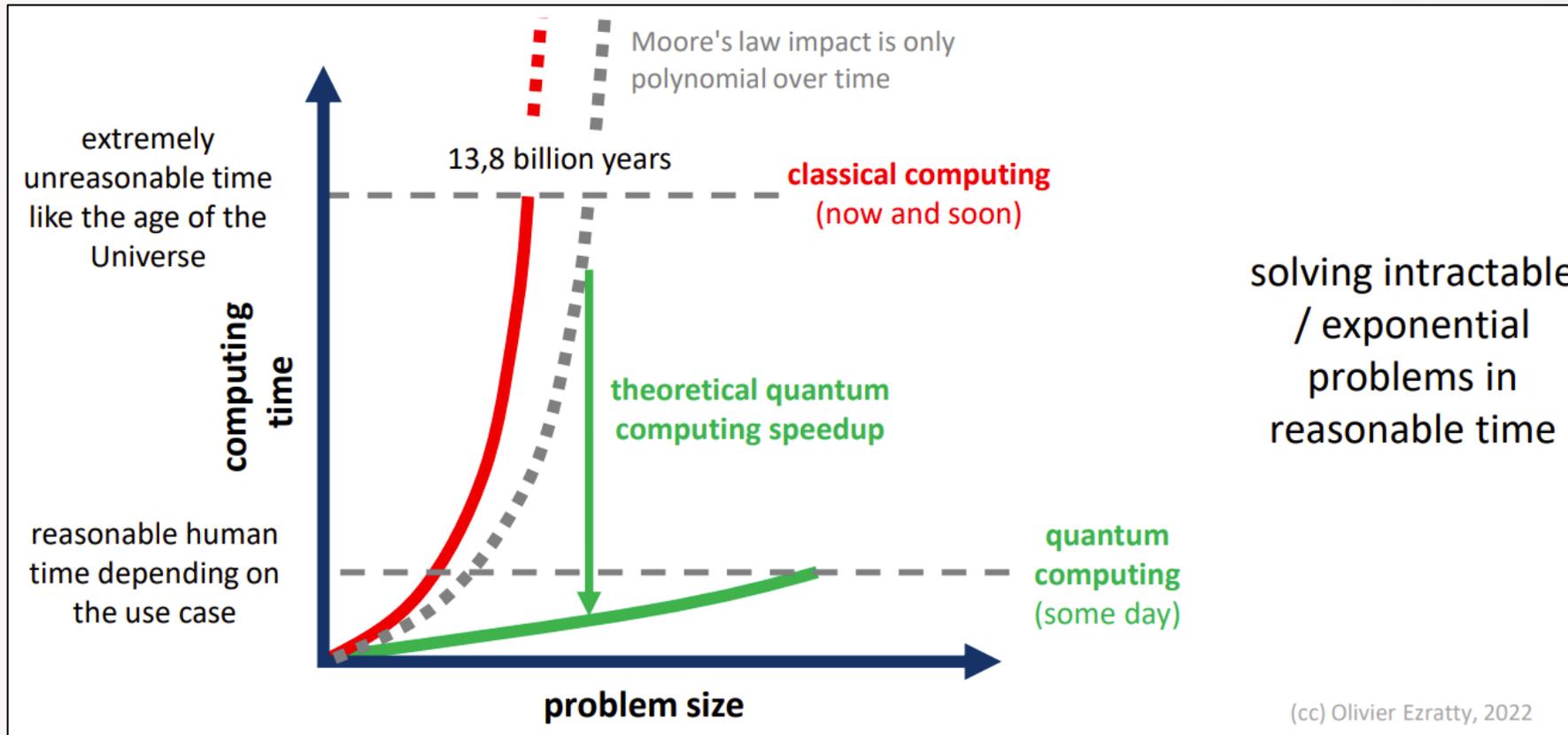


Today's unapproachable calculations #2



NOT ENOUGH TIME

The quantum PERFORMANCE promise: exponential



O.Ezratty, 2022

Quantum: a NEW computing paradigm



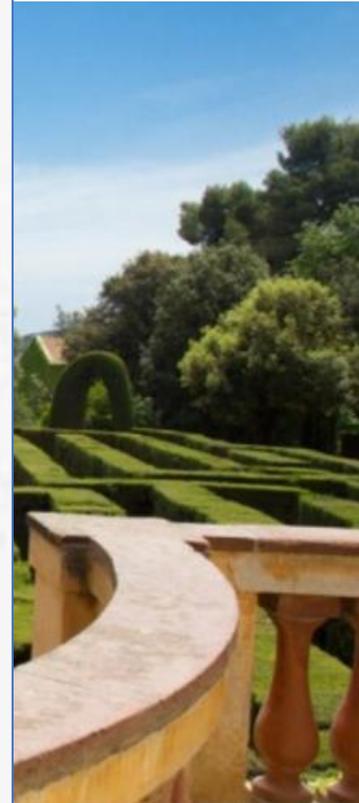
- **NEW** hardware & **NEW** software
- Revolutionary – **orders** of magnitude for **some calculations**
- More **compute** power & less energy **consumption**
- **Complementary** & hybrid = QPU + CPU + GPU
- Futuristic – next decade



A very lengthy problem...

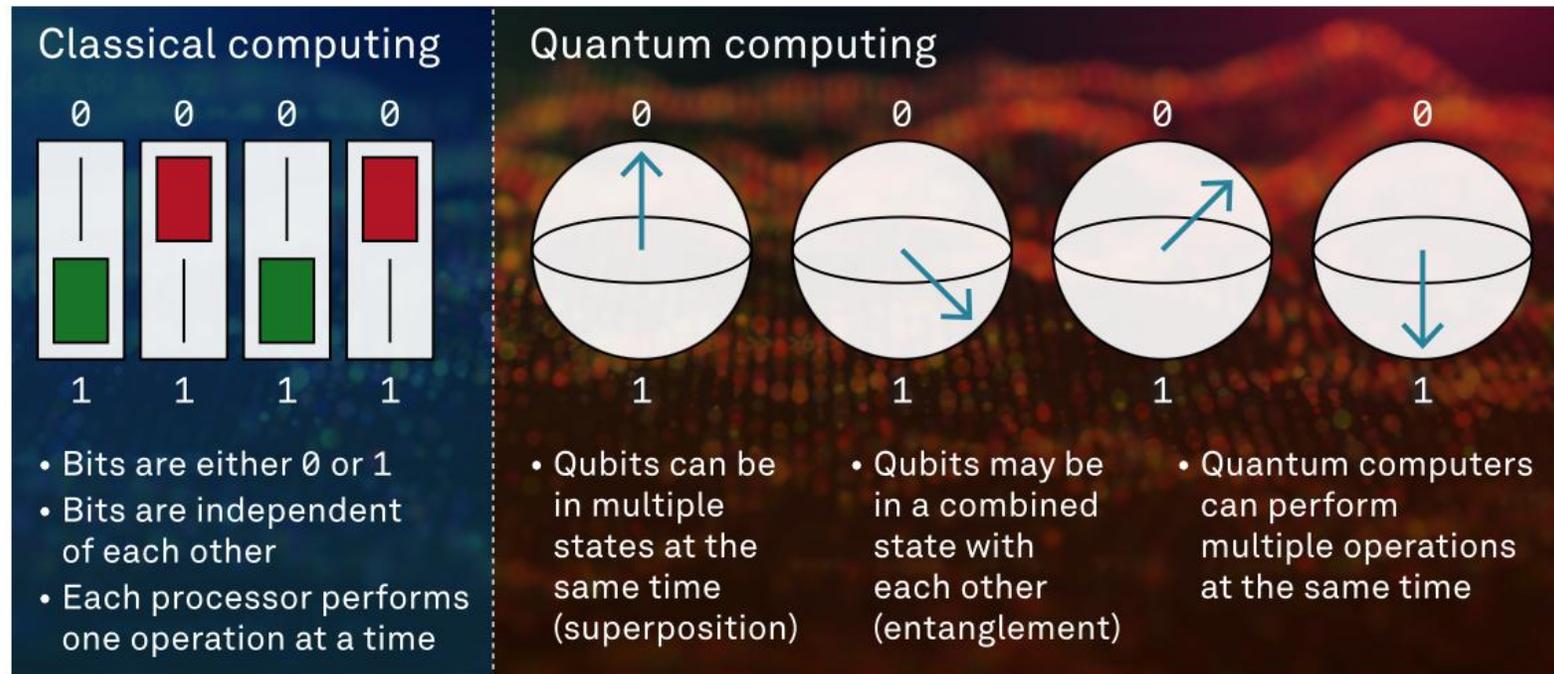


... solved in one go



Single quantum states: Qubits

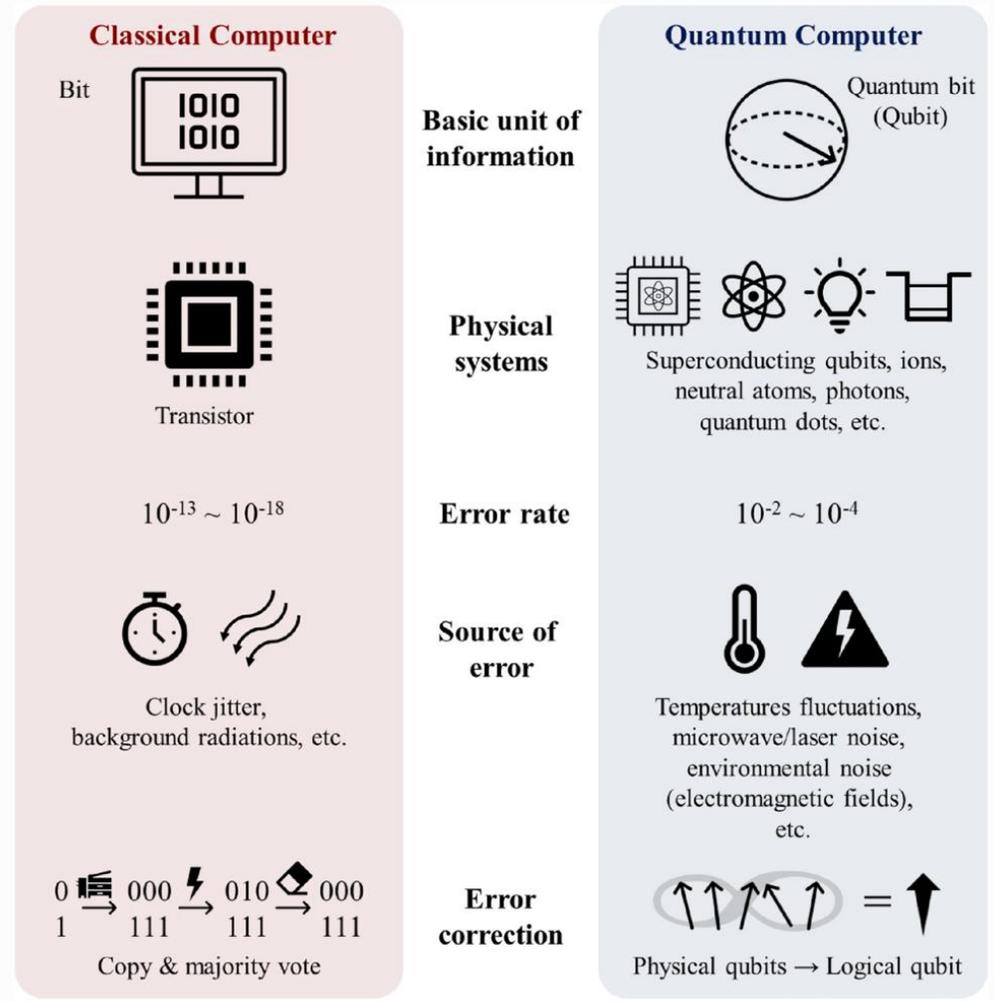
Figure 2: Classical computing versus quantum computing



Source: S&P Global.
© 2024 S&P Global.

Quantum vs classical computing

From: [An elementary review on basic principles and developments of qubits for quantum computing](#)



E.Chae et al., March 2024

Use cases

A quantum computer leverages quantum mechanics, making it very powerful.

Why is quantum computing so powerful?

It leverages the phenomena of quantum mechanics:

- **Superposition:** The possibility of quantum systems to not be in a single defined state (left or right, up or down, etc)
- **Entanglement:** The possibility of two or more (even physically separate) systems to form an inseparable combined state
- **Interference:** The potential of quantum states to combine

Which problems can a quantum computer solve?

- **Linear algebra (machine learning and AI)** for, eg, reduction of large data for better decisions, predictions, and automation
- **Simulation** of quantum systems and processes—eg, molecular processes, material sciences, and life sciences
- **Mathematical optimization** with algorithms that can enable near real-time optimization for, eg, financial modeling
- **Factorization (security) of large numbers with exponential speedup**—eg, to break mainstream encryption protocols

What do potential use cases look like?



Automotive

Linear algebra for battery optimization: Efficiently predict the lifetime of batteries



Pharma and chemicals

Simulation of molecules: Simulate molecular processes for drug discovery



Finance

Optimization of collaterals: Consider more collaterals and solve with higher accuracy



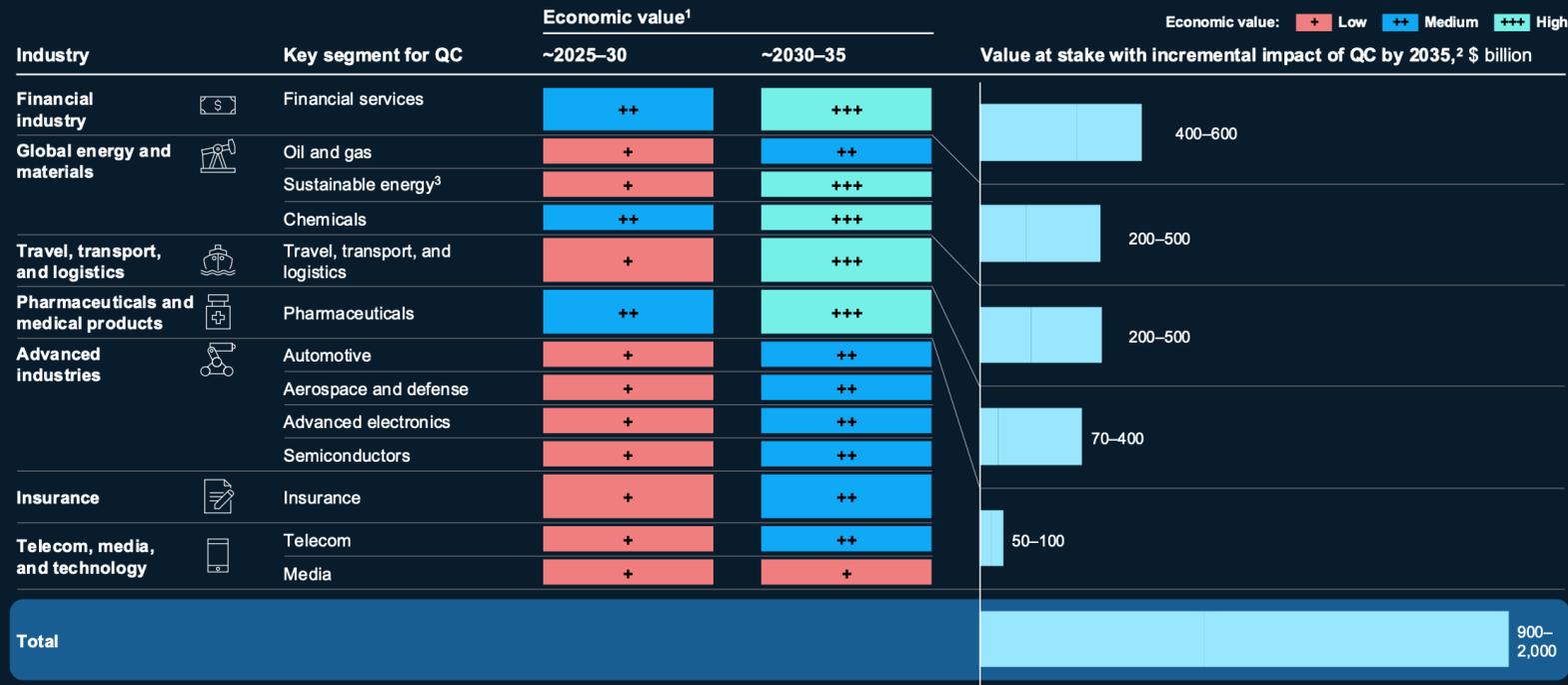
Security

Factorization: Use quantum random number generators to enhance security

McKinsey, 2025

Economic impact: \$1 to \$2 Trillion

Deep dive: QC presents a \$1 trillion to \$2 trillion use case opportunity, with rapid acceleration expected in the next five to ten years.



McKinsey, June 2025

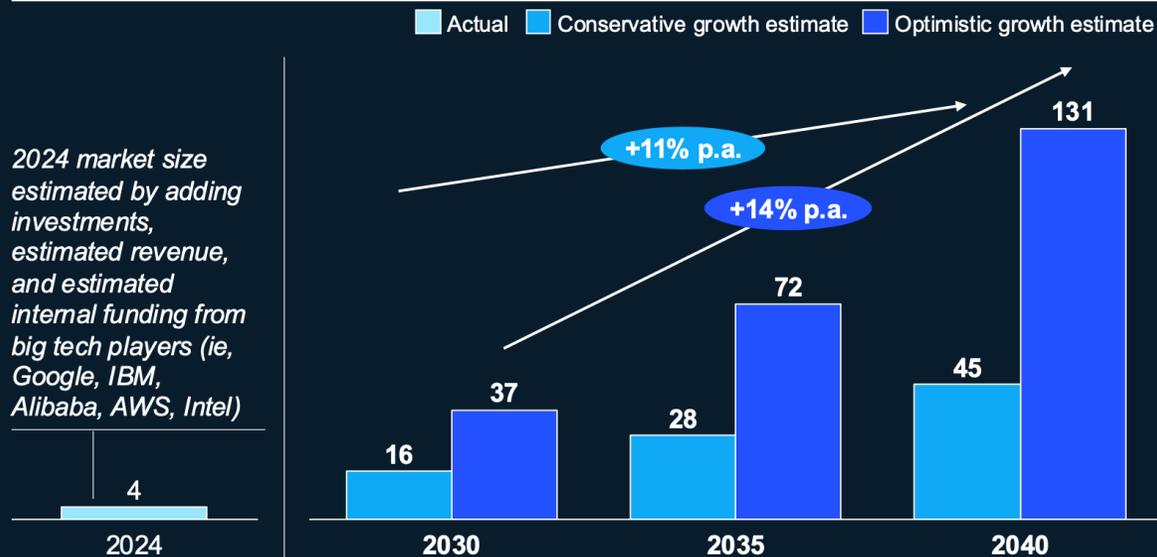
1. Economic value is defined as the additional revenue and saved costs that the application of QC can unlock. These industries are the most likely to realize this value earlier than other industries; therefore, they are examined in more depth.
 2. Value estimates are approximative, not definitive projections for business value.
 3. Sustainable energy market is expected to grow rapidly from 2022 to 2035. However, the 2035 market size is influenced by numerous factors and challenging to predict.
 Source: Oxford Economics; McKinsey analysis



Market size: \$100 Billion

Deep dive: The QC market is expected to reach \$16 billion to \$37 billion by 2030 and \$45 billion to \$131 billion by 2040.

Expected market size (revenue plus external funding) in each scenario, \$ billion



Numbers include both funding and investment in QC and proceeds to quantum providers

Source: Expert interviews; press search; McKinsey analysis

Key insights



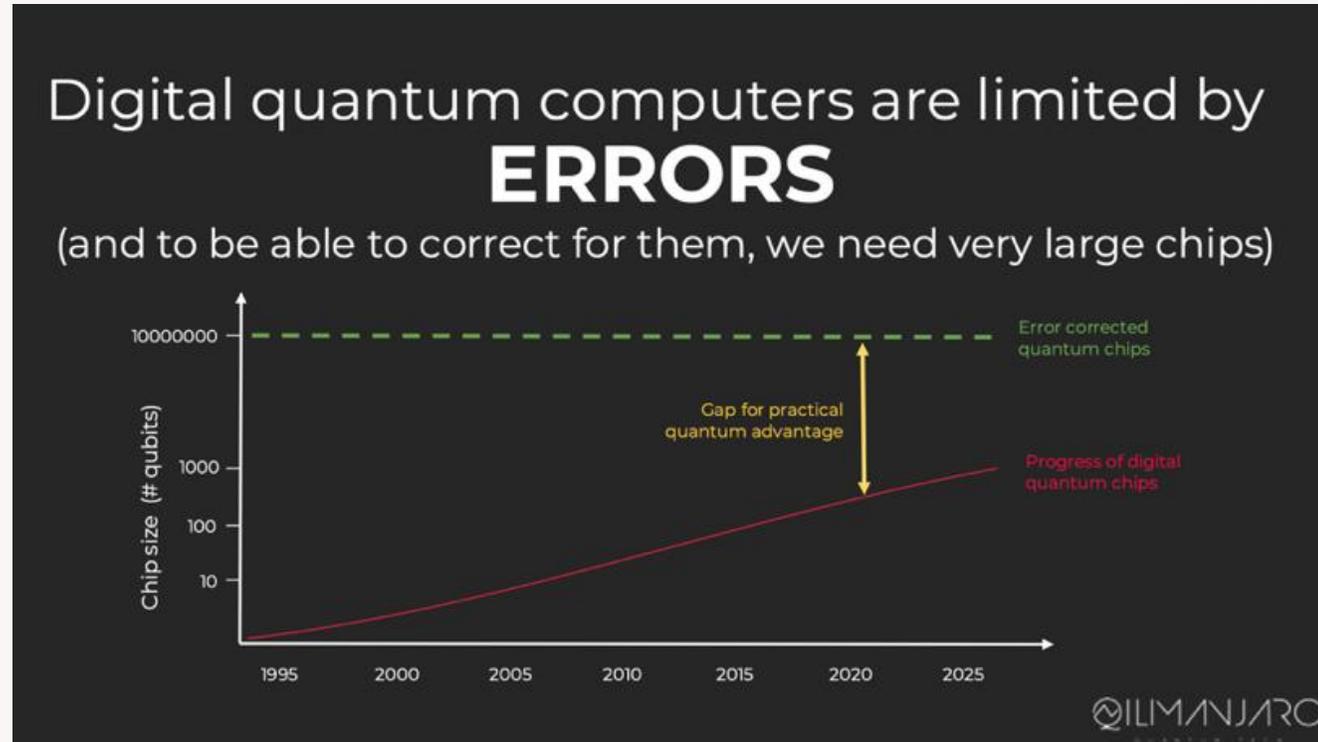
- Expected overall market size of \$45B–\$131B in 2040, depending on assumed growth scenario
- Growth rates are expected to be 11–14% per year in the next decade
- The key difference between scenarios is the pace of solving today's challenges combined with higher demand in case of faster progress
- Industry capital expenditures in 2024 were ~32% of overall market size

McKinsey, June 2025

McKinsey & Company 32



“Noisy Intermediate-Scale Quantum” Today’s era



Google Quantum AI-Led Researchers Find ‘Sweet Spot’ To Use Current Quantum Computers To Make Practical Calculations

Research Matt Swayne • October 9, 2024

News • June 19, 2025 • 4 min read

Microsoft advances quantum error correction with a family of novel four-dimensional codes

How to factor 2048 bit RSA integers with less than a million noisy qubits

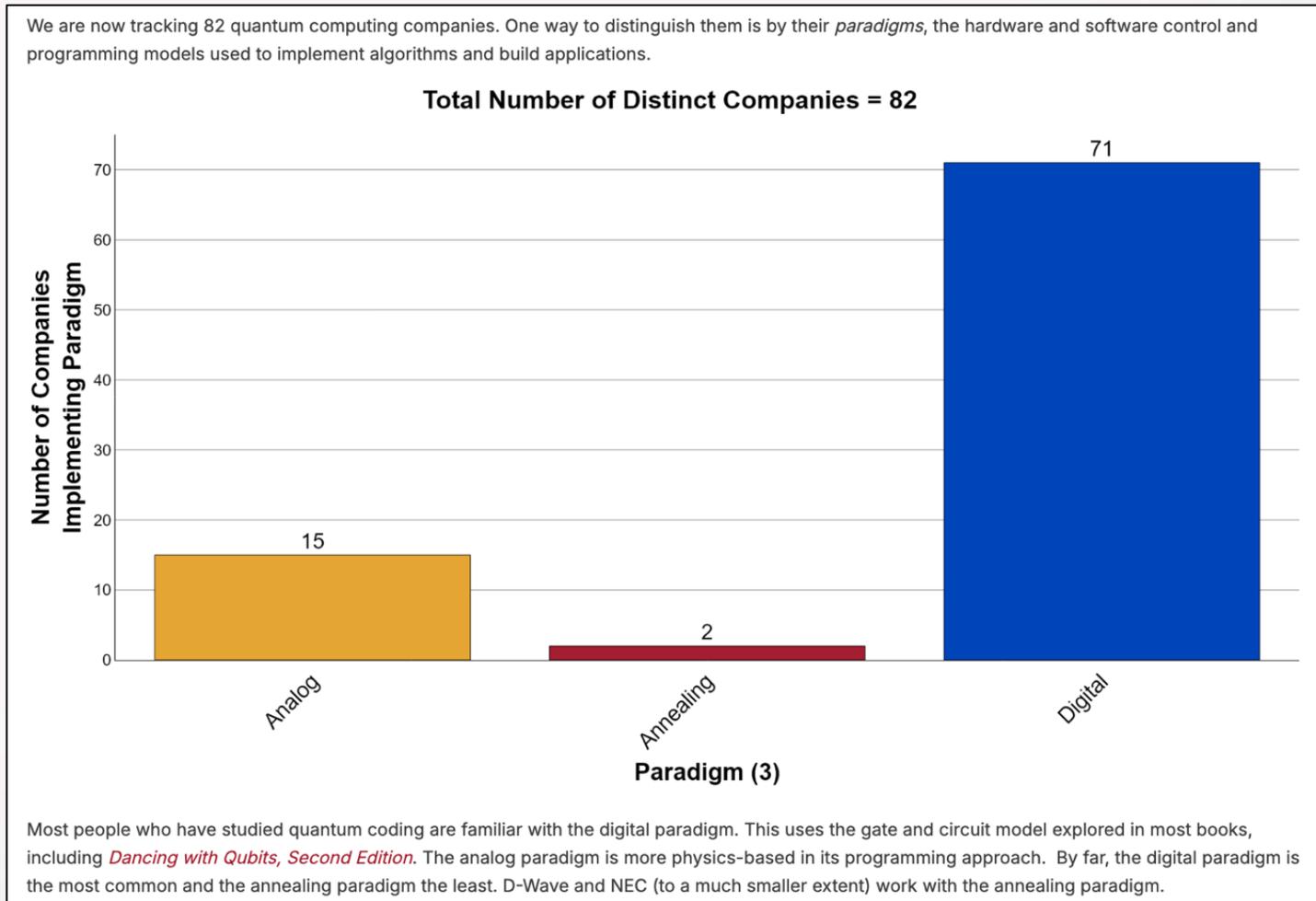
Craig Gidney

Google Quantum AI, Santa Barbara, California 93117, USA
May 23, 2025



There's another way

Sutor Group, May 2025



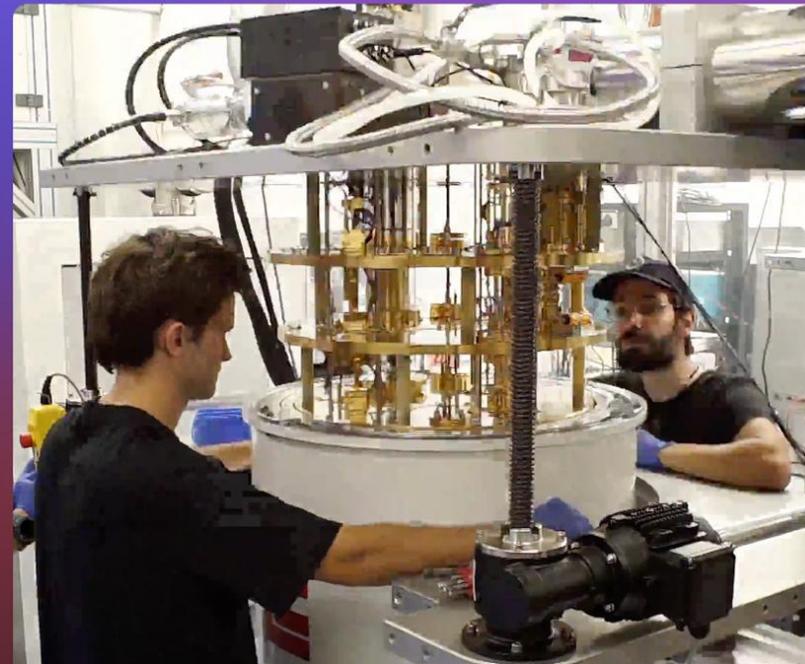
Qilimanjaro Quantum Tech



We do full-stack analog QASICs

Unlocking nature through analog quantum computing. Because nature is intrinsically quantum and analog, our custom-designed, analog approach opens the true potential of quantum computing, delivering faster, more accurate and sustainable solutions, tailored to your specific needs for simulation, optimization and AI.

We're building a path towards universal quantum computing through quantum app-specific integrated circuits (QASICs), tackling high-value problems today while laying the groundwork for broader applications in the future.



Qilimanjaro on premise

La Vanguardia, 29.01.2025

Bruselas aprueba construir un tercer computador cuántico en Barcelona

MareNostrum-Ona costará 8,5 millones de euros y se instalará en el BSC

FRANCESC BRACERO
Barcelona

La Comisión Europea anunció ayer mediante su agencia para la computación de altas prestaciones, EuroHPC JU, un acuerdo para instalar en el Barcelona Supercomputing Center (BSC) un tercer ordenador cuántico llamado MareNostrum-Ona, construido por la compañía Qilimanjaro Quantum Tech en asociación con Do it Now. Bruselas financiará el 50% del coste de su instalación, de 8,5 millones de euros. La otra mitad la aportará el consorcio EuroQCS-España, dirigido por el BSC, que incluye el Instituto de Física de Altas Energías (IFAE) de España y el Laboratorio Ibérico Internacional de Nanotecnología (INL) de Portugal.

MareNostrum-Ona será un ordenador cuántico analógico. En su primera generación, este sistema tendrá al menos 10 qubits físicos que se irán ampliando en la tercera generación, según el comunicado de EuroHPC sobre el acuerdo para la instalación en la capilla de la torre Girona del BSC. El ordenador cuántico desarrollado por Qilimanjaro utiliza tecnología de qubit superconductor siguiendo el modelo de computación adiabática (sin pérdida ni ganancia de calor)/analógica.

La nueva máquina es del tipo *quantum annealer* (que se podría traducir como *horno cuántico*), un tipo de ordenador cuántico que se usa para encontrar la solución de mínima energía de un problema de optimización, que suele ser la solución más eficiente. Mientras que en



En este espacio de la torre Girona donde ya hay dos ordenadores cuánticos se instalará un tercero

EuroHPC indica que “permitirá el desarrollo de aplicaciones de gran relevancia industrial, científica y social”

computación clásica se miran todos los caminos para encontrar el más rápido, en el *quantum annealer* se puede hallar esa vía mediante una forma más rápida y eficiente porque es como si se pudieran ver todas de

golpe.

A diferencia de los computadores clásicos, donde la unidad de información básica, el bit, se basa en 1 y 0, con un solo estado cada vez, en la computación cuántica se utilizan qubits, que pueden tener dos estados de forma simultánea, lo que permite nuevas puertas lógicas y algoritmos de mayor complejidad para resolver problemas que en los ordenadores tradicionales son prácticamente inabordables.

EuroHPC anunció que MareNostrum-Ona “será accesible a

una amplia gama de usuarios europeos, desde la comunidad científica hasta la industria y el sector público”. La nota asegura que la nueva instalación “permitirá el desarrollo de aplicaciones de gran relevancia industrial, científica y social en toda Europa, añadiendo nuevas capacidades al panorama de la supercomputación europea”.

El nombre de MareNostrum-Ona es una referencia a la función de onda que representa el estado cuántico y, además de nombre de mujer, alude al mar como MareNostrum, el nombre

del supercomputador en el que se integrará y que ya va por su quinta generación. La nueva máquina complementará el doble ordenador cuántico digital ya instalado en el BSC, que fue adquirido en el marco de la iniciativa Quantum Spain.

Qilimanjaro acaba de instalar estos dos computadores cuánticos en la capilla de la torre Girona del BSC. Las nuevas máquinas son un sistema superconductor inicialmente equipado con un chip de cinco qubits fabricado por QuantWare, pero está previsto que se le instale más adelante un chip de 35 qubits que lo situará entre los sistemas cuánticos más avanzados de Europa, según la compañía, que es un *spin-off* (una separa-

Qilimanjaro Quantum Tech instalará la nueva máquina, que en una primera fase dispondrá de 10 qubits

ción) surgida del propio BSC en el 2019. Un ordenador cuántico analógico resulta útil para simular procesos cuánticos de la naturaleza, como el comportamiento de moléculas químicas para fabricar nuevos fármacos. Los computadores cuánticos analógicos y digitales abordan las tareas de forma diferente.

Por ejemplo, para llevar una pelota de un punto A a un punto B, el digital guía la pelota a base de empuje. En cambio, el analógico, en lugar de empujar la pelota, es como si construyera un tobogán para que se deslice sola hasta el punto B.

Desde el 2023, EuroHPC ha ordenado adquirir ocho computadores cuánticos en República Checa, Alemania, España, Francia, Italia, Polonia, Luxemburgo y los Países Bajos. El objetivo es tener la mayor variedad posible de plataformas de computación cuántica y arquitecturas híbridas clásico-cuánticas. ●

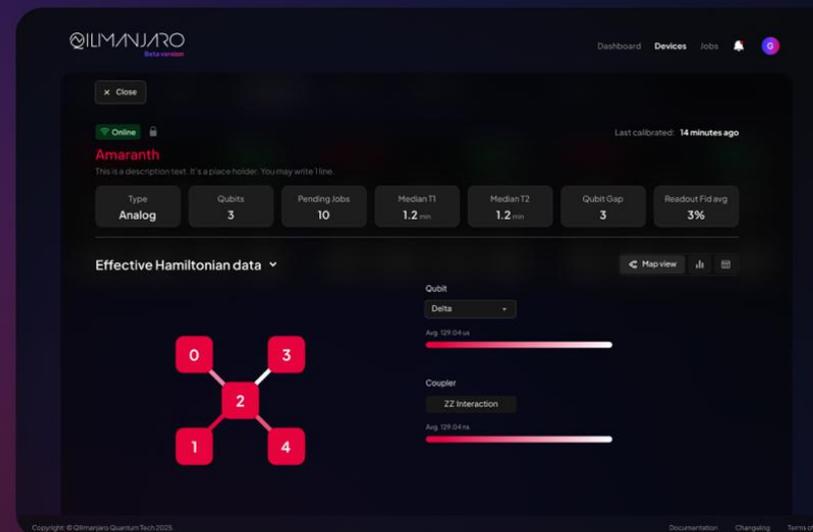
Qilimanjaro cloud Quantum-as-a-Service

Our Go-to-Market: Democratizing Quantum

A Dual Strategy to Bring Users Into the Quantum Era

Qilimanjaro's QaaS – a European Hybrid Quantum Data Center

- **Cloud access** to our supercomputing solutions through **SpeQtrum** — our QaaS offered through an accessible subscription model.
- **Hybrid**: digital, analog and classical.
- **Easy adoption**: empowering businesses to make informed decisions and maximize quantum value via our exploratory services.



QILIMANJARO

Qilimanjaro algorithms co-design

Our Traction



INFRASTRUCTURE
HPC

EuroHPC
Barcelona Supercomputing Center
सी डेक CDAC



OPTIMIZATION
FINANCE
Index Tracking

Santander
BBVA



OPTIMIZATION
TELECOMS
Network Optimization

Telefónica



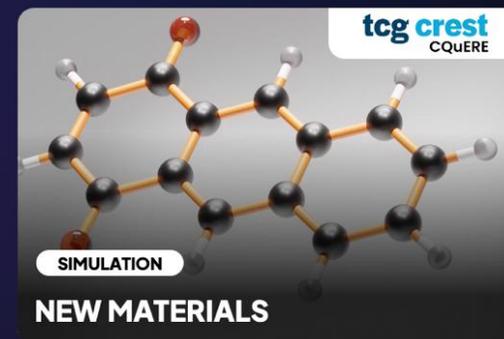
OPTIMIZATION
HEALTH
Operating Room Optimization

Hospital del Mar Barcelona
Clínica Barcelona
SJD Sant Joan de Déu Barcelona - Hospital



OPTIMIZATION
Logistics
Last-Mile Delivery Dispatching Systems

stuart



OPTIMIZATION
SIMULATION
NEW MATERIALS

tgc crest
CQUERE

QILIMANJARO



Recognitions from EC, Intel, MWC

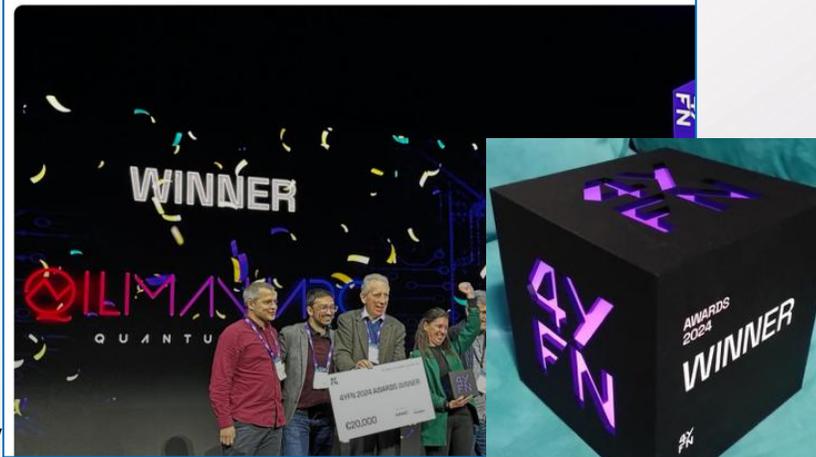


intel ignite
Intel® for Deep Tech Startups

Intel® Ignite Selects Startups for Spring '23 Cohorts

Spanish quantum computing startup Qilimanjaro Quantum Tech wins 4YFN competition at Mobile World Congress

Sergio Ramos - March 1, 2024



Category winner 'NextGen Tech'

Qilimanjaro secured the NextGen Tech award for its full-stack Quantum Application Specific Solutions (QASICs), delivering quantum benefits today. The company's cutting-edge approach accelerates quantum innovation through practical applications.



INNOVATION RADAR PRIZE



Global Forum
Shaping the Future
2025

TECHNOLOGY, SUSTAINABILITY & HUMANITY
27 & 28 OCTOBER 2025
MADRID, SPAIN

Quantum computing expectations

TRUE QUANTUM COMPUTING
IS A REALLY DISRUPTIVE TECHNOLOGY

CURRENT ADVANTAGES ARE LIMITED
SINCE
TODAY'S SYSTEMS ARE
FIRST GENERATION



NISQ era “limited” value-add: quantum-classical & quantum-inspired

FINANCIAL TIMES

COMPANIES TECH MARKETS CLIMATE OPINION LEX WORK & CAREERS LIFE & ARTS HTSI

HSBC Holdings PLC [+ Add to myFT](#)

HSBC claims quantum trading breakthrough

Europe's largest lender tested a tool developed by IBM on bond market data



FT, September 25, 2025

Shtetl-Optimized
The Blog of Scott Aaronson

If you take nothing else from this blog, quantum computers won't solve hard problems instantly by just trying all solutions in parallel. Also, please read Zvi Mowshowitz's masterpiece on how to fix K-12 education!

« Darkness over America

HSBC unleashes yet another “gombie”: a zombie claim of quantum advantage that isn't

Today, I got email after email asking me to comment on a new [paper from HSBC](#)—yes, the bank—together with IBM. The paper claims to use a quantum computer to get a 34% advantage in predictions of financial trading data. (See also blog posts [here](#) and [here](#), or numerous popular articles that you can easily find and I won't link.) What have we got? Let's read the abstract:



S.Aaronson blog,
September 25,
2025

MULTIVERSE
COMPUTING

Multiverse Computing Compresses Llama 3.1-8B and Llama 3.3-70B By 80% With Almost No Precision Loss

Advanced LLM compressor CompactifAI delivers smaller versions of the most popular open-source AI models available as a service

April 08, 2025 09:00 ET | Source: [Multiverse Computing](#) [Follow](#)



**Transformational Change:
Building a Collaborative Future**



TECHNOLOGY, SUSTAINABILITY & HUMANITY

27 & 28 OCTOBER 2025

EUROSTARS TOWER

MADRID, SPAIN

BBVA

Ventura Sarasa



Who are we?



A team of **mathematicians and physicists**, with PhDs, decades of experience in both academia and industry, having worked in **finance, data science, and cybersecurity**.



Escolástico Sánchez

Mathematician with 3 Master's degrees
25+ years in industry



Senaida Hernández

PhD in Physics
4 years in industry | 10 years in research



Pablo Serrano

Physicist, Master's in Data Science & Quantum Computing
6 years in industry



Ventura Sarasa

Mathematician, Master's in Cybersecurity & Quantum Computing
3 years in industry | 1 year in research



Our ambition is to be an early adopter, for which we have set a strategy based on 3 pillars



Pillar

Approach

Cultivate in-house **Expertise**

Build a specialised internal team capable of identifying and translating business challenges into quantum-computable problems and evaluating external technologies readiness

Orchestrate an internal & external **Ecosystem**

Form a curated network of trusted partners (business, peers, quantum vendors, startups, academic institutions and public sector) to accelerate learning, de-risk investment, and gain access to cutting-edge technology

Drive a use-case **Execution Plan**

Pinpoint and prioritise high-value business problems that are computational bottlenecks and run proofs-of-concept with a phased approach and a clear focus on practical implementation



Quantum Advantage



Problem types:



Machine Learning:

Quantum machine learning methods will allow learning more complex patterns and provide more accurate predictions.



Simulation

Quantum algorithms will be able to obtain the solution faster than the most advanced Monte Carlo methods.



Optimization

Quantum computing will be able to find better solutions more efficiently than conventional algorithms.

Available technologies:



Gate-Based Quantum Computing:

Gate-based quantum computing operates using quantum logic gates that modify the states of the qubits. These types of computers are universal, being the quantum analog to classical computers.



Quantum Annealing:

Quantum annealers are a type of quantum hardware designed to solve optimization problems.



Quantum-Inspired Methods:

Collection of classical algorithms originally designed to study quantum phenomena, but which have proven to be applicable in other areas.



Quantum Threat



Asset Inventory

Build an inventory of cryptographic assets to have a clear understanding of where cryptography is being used, as well as its level of exposure to the Quantum Threat.

Leverage external tools for asset discovery and ensure adequate completeness of the inventory.



Crypto-Agility

Adopt crypto-agility as a new paradigm to increase BBVA's response capacity in case any of our crypto assets are compromised.

Adjust internal systems to comply with crypto-agility principles.



PQC Adoption

Plan the adoption of Post-Quantum Cryptography (PQC). Assess the impact related to the replacement of current algorithms in both internal and third-party systems.

Define an adoption roadmap based on a proper risk assessment.



Research

Search for new forms of quantum securitization, researching technologies such as Quantum Key Distribution (QKD) and Quantum Random Number Generators (QRNG) to provide pure entropy for the bank's cryptographic services.



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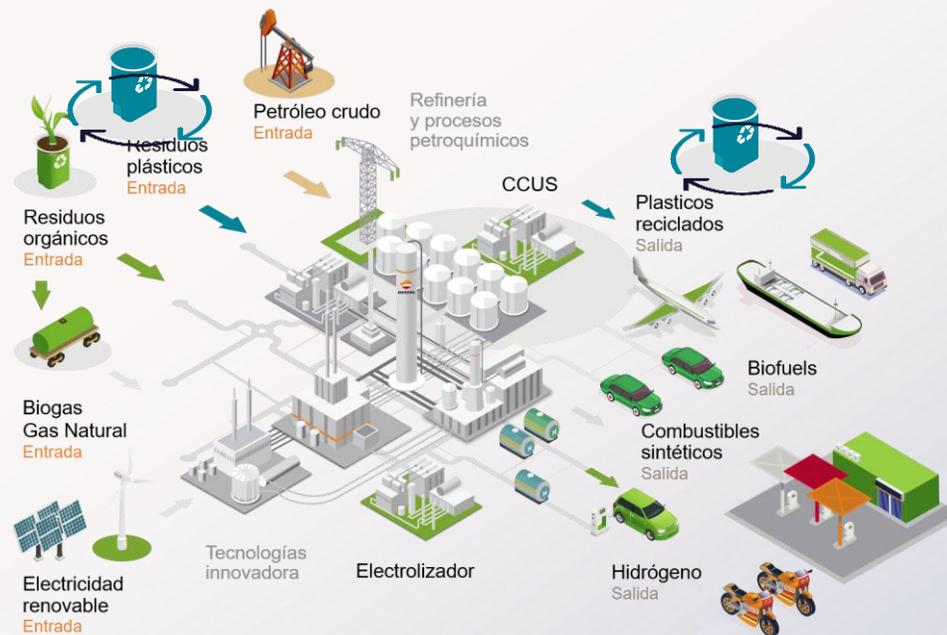
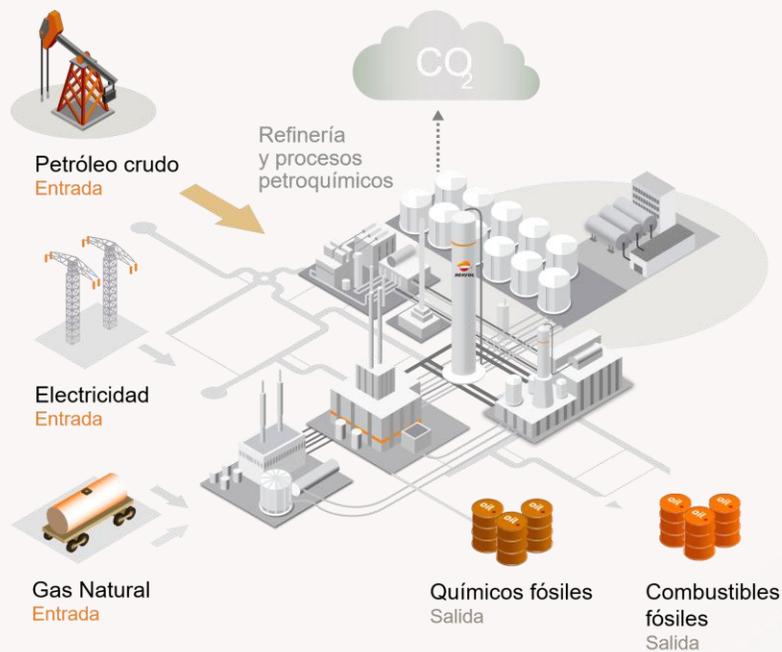
MADRID, SPAIN

Repsol

Ricardo Enríquez



A Quantum revolution in energy



NOW

From actual refineries and petrochemical processes...

...To low-carbon petrochemical plants and refineries

FUTURE

Repsol ha orientado su estrategia para alcanzar cero emisiones netas en 2050

Josu Jon Imaz



Repsol Compromiso Cero Emisiones Netas 2050



Quantum and energetic sustainability



CUCO
COMPUTACIÓN CUÁNTICA
EN INDUSTRIAS ESTRATÉGICAS

PROYECTO CUCO

COMPUTACIÓN CUÁNTICA EN INDUSTRIAS ESTRATÉGICAS



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MADRID, SPAIN

Universidad
Politécnica
de Madrid

Vicente Martín



POLITÉCNICA

UNIVERSIDAD
POLITÉCNICA
DE MADRID

The bad news? We have to Move Faster than QC!



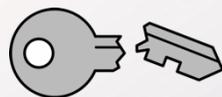
Courtesy:  KEEQUANT

QC kills the current public key crypto. Moving to quantum-safe.

- Estimated probability +60% in 15 years, +80% in 20.
- Transmitting encrypted data today with a lifetime > 15 years today, is not secure.

Today

~~Asymmetric
Cryptography~~
(e.g. ECDH-KE)



Waiting is not an option

Know your risk: inventory

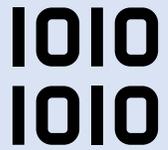
Quick response: Cryptoagility

Avoid catastrophe : Safety net

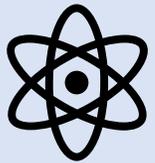


Seizing the opportunity: A Resilient Security Infrastructure for the Future

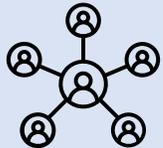
Use the full cryptographic toolkit:



PQC standards



QKD: Quantum Cryptography

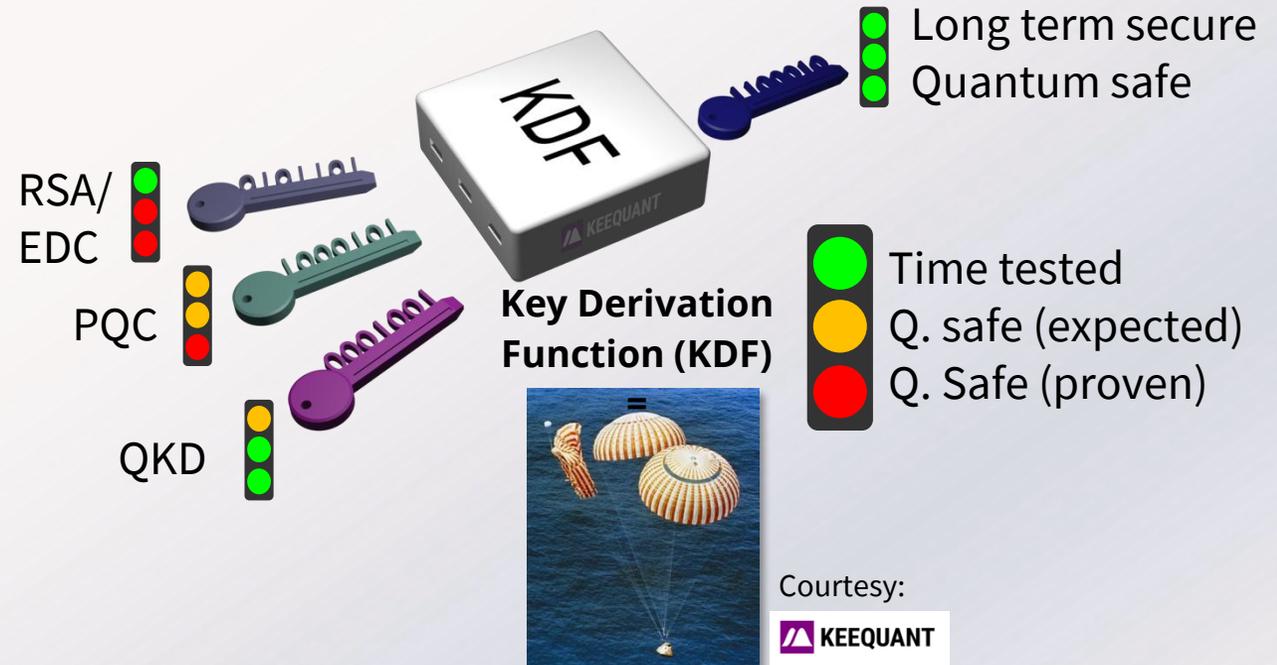


Pre-shared keys



Symmetric Key Infrastructure

We can start now: hybridization



For **Defense in depth** and a **long term security infrastructure** that can **evolve, but not break.**

Good entropy ►

Seizing the opportunity: A Resilient Security Infrastructure for the Future

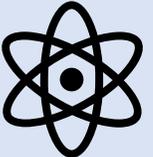
SME Quantum Communications Ecosystem in Spain:

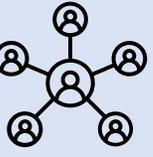


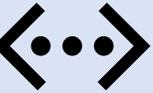
Plus large companies are also including it in their portfolio.

Use the full cr

1010
1010 PQC stan

 QKD: Qua

 Pre-shar

 Symmetr

For **Defe**

ization

Long term secure
Quantum safe

ime tested
). safe (expected)
). Safe (proven)



Good entropy ►

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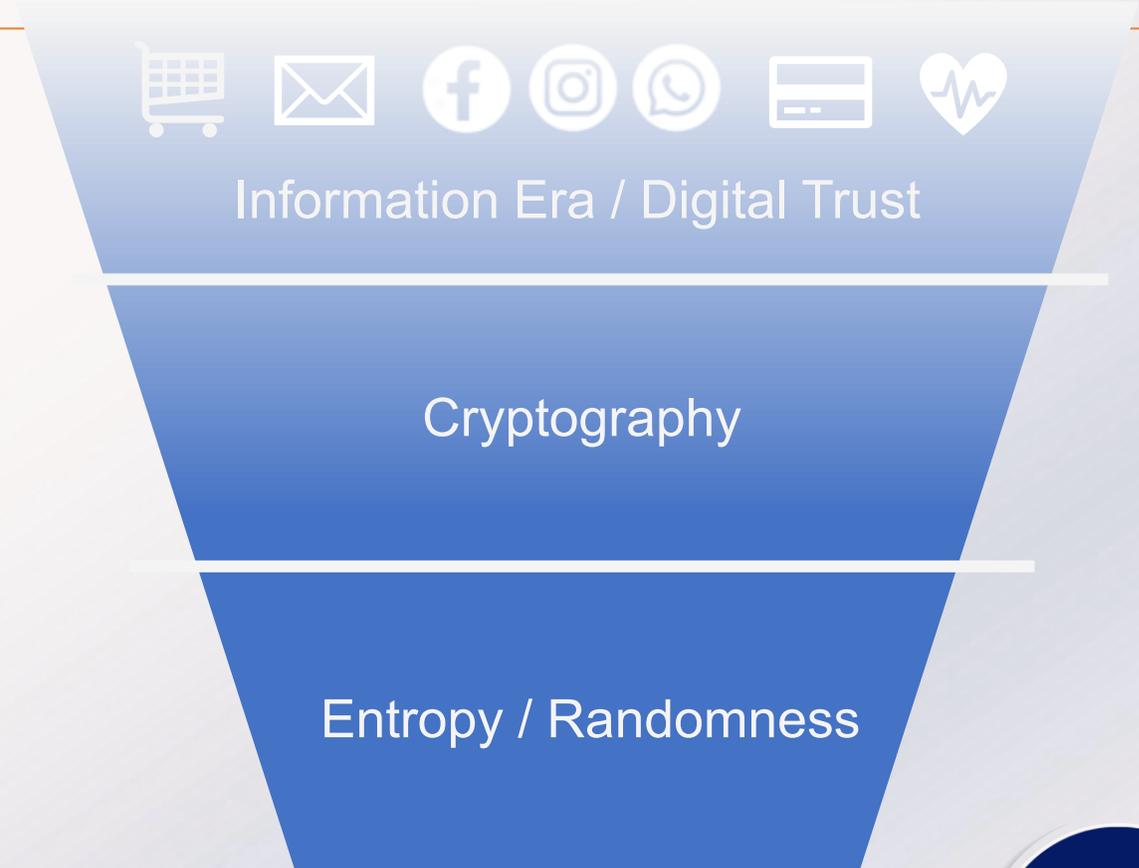
Quside

Fernando de la Iglesia



Vision

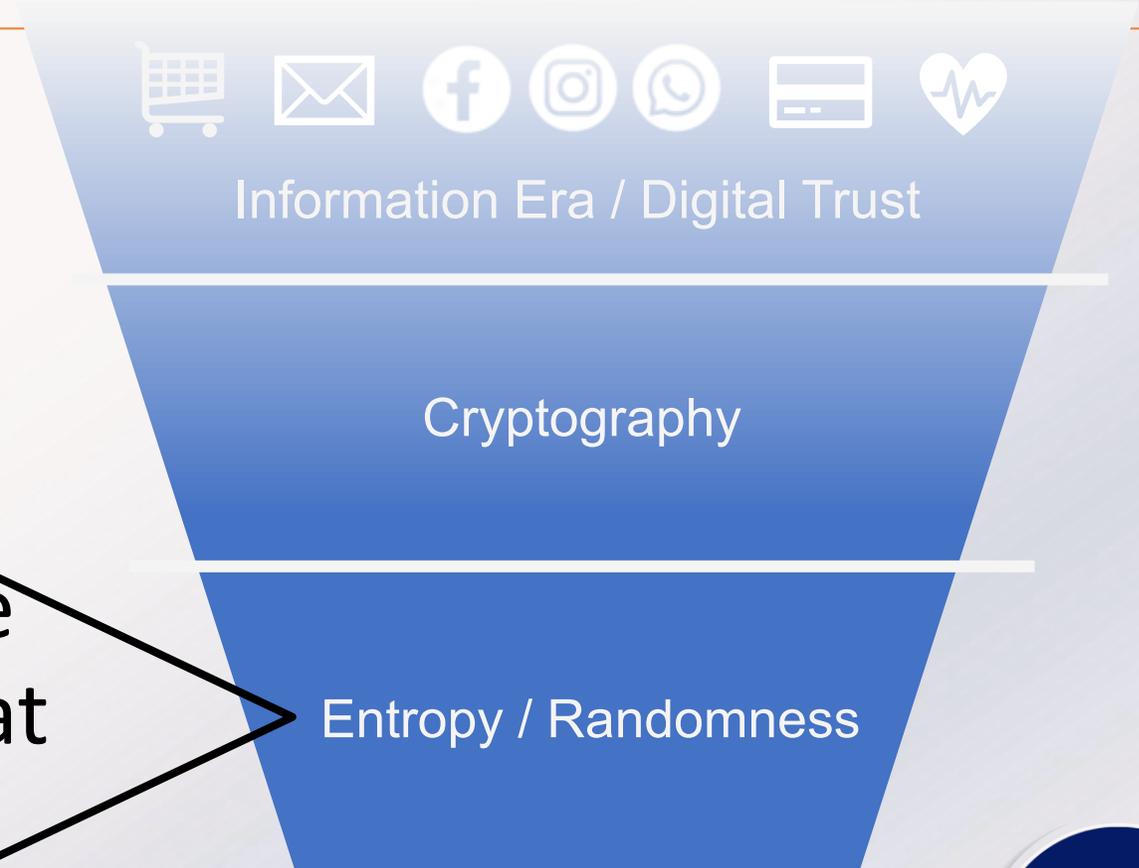
Everyone, everywhere,
should have access to the
strongest foundation of
digital trust



Vision

Everyone, everywhere,
should have access to the
strongest foundation of
digital trust

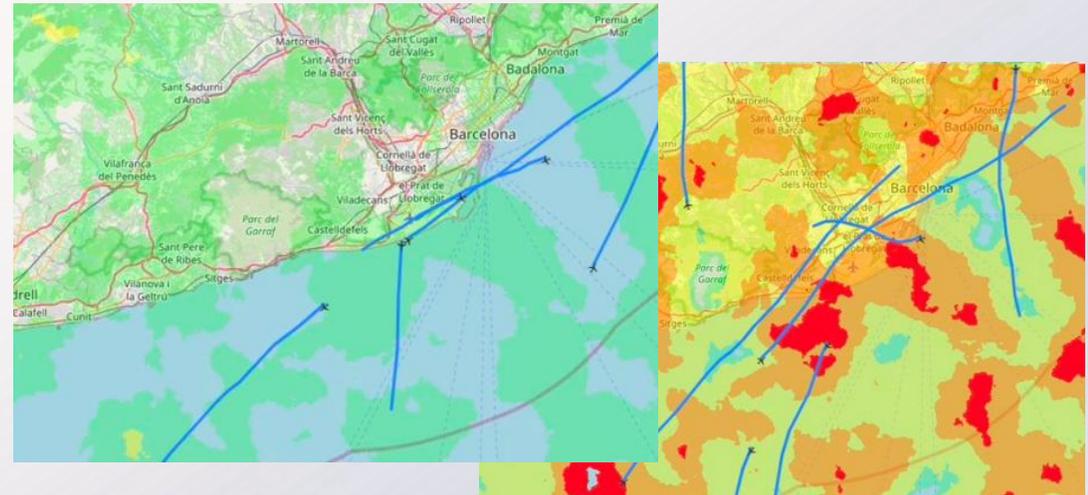
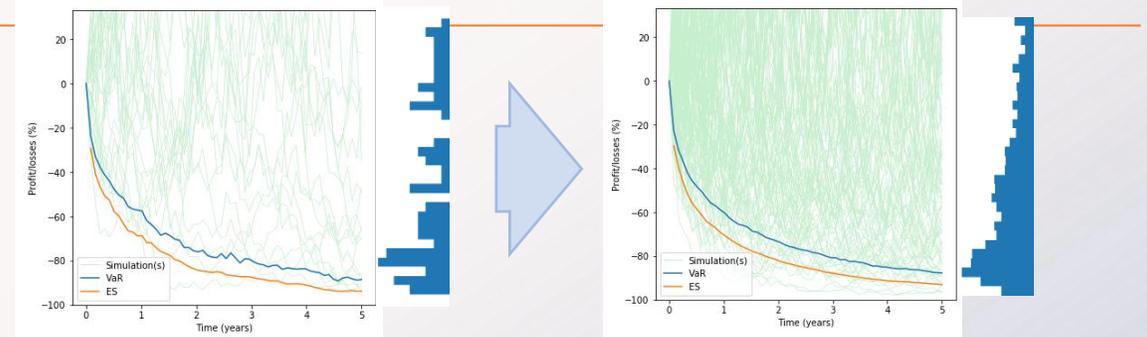
Quantum technologies provide
true randomness by nature that
we can measure



Vision

Efficiency and performance to help solving the global challenges.

Stochastic computing.



Transformational Change:
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TECHNOLOGY, SUSTAINABILITY & HUMANITY

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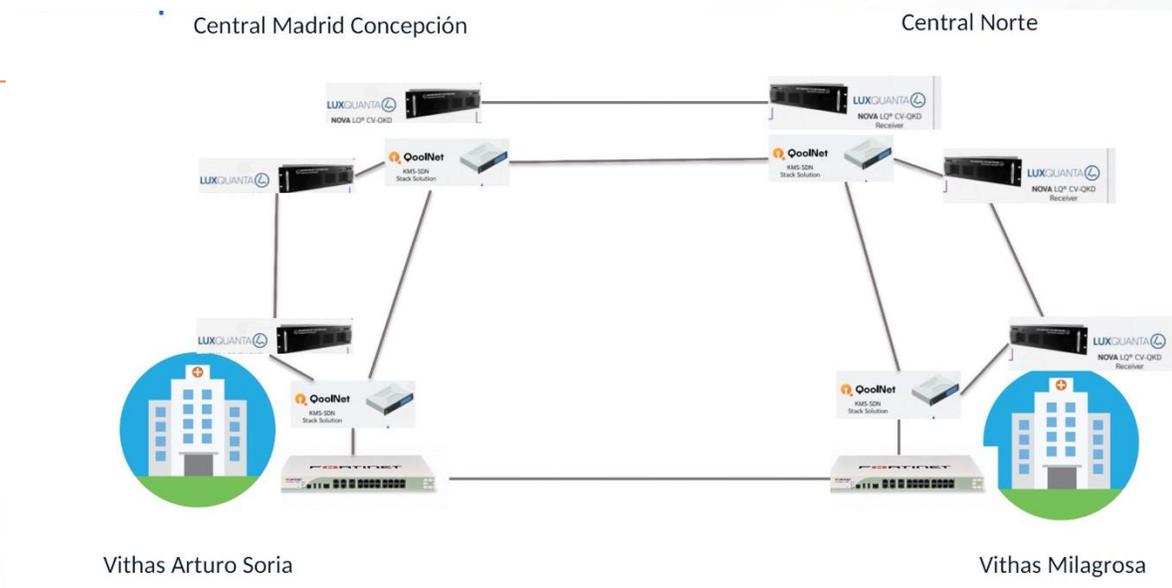
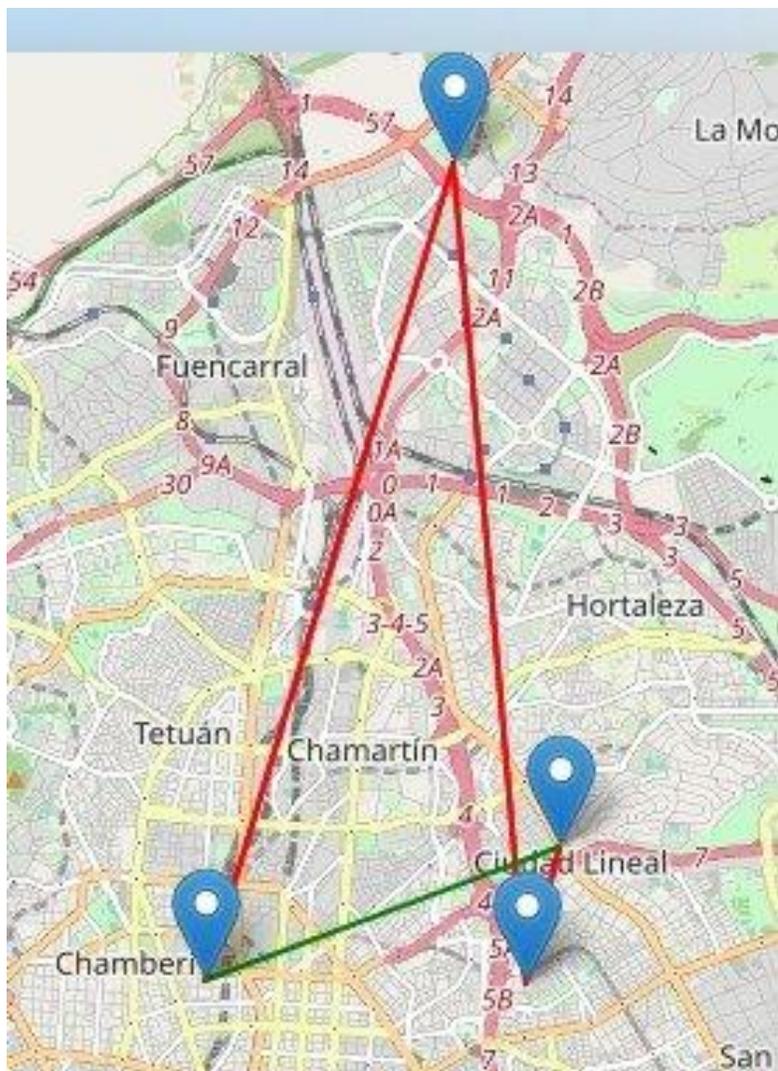
MADRID, SPAIN

Telefónica

Diego López



Building Today's Quantum Communications



- Protect information shared between hospitals
- Enable collaborative clinical sessions
- Production environment
 - Two Vithas hospitals: Arturo Soria and Milagrosa
 - Two Telefónica PoPs: Norte and Concepción
 - Commercial fiber deployment

Thinking of Tomorrow's Quantum Communications

- An exclusively Quantum Internet is neither feasible nor desirable
 - Cost and accessibility
 - Reliability and robustness
 - Speed and efficiency
- The three goals to achieve a Quantum-Enabled Internet
 - **Universality**, accommodating any application
 - **Transparency**, sharing physical media with classical networks
 - **Scalability**, so protocols can support the growth of the network
- Via three essential architectural properties



Agility: avoid a tight coupling with specific (physical) technologies



Sustainability: open availability in technological and economical terms



Pliability: seamless integration with networking best practices

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Quantum Europe

Oscar Diez

CNECT C2



Outlook: Global Public Funding



Region/Country	Public Investment	Private Investment	Key Players
European Union	MS +6bn + €2B Quantum Flagship (HE)	Lower compared to global counterparts	Universities, startups, MS and EU-led, IQM, Pasqal, AQT, Blueforce,...
United States	National Quantum Initiative	Strong from bit tech players such as Google, IBM, Microsoft	Google, IBM, Microsoft, Rigetti, Qera, Quantinuum, ...
China	Large state-backed investment in quantum infrastructure	Growing, government-driven	Government-led, Alibaba, Huawei
Canada	Gov-private partnerships on quantum computing research	Strong collaboration with D-Wave, Xanadu	D-Wave, Xanadu, ...
Japan	Significant gov investment (Moonshot, Quantum Strategic Program)	Growing with Toshiba, NTT, Fujitsu	Toshiba, NTT, Fujitsu, Q*Quantum
UK	Major public funding through UK National Quantum Technologies Programme	Moderate, focused on startups and collaborations	OQC, ORCA, Riverlane, Universal Quantum
Australia	State investment in quantum computing and communications	Collaboration with companies like Silicon Quantum Computing	Silicon Quantum Computing, Quantum Brilliance, Diraq

AUSTRALIA
€580M



The international competition and the corresponding public funds having radically increased over the past years

Source: qt.eu, McKinsey, Qureca



Why a Quantum Strategy ?

Global race is heating up → Europe risks losing the lead

- **Fragile ecosystem:** startups lack scale-up capital & anchor customers private investment issues, 120 startups
- **Fragmentation:** scattered EU / Member-State programmes dilute impact EU programs + 27

Acting now secures tech sovereignty, jobs & security benefits

Why a Quantum Strategy



Global race heating up



Fragile ecosystem



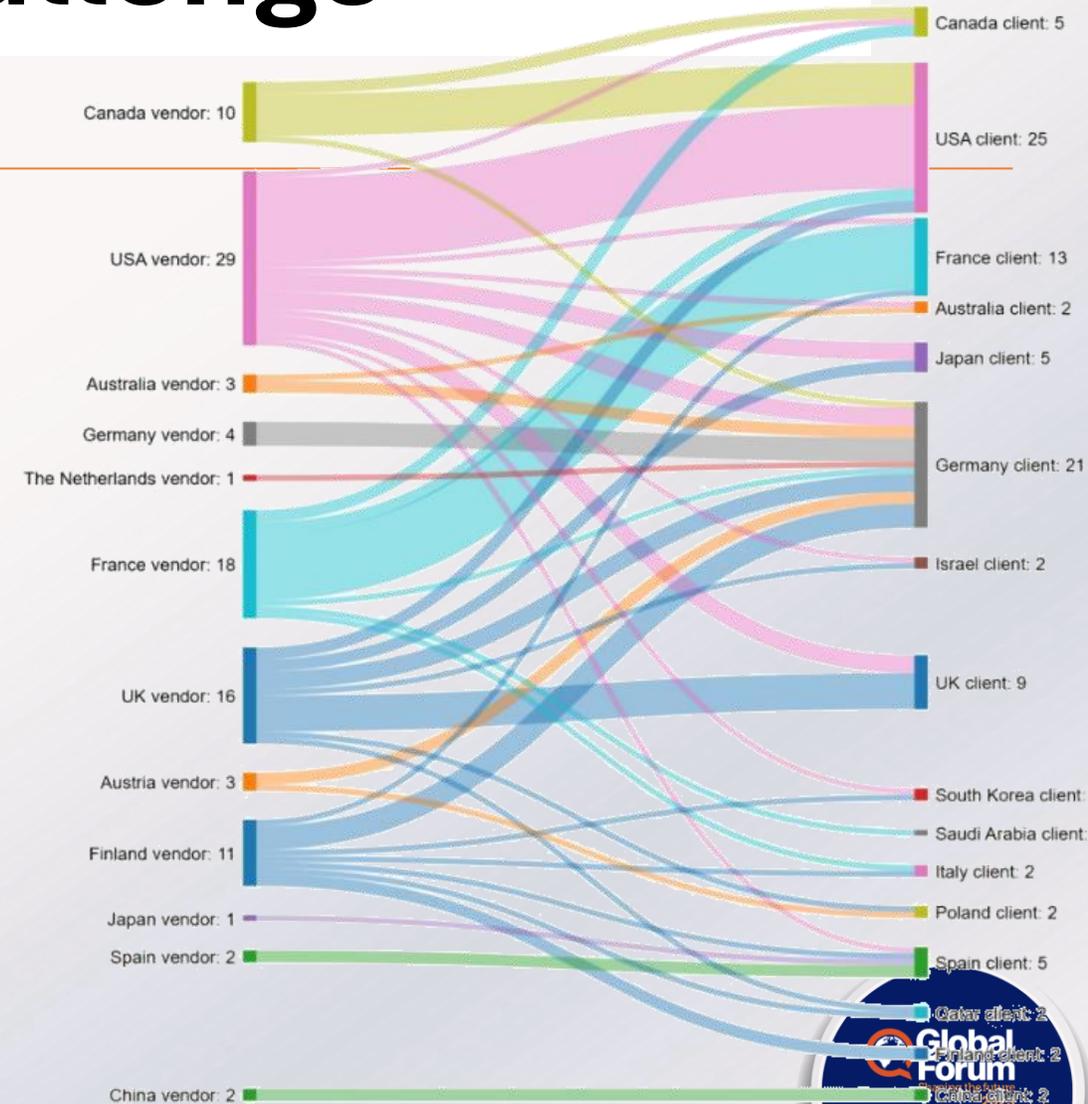
Fragmentation

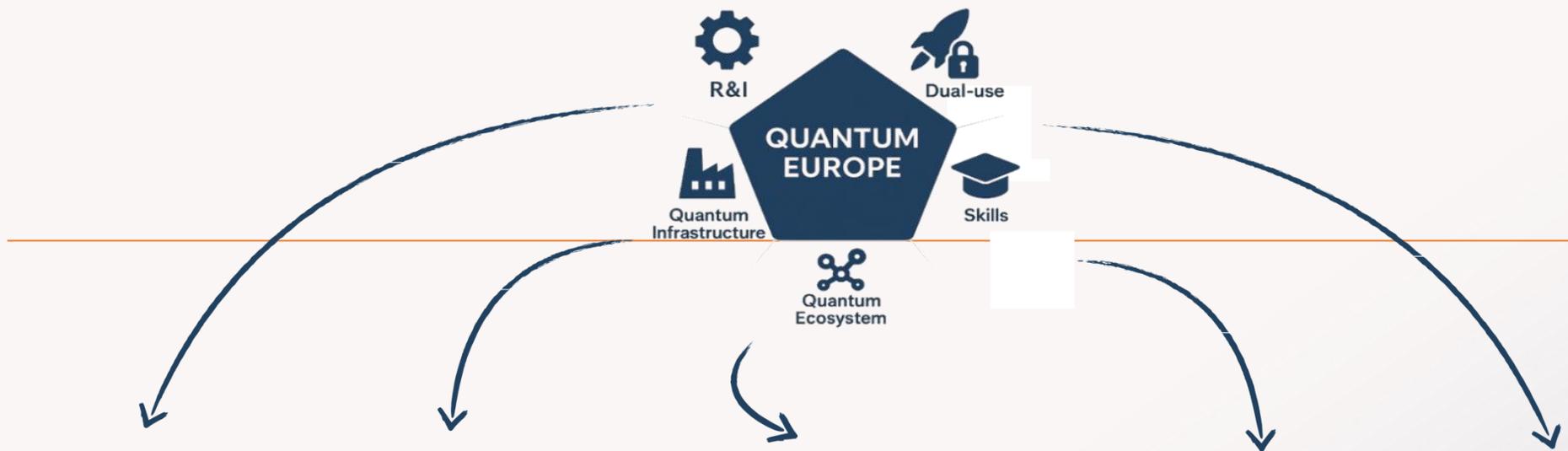


Acting now secures sovereignty

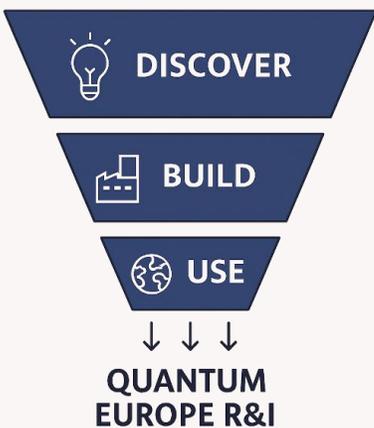
The Fragmentation Challenge

- 100+ deployable quantum computers globally by 2025
- Europe hosts the **largest QPU zone (~40 systems)**—but distributed across 20+ vendors
- **Lack of consolidation limits scalability and market leadership**
- U.S. shows self-sufficiency (IBM, IonQ); Canada and Finland are strong exporters
- Germany remains a key user but depends on imported hardware
- *"The question is not whether Europe can lead. It's whether it can organize to lead at scale."* – Neil Abroug, Head of Quantum at INRIA





FROM LAB TO MARKET



SCALING QUANTUM CAPABILITIES

- Quantum computers in 10+ EU countries
- EuroHPC
- EuroQCI secure quantum communication
- Quantum sensors: gravimeters, MRI, inertial navigation
- Pilot lines for production and testing
- Interoperability & hybrid systems

GROWING EUROPE'S QUANTUM ECONOMY

- 6 industrial pilot lines
- EU Design Facility + cloud-based tools
- Public procurement to stimulate demand
- QU-TEST: EU-wide certification + benchmarking
- IP strategy + resilience for EU supply chain

STRATEGIC AUTONOMY IN SPACE, SECURITY & DEFENCE

- Quantum sensors for GNSS-free navigation
- Quantum communication in IRIS² satellites
- Roadmaps: PQC, dual-use applications, ESA cooperation
- Quantum in EU defence and NATO strategy
- Quantum in EU defence and NATO strategy

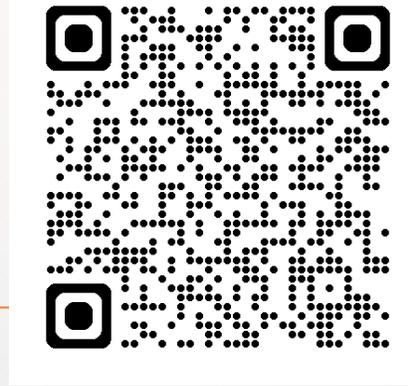
CIVIL / **DEFENCE**

A QUANTUM WORKFORCE FOR THE FUTURE

- 110,000+ graduates/year in related fields
- European Quantum Skills Academy (2026)
- Training, scholarships, internships, mobility schemes
- Outreach to schools and Widening Countries
- Talent portal + 'Teach the Teacher' modules
- Robust IP strategy

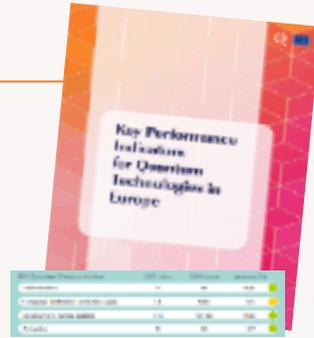


Strategic Pillars of the EU Quantum Ecosystems



RESEARCH BASED

HORIZON EUROPE



2021-2027



INFRASTRUCTURES

DIGITAL EUROPE

Flagship

Bring quantum technologies from the lab to the market and consolidate European scientific leadership in quantum research

- Fundamental R&D
- Technology Supply

European Chips Act



Bolster Europe's competitiveness & resilience in semiconductors & quantum chips including production facilities & Quantum Fund

From Lab to Market



Pilot Lines & Testing Facilities

Q Sensing Deployment

Build and deploy Quantum sensing devices

Quantum Gravimeters

Quantum MRIs

EuroQCI



Build and deploy in the next decade a certified secure pan-European end-to-end QCI for cybersecurity services

QKD Infrastructure

EuroHPC-QCS



Build and deploy an infrastructure for high performance computing and quantum computing

HPC with Accelerators

Stand-alone Q Computers

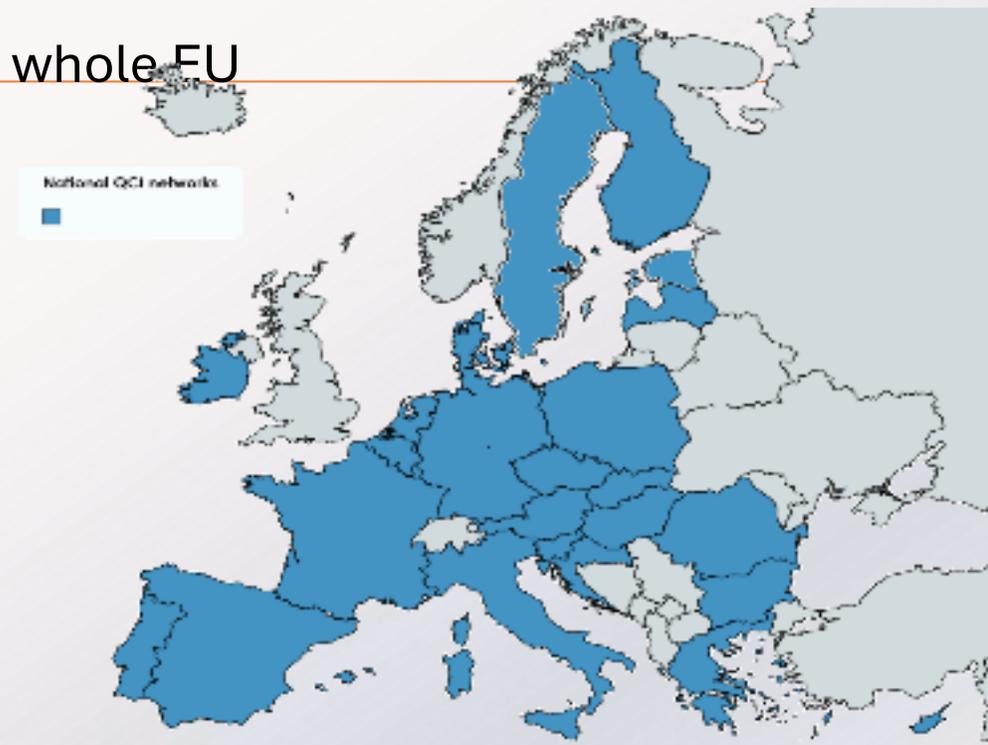
Advanced Digital Skills



Develop short term training courses and Master's programmes in key capacity areas

EuroQCI quantum communications

- Integrated **satellite and terrestrial** system spanning the whole EU for ultra-secure exchange of cryptographic keys
- Part of the EU Secure Connectivity Programme (**IRIS²**)



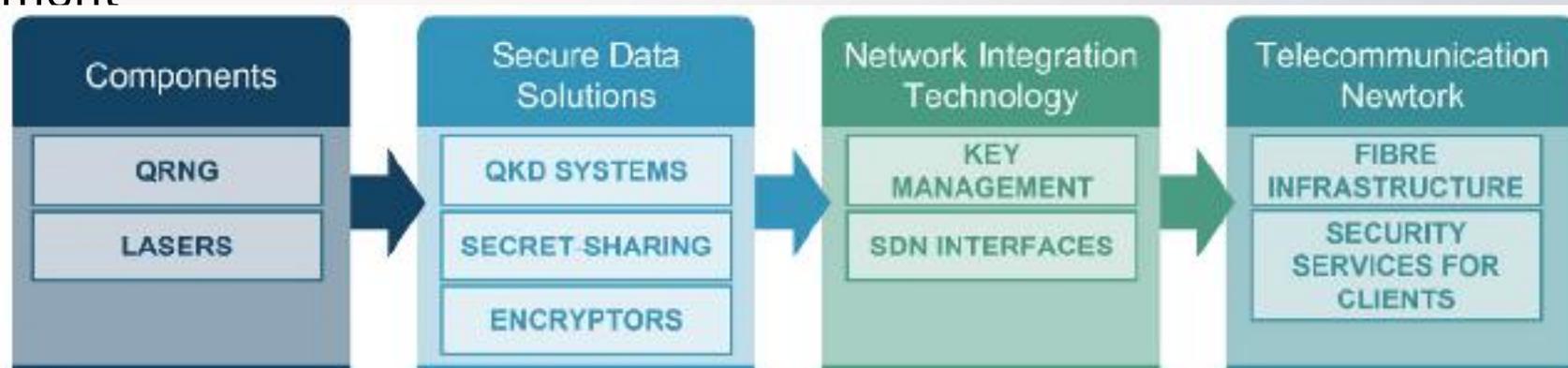
→ Deployments

***Terrestrial** segment

- DIGITAL: **6 industrial & 26 national projects, CSA**
- Ongoing: **procurement for QKD testing & evaluation**
- 2024+: **CEF call for cross-border connections / OGS**

***Space** segment

- Eagle-1
- SAGA



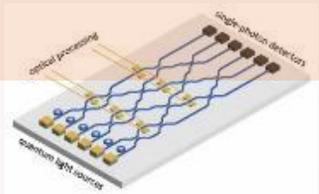
Quantum Computing and simulation Infrastructure

Quantum Diversity in Technology

EuroQCS-
France
[GENCI]



Photonic
Qubits (digital)

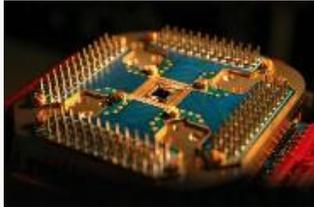


Joliot-Curie

Euro-Q-Exa
(Germany)
[LRZ]



Superconducting
Qubits (digital)

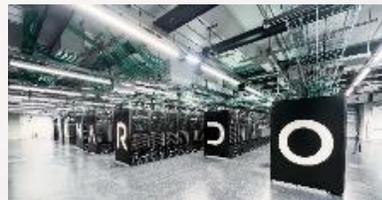
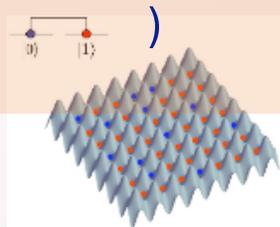


SuperMUC-NG

EuroQCS-
Italy
[CINECA]



Neutral atom
Qubits
(analogue/digital)

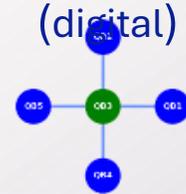


Leonardo

Lumi-Q
(Czechia)
[IT4I]



Superconducting
Qubits with a star-
shaped topology
(digital)

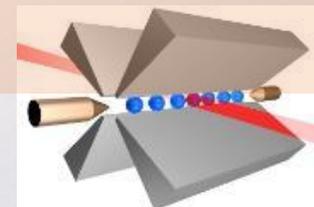


Karolina

EuroQCS-
Poland
[PSNC]



Trapped ion
Qubits (digital)

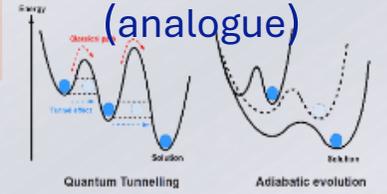


Altair

EuroQCS-
Spain
[BSC]



Superconducting
Flux Qubits –
Annealer Mode
(analogue)



Mare Nostrum-5

Quantum Stability Pilot lines

Growing Europe's Quantum Economy

Quantum Tech	Technical Focus	Strategic Objective
 Superconducting	Integrated microwave control, scalable fabrication, coherence preservation	Industrial-scale yield of superconducting QPUs
 Photonic	Quantum Photonic Integrated Circuits (QPICs), monolithic integration, photon sources	Enable photonic QPUs & QComm chips with CMOS-compatible fabrication
 Semiconducting	Silicon spin qubits, CMOS-compatible fabrication, 2D/3D stacking	Transfer spin-based QPUs from labs to fabs, scalable readout & packaging
 Diamond-based	NV and SiV centers in diamond, sensing and computing integration	Advance EU self-sufficiency in quantum sensors and QPUs based on diamond
 Neutral Atoms	Atom arrays, optical tweezers, laser beam integration	Create pilot-level capability for neutral-atom-based digital/analog QPUs
 Trapped Ions	Micro-fabricated ion traps, vacuum packaging, integrated laser systems	Establish EU trapped-ion foundry with sustainable chip-level production



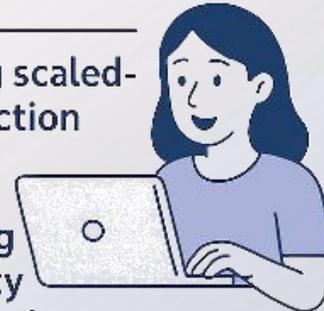
WHAT THE PILOT LINES DO



Supporting the development of quantum chip technology



Providing scaled-up production facilities



Enhancing availability for computing, communication and sensing

Open to European stakeholders, especially start-ups and SMEs



Boosting innovation capacity for Europe



Boosting innovation capacity for Europe



Quantum Grand Challenge

Scaling Europe's Quantum Startups



- 2-phase programme to support EU-based quantum computing startups
- **Phase 1:**
 - Up to **12 grants** funded with **€200k-300k grants** (4-month projects)
 - Deliver technical & financial roadmaps + working prototypes → Benefit from EIB Advisory to prepare bankability Phase 2
- **Phase 2:**
 - Up to **6–7 top performers** receive **up to €30M InvestEU investment**
 - Build scalable quantum platforms validated in real-world settings
- Focus on **integrated hardware–software systems** and **market-ready use cases**
- Backed by **InvestEU, EIB**, and supported with the **Sovereignty Seal**
- Key goal: **Create bankable, competitive quantum computing platforms in Europe**

QUANTUM GRAND CHALLENGE

Scaling Europe's Quantum Startups



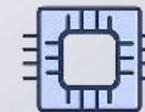
PHASE 1

- Up to 15 grants of €400,000 each
- 6-month projects to deliver roadmaps and prototypes



PHASE 2

- 6-7 startups selected to receive up to €30 million each
- Develop scalable quantum platforms and demonstrate industry use cases



Focus on integrated hardware–software systems



Support from InvestEU and EIB



Backed by the Sovereignty Seal



Bankable quantum computing solutions

27 & 28 OCTOBER 2025
MADRID, SPAIN

Quantum Skills Digital Academy

EU Call for Proposals (DIGITAL-2025-SKILLS-08)

Establish a central EU-level academy to deliver specialised training in quantum technologies, targeting various education levels and professional profiles.

Scope of Activities:

- Master's/Doctoral programmes (ISCED 7 & 8)
- Self-standing training modules for professionals
- Hands-on quantum lab experiences, internships, summer schools
- Teacher training (Teach-the-Teacher), including visits to quantum labs
- Outreach to underrepresented groups, including women and less-developed regions

Ecosystem Building:

- Strong partnerships with academia, industry, and research centres
- Promotion of industry-linked education and quantum career paths
- Integration with EU initiatives like the Quantum Flagship and Deep Tech Talent Initiative

Measuring Impact:

- KPIs include number of trained individuals, industry uptake, satisfaction, and inclusivity
- Progress monitoring aligned with the Digital Decade & EU Skills Framework

Funding:

- Lump Sum Grant with a 50% funding rate
- Includes support for infrastructure, mobility, and third-party training initiatives

Launch Date:

- 2025, under the Digital Europe Programme

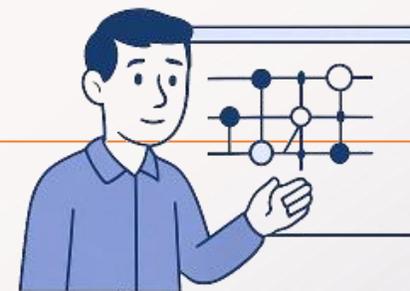
More Info: Visit [Digital Skills & Jobs Platform](https://digital-skills-jobs.europa.eu/en) <https://digital-skills-jobs.europa.eu/en>

Open: 15 April 2025 Submission deadline

2 October 2025 (17:00 CET)



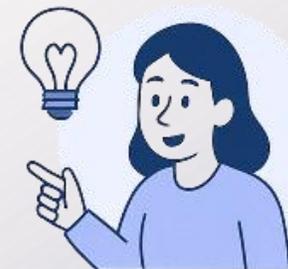
QUANTUM SKILLS DIGITAL ACADEMY



Advanced training
programmes



Industry
collaboration



Teaching
initiatives



Inclusive
outreach



Inclusive outreach



The Quantum Act

From Strategy to Action

Provides the legal and financial backbone for implementing the Quantum Europe Strategy

- Establishes a legislative basis for sustained multi-annual EU and MS investment
- Empowers programme continuity beyond political cycles

Defines governance, IP, and infrastructure access frameworks

- Clarifies roles for the European Commission, EuroHPC, Chips JU, and Member States
- Supports sovereign, standards-compliant EU infrastructure (compute, sensing, comms)
- Protects European-developed intellectual property from strategic leakage

Aligns EU, Member States, and industry under a shared operational vision

- Facilitates vertical coordination from research to deployment
- Streamlines regulatory and procurement procedures across actors

Enables coordination, monitoring, and life-cycle support mechanisms

- Introduces Key Performance Indicators (KPIs), progress benchmarking, and oversight
- Supports dynamic reallocation of resources across technology readiness levels

Supports transition from project funding to strategic industrial policy

- Ensures legal stability for industrialisation, certification, and standardisation
- Positions the EU to lead in global quantum governance and competitiveness

THE QUANTUM ACT (2026)

FROM STRATEGY



Provides legal + financial backbone

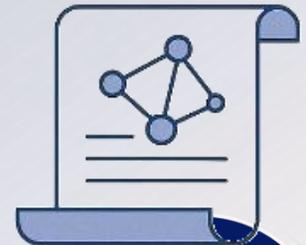
Covers governance, investment, IP infrastructure



Aligns EU, MS, industry under shared vision



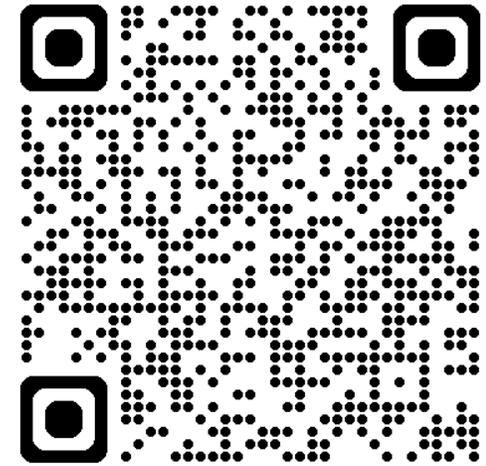
Enables coordination, monitoring, and life-cycle support





European Quantum Technologies Conference

a Quantum Flagship event



EQTC European Quantum Technologies Conference
Showcasing Europe's Quantum Future
Copenhagen 2025

Registration is open

European Quantum Technologies Conference

10-12 November 2025

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