

Quantum Sensors Here & Now: Examples of How Today's Use Cases Can Help Businesses Now

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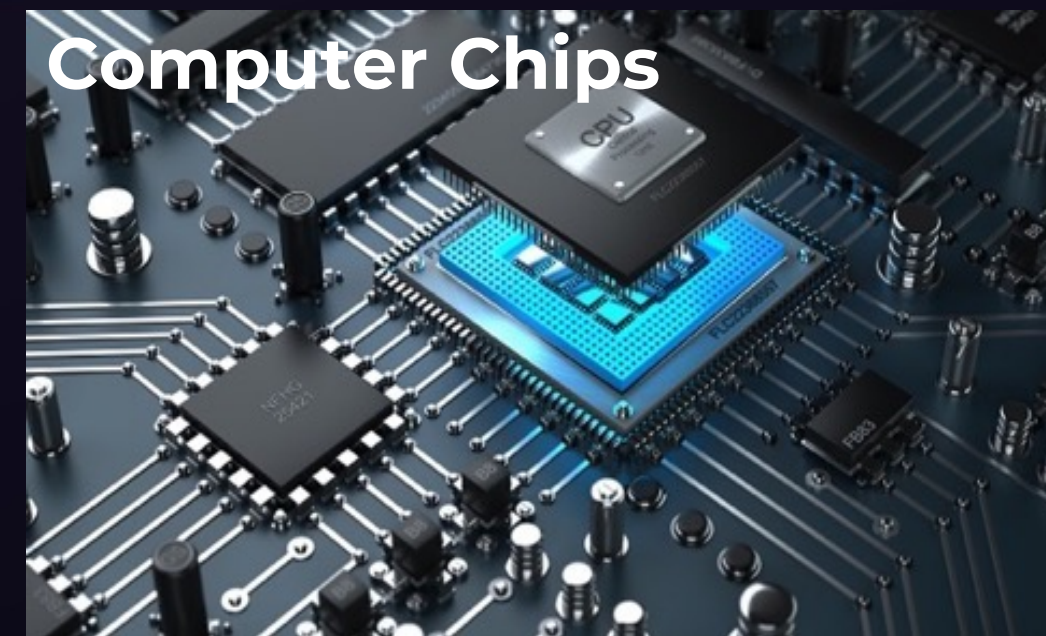
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What is Q-Cat?

- Focused on R&D for quantum sensing
- Spin-out companies addressing large markets using shared resources
- Strong IP portfolio
- Contract with government & major companies
- Successful track-record of productization (QDM)

Quantum 1.0

- Breakthroughs of 20th century physics
- Focus on groups of particles
- Devices that rely on quantum effects
- Beginning of the "modern information age"



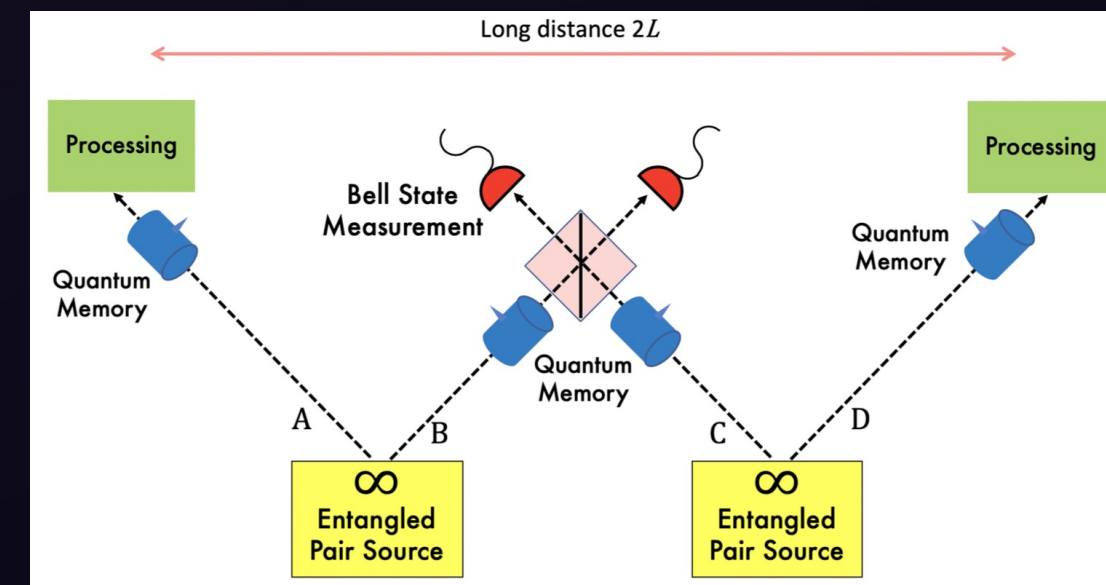
Quantum 2.0

- Understanding of individual particles, rather than behavior of ensembles
- Manipulation of quantum states/qubit control
- Compute faster & more accurately by exploiting superposition & entanglement

Quantum Computer



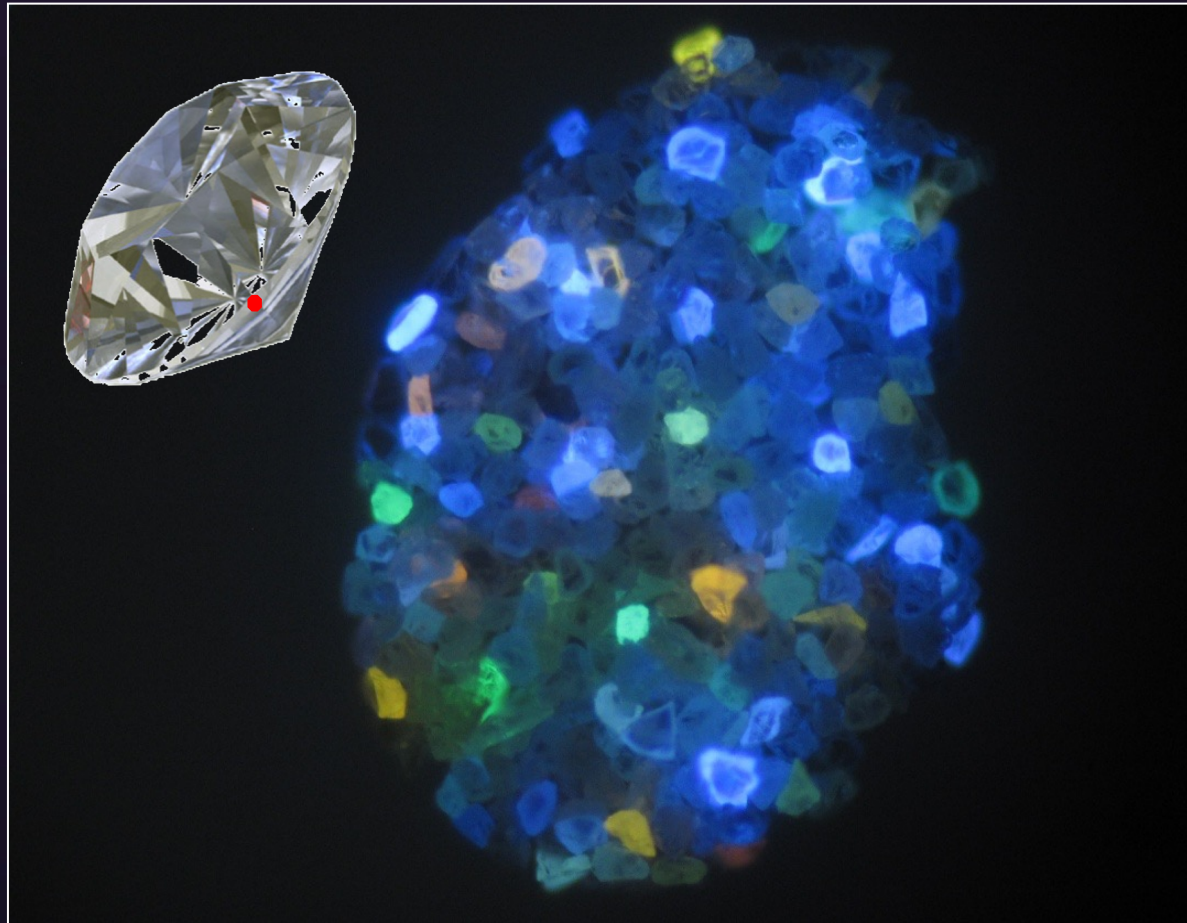
Quantum Internet



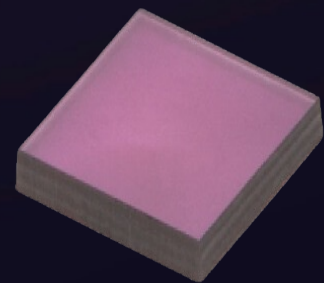
Quantum 2.0: **Sensor Technology**

- Measure and image at the single - atom level
- Extreme sensitivity to physical phenomenon
 - gravity, electromagnetic fields, temperature
- Materials that can be used as sensors
- Various architectures, various applications

Quantum Sensor Example: **Diamond**

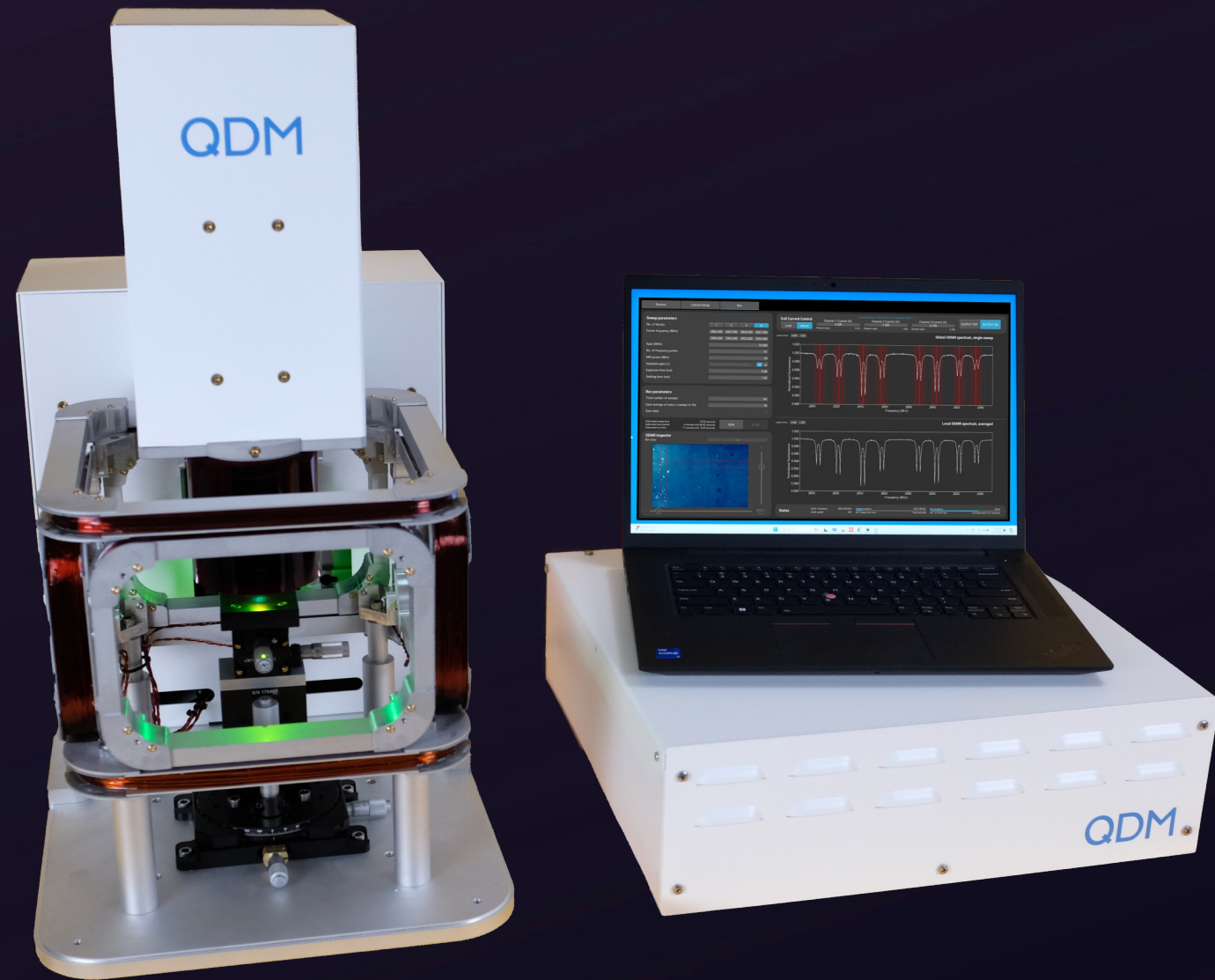


- Lab grown diamond
- Various quantum defects in crystal
- Emit light carrying important information about a local environment
- Room temperature operation
- Robust



Quantum grade diamond
from Element Six

Current Technology: QDM



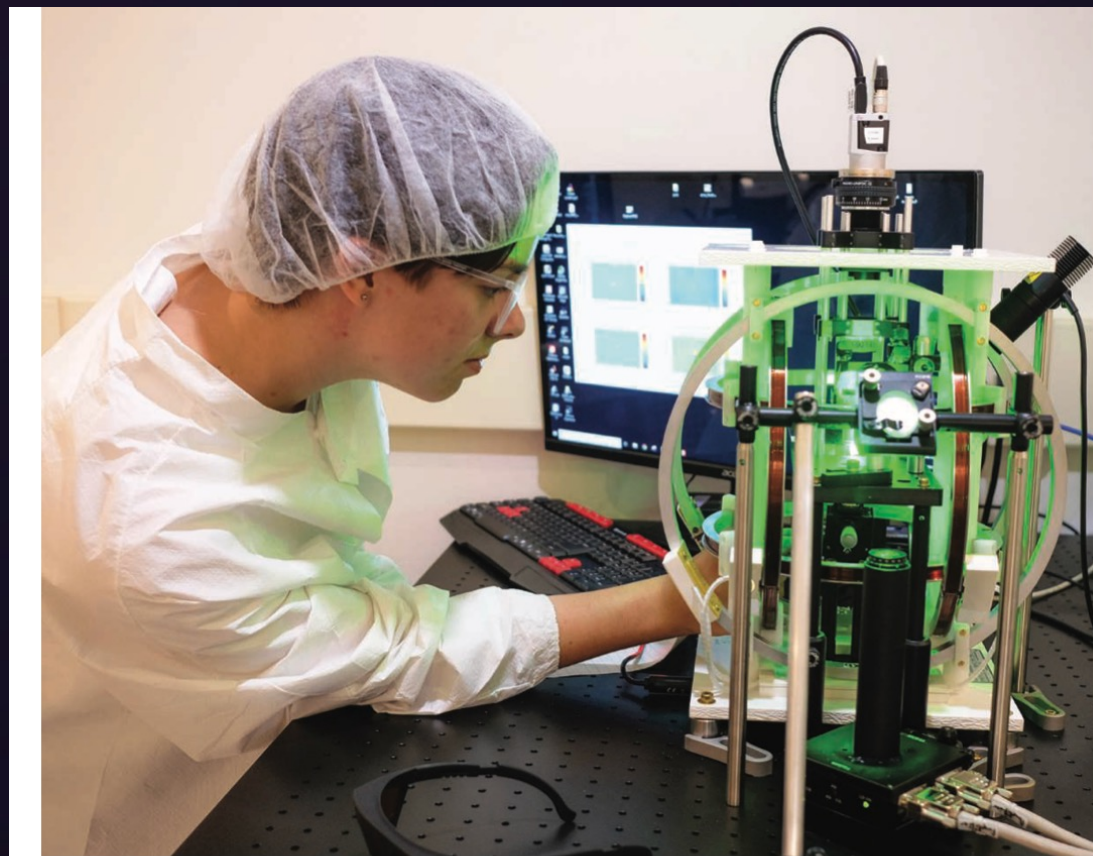
**Quantum Diamond
Microscope (QDM)
by Quantum Catalyzer**

- Robust easy to use tool for magnetic imaging
- Various use cases ranging from health to rugged environments
- Micron-scale resolution
- Millimeter field-of-view

QDM: Transformative Research Tool

Earth & Planetary Science

Science magazine

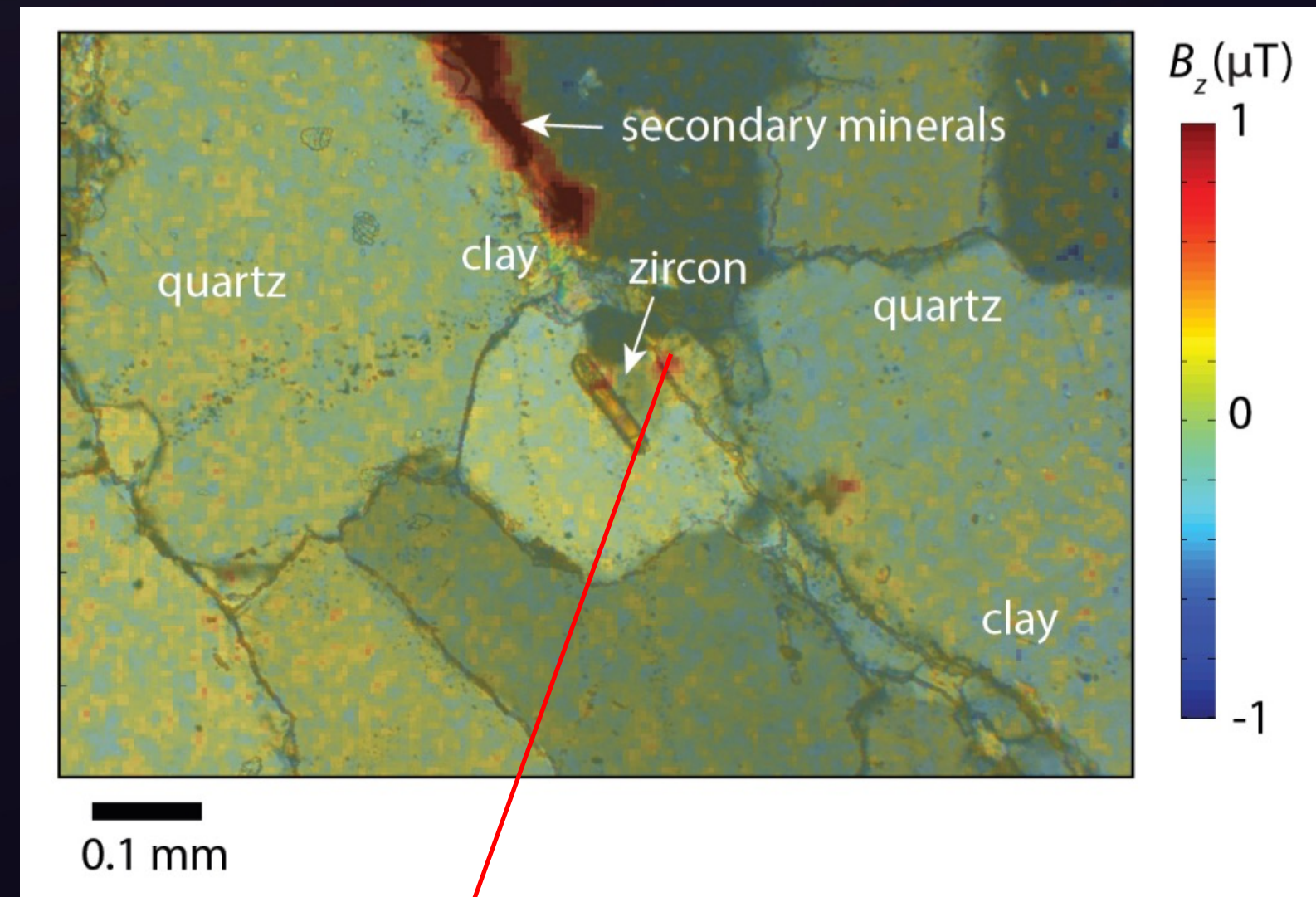


EARTH SCIENCE

Diamond microscope unlocks ancient rocks' magnetic secrets

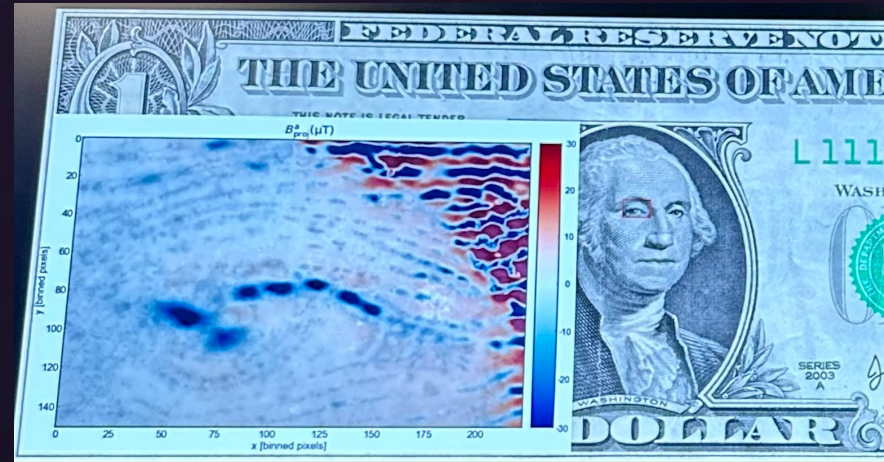
Quantum sensor reveals clues about plate tectonics, planet formation, and climate change with exquisite resolution

QDM Image of Ancient Rock



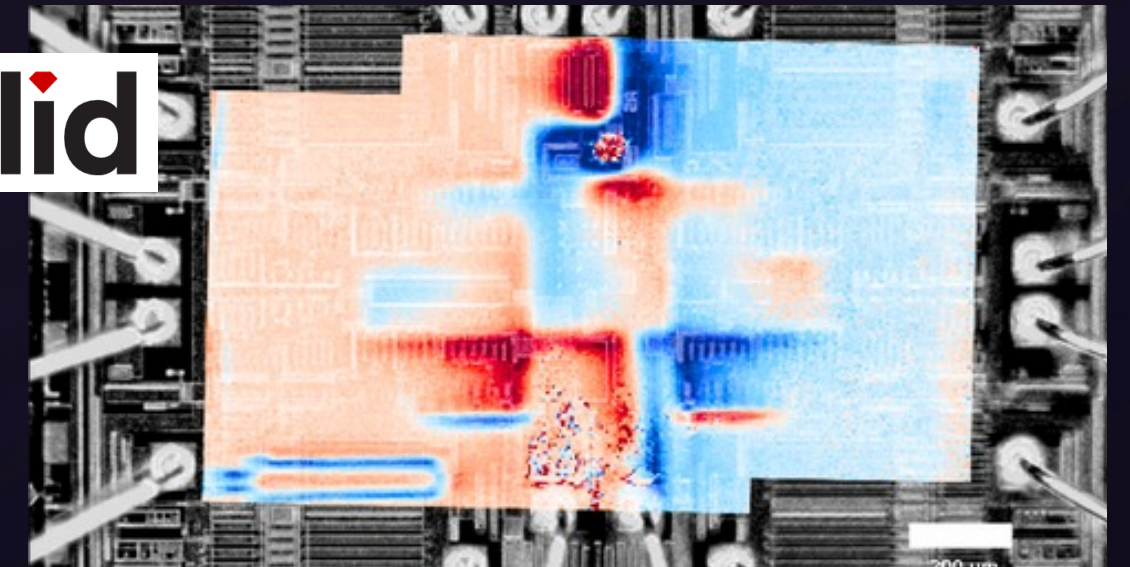
4 billion year old feature

Current **Diamond** Applications



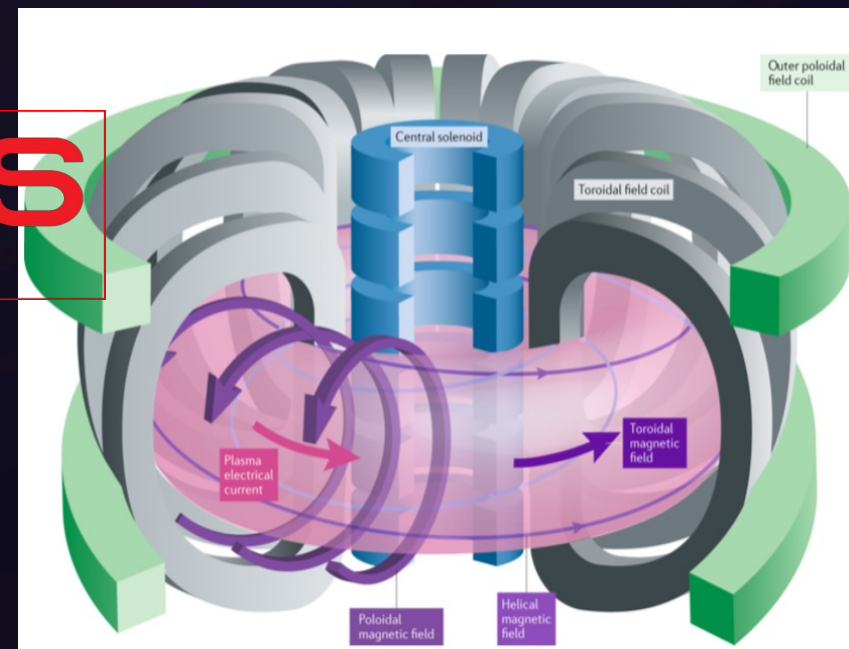
Magnetic imaging of high-value objects

EuQlid

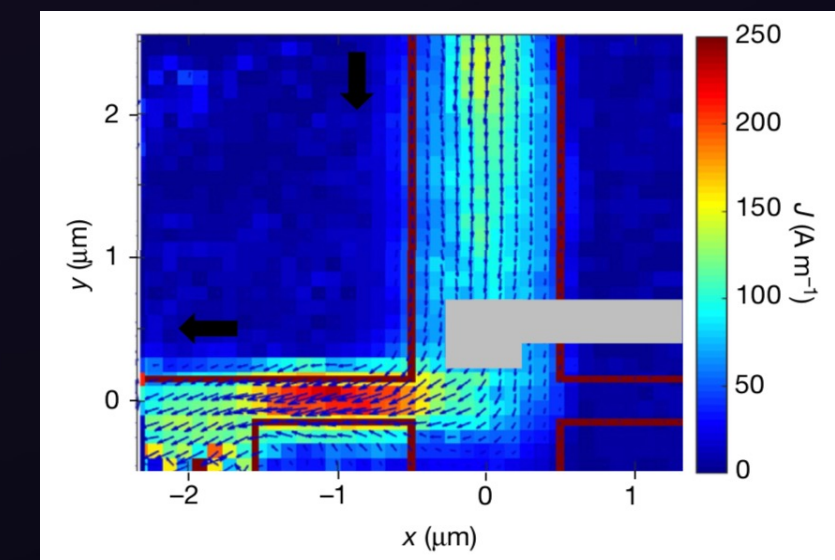


Failure analysis for electronic systems

XERXES
TECHNOLOGIES

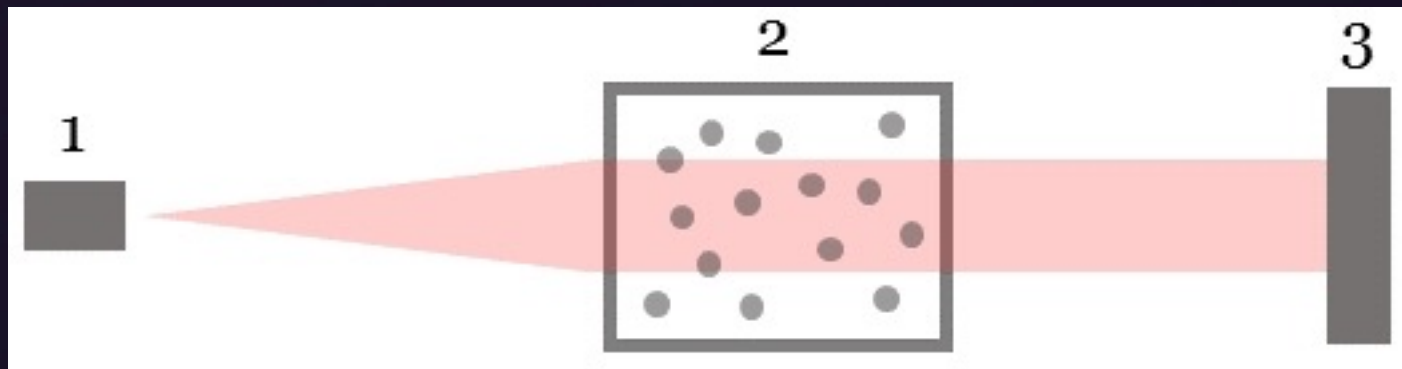


Sensing in rugged environments



Materials characterization

Quantum Sensor Example: OPM



OPMs have three main components: (1) a laser, (2) a glass vapor cell containing 'sensing' atoms in a gaseous state, and (3) a photodetector

- Optically pumped magnetometers (atomic vapor)
- Use lasers to prepare a gas of atoms in a quantum state to measure magnetic fields
- Accurate, does not need calibration
- Sensitive
- Room temperature
- Compact

Current **OPM** Applications

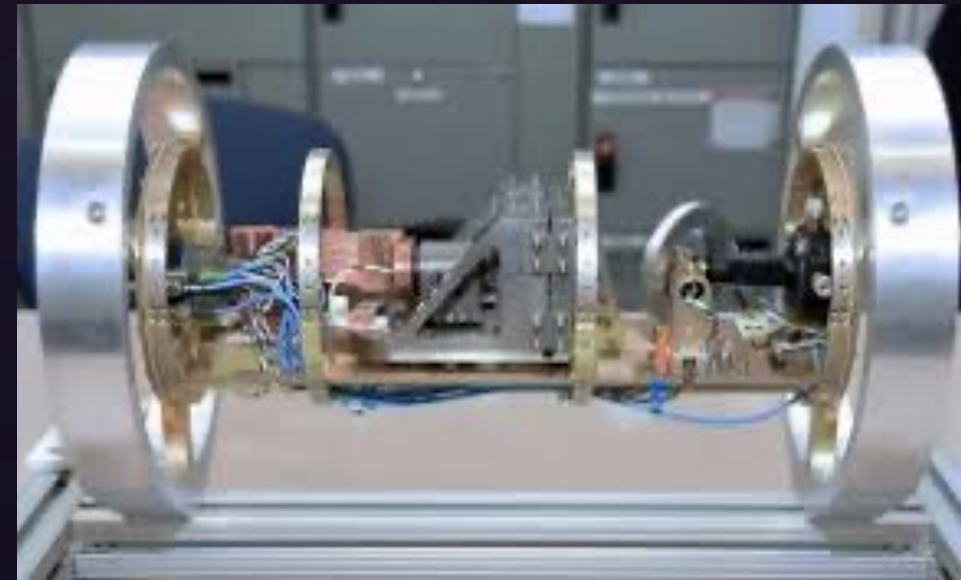
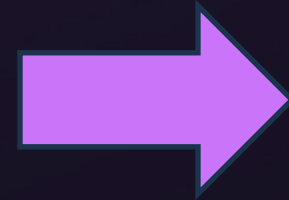


**Magnetoencephalography (MEG)
measurements**

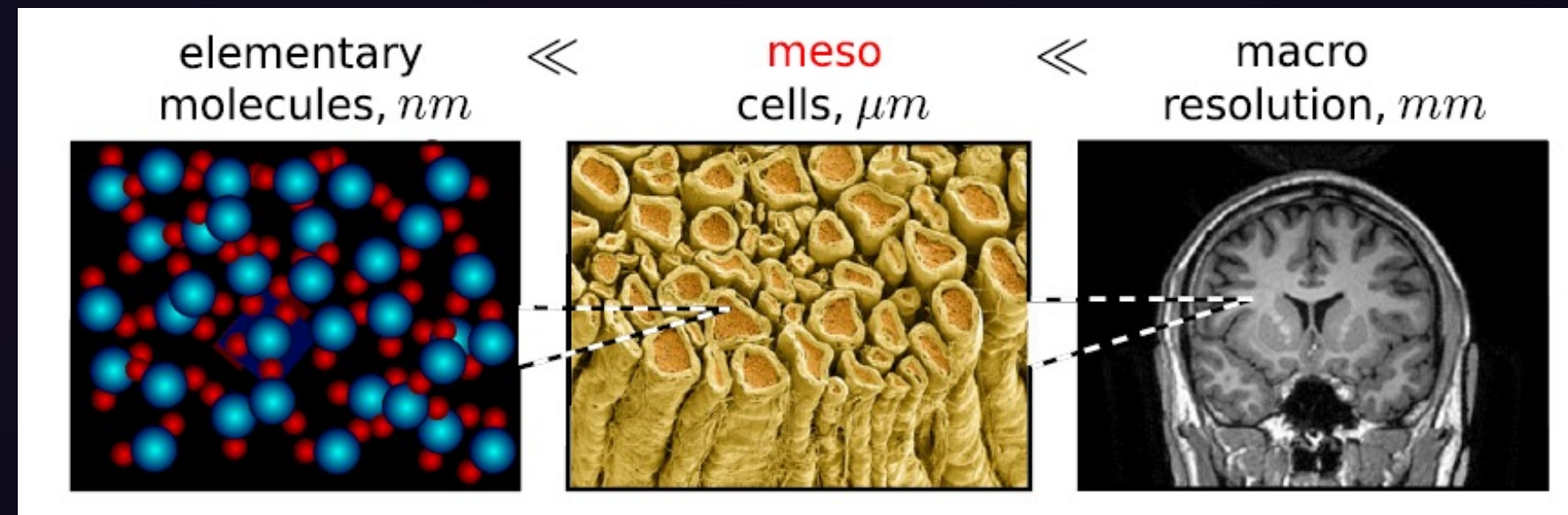
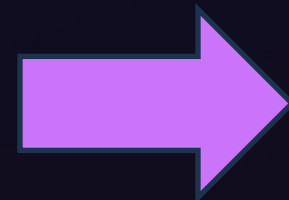


**Ground surveying
and monitoring**

Long Term Technologies



Quantum Sensors for next-generation GPS/GPS denied environments



MRI with single cell resolution using quantum diamond

How Can Quantum Sensors Help Business Now?

- Robust research tools
- Integrate with current technologies and infrastructure
- Embrace short-term value, plan for long-term

First Industries of Impact

- Military/Defense
- Aerospace
- Life Sciences/Health Care
- Semiconductors
- Automotive
- Oil & Gas

What is Needed?

- Reduction of size, weight, & power
- Research programs to explore further applications of quantum sensors
- Discoveries of new capabilities beyond what currently exists
- Funding for further development

THANK YOU!

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