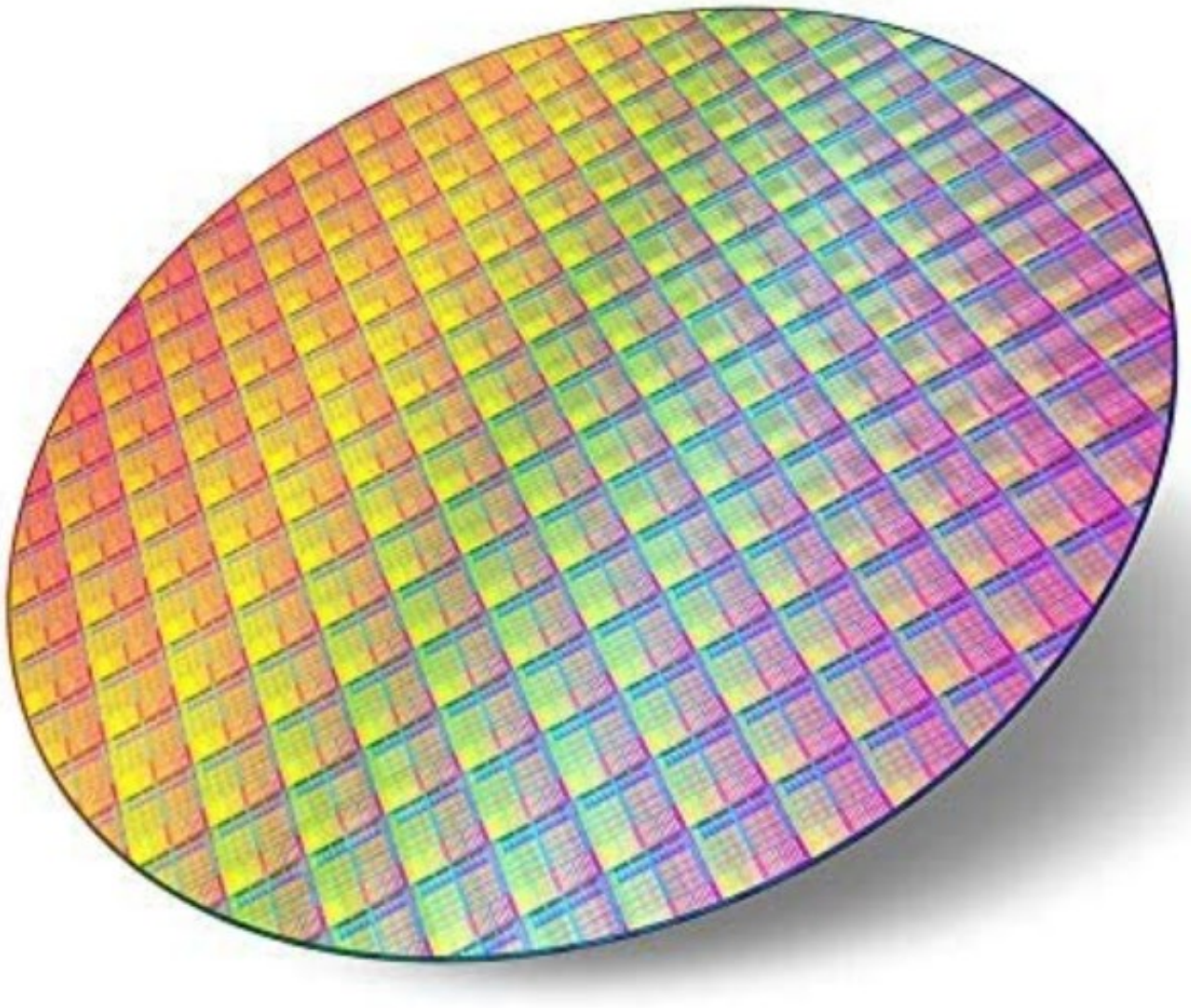
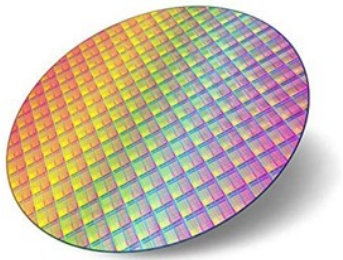
Early Days in Quantum Computing



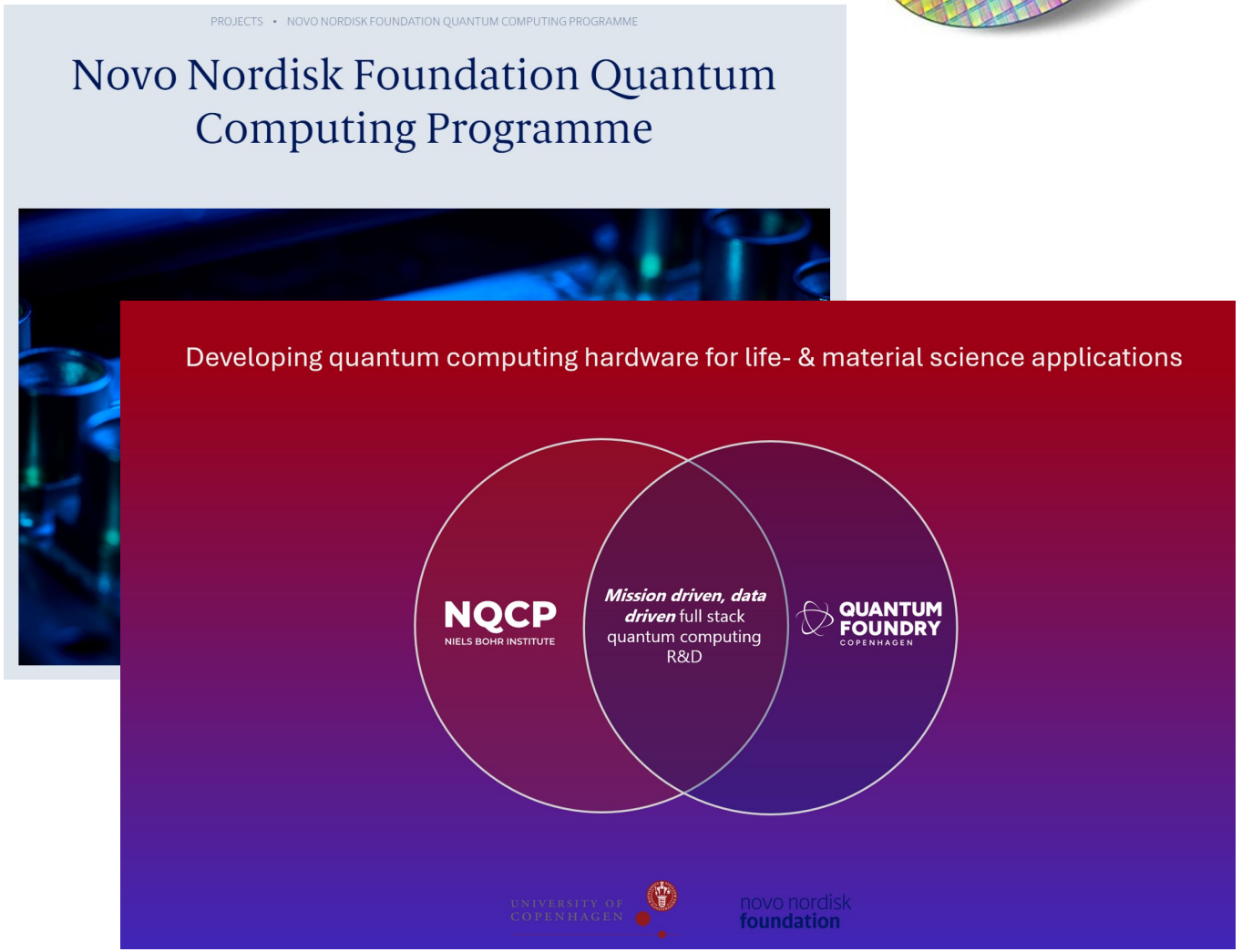
Tobias Særkjær,
Quantum Foundry

DTU Chip Day
April 14th 2026

Who am I?

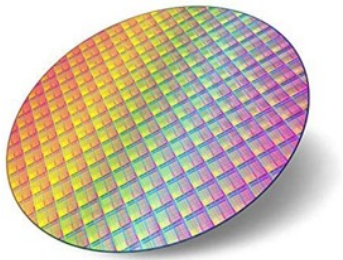


- Graduated from NQCP, UC
  - PhD, Quantum Physics
- “Chip Design Engineer”



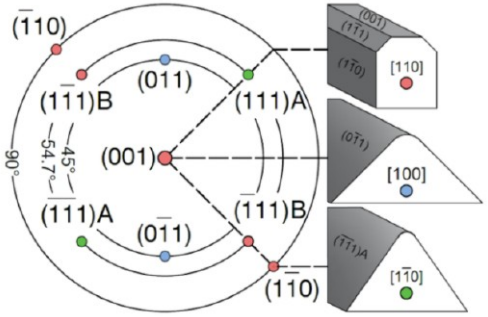
Background

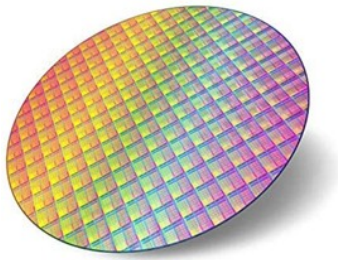
"Chip Design Engineer"



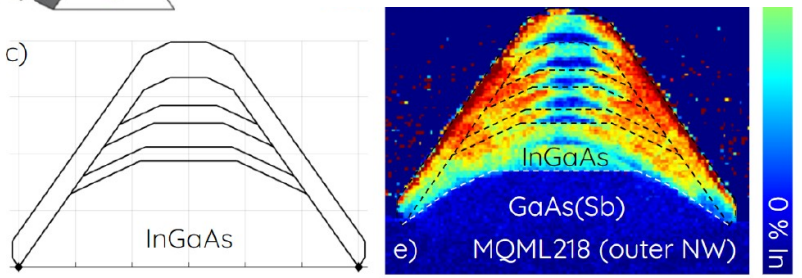
- System level modeling in Catapult HLS
- Mapping of data flows in Verilog
- Synopsys Design Compiler gate level design
- Validated standard cells in Cadence Virtuoso
- IRSIM transistor logic simulation
- Geometric layout Virtuoso Layout

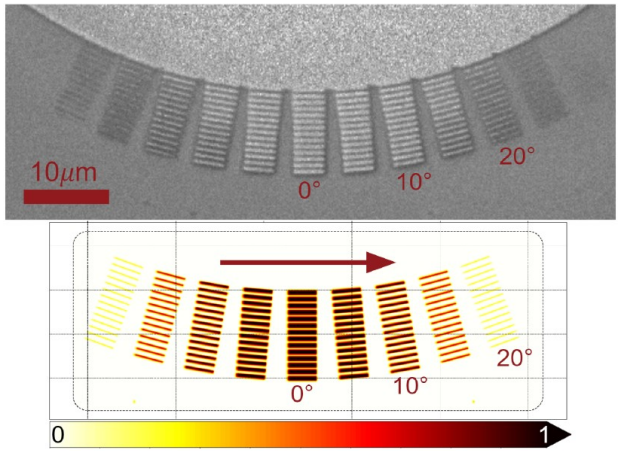
Background





- Materials science and structural analysis
- Crystal growth kinetics and thermodynamic
- Novel fabrication methods
  - Superconducting quantum device architectures
  - Quantum processor integration

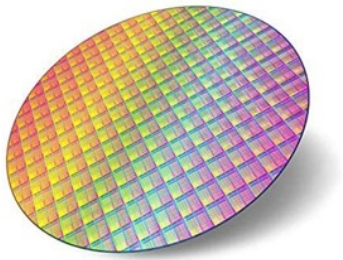




Quantum Computing

How did I end up here?

A brief history of quantum geopolitics



1980s-1990s: Concepts and early algorithms

2000-2015: Quantum information research (10s-100s M USD)

2016-2019: Strategic investments in China, EU Flagship, US NQI (~10B USD)

IBM, Google, Microsoft initiate full-stack research

2020-2023: Governments (UK, France, Germany, India, US expands) (~50B USD)

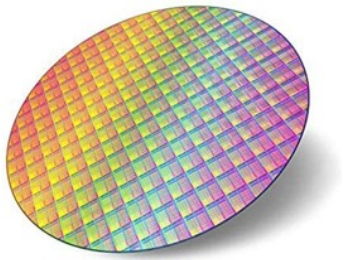
Private capital enters/expands, venture funding + NVIDIA

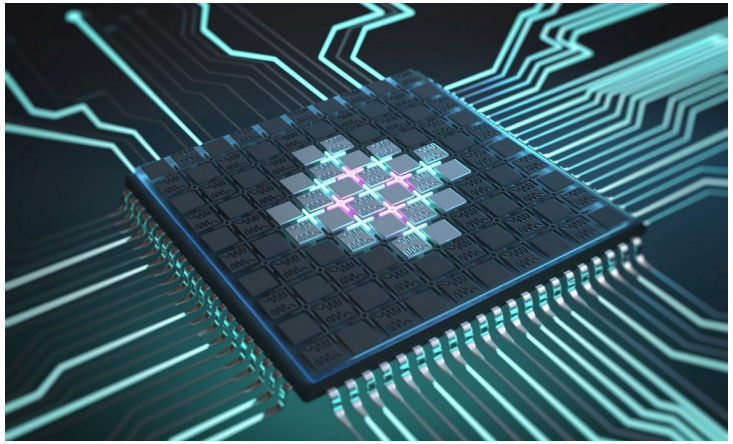
2024-2026: Governmental industrial focus (UK, Canada, S-Korea, Denmark)

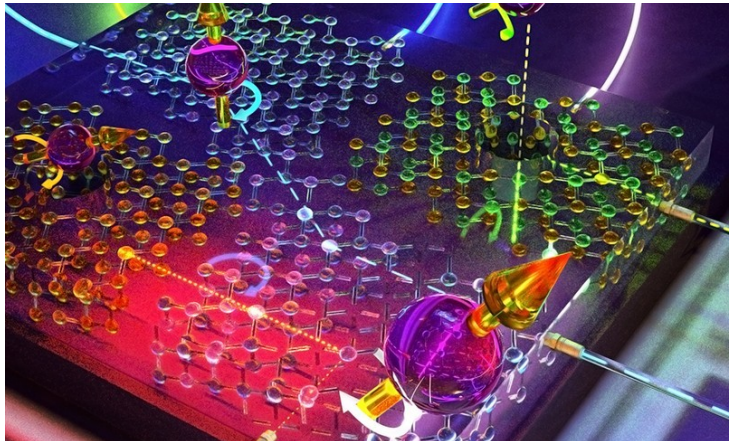
Big tech funding (Quantinuum, PsiQuantum, QuEra)

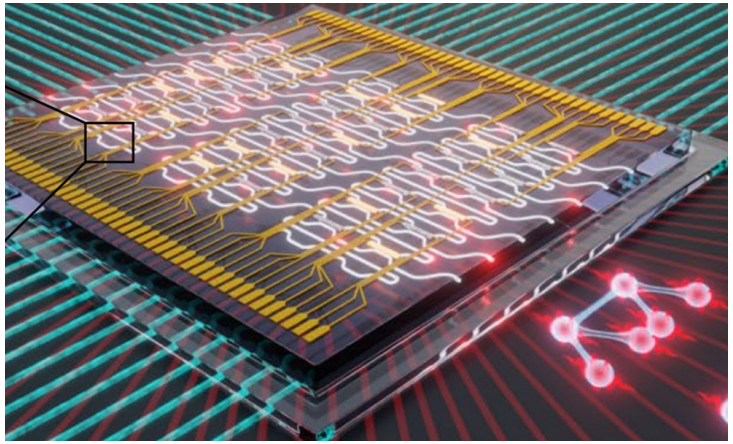
Quantum Computing is mostly chip-based

Quantum is more chips

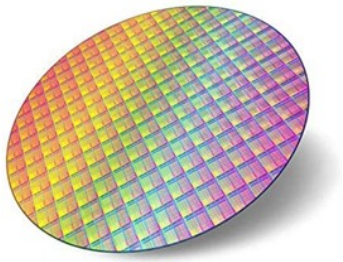








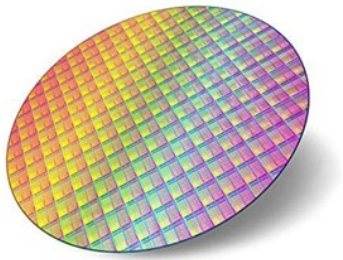
Quantum chips?



Similar to CMOS – we just care about more details

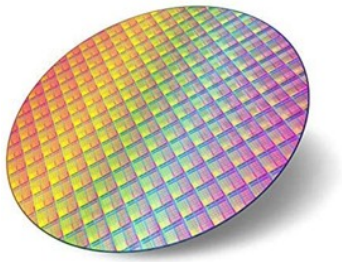
- Electrons as carriers of current → electron wavefunction
- Noise slows us down → noise destroys quantum information
- Interconnects scaling → quantum coherent links
- Power density → cryo power density
- Packaging
- Yield with fabrication scale → scale (at all)

We already did it once!



- Shrinking – but also multiple complete reinventions
- Dennard scaling – no such thing in sight for quantum
- Materials engineering
- Co-design and co-optimization
- EUV lithography, curvilinear, inverse
- EDA tools – SPICE models, place & route, verification flows

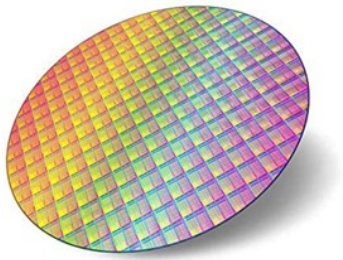
Scaling for quantum?



- Re-inventing qubits, couplers, architectures, interconnects
- Materials engineering
- Co-design and co-optimization
- Fab process overhauls
- EDA tools, automation and verification

- Theory, QEC, algorithms
- Shovels

Why quantum?



- Industry
- Discipline
- Shovels
- Challenge
- Timing

Materials quality

Fabrication at scale

Q & A