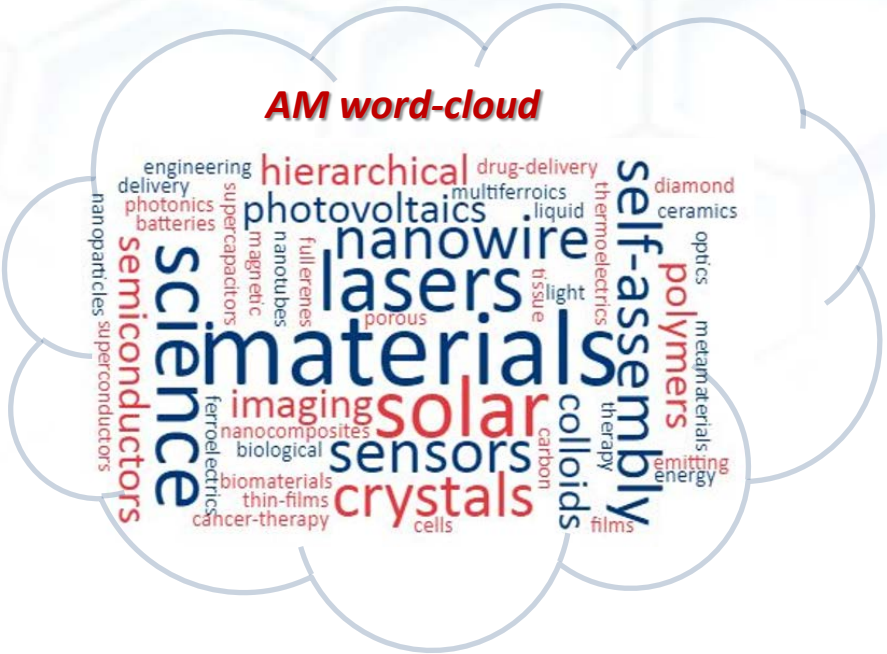
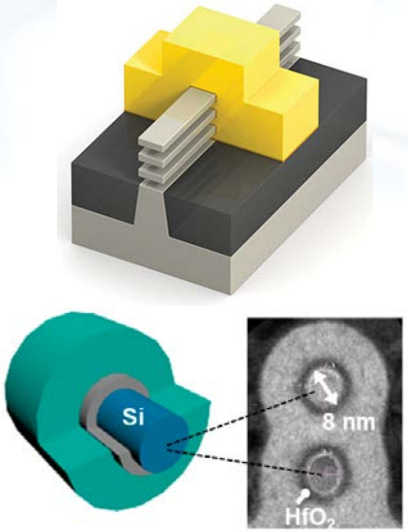
Advanced Materials (**AM**)

- **AM** exhibit *novel or enhanced properties* (electronic, optical, magnetic, mechanical…) that improve performance over conventional products and processes, e.g.:
  - ultra-thin vs. conventional silicon in transistors
  - carbon nanotubes for quantum optics

AM word-cloud

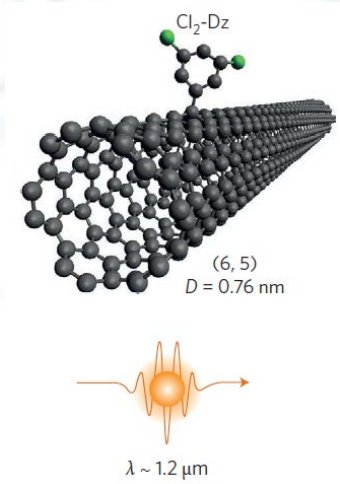


Stacked nanowire FET



Appl. Sci. ***2020****, 10, 2979*

Emission from SWCNT

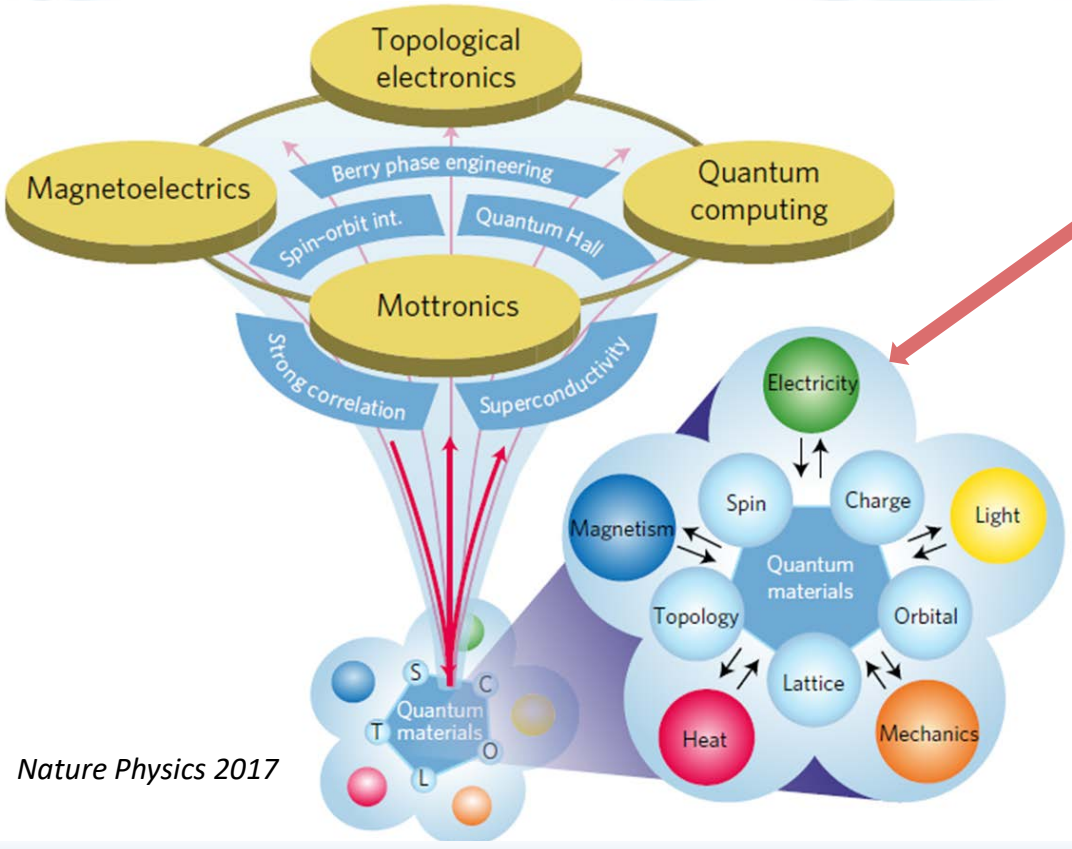


Nature Photonics ***2017****, 11, 535*

Needs for **AM** standardization:

- Establishing "Structure – Property – Performance" relationship
- Standardization of emerging technological processes
- Establishing EHS standards
- Support National initiatives: a) Quantum Information Science, b) CHIPs for America (microelectronics)

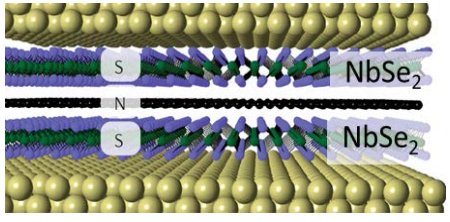
Quantum Materials (**QM**)



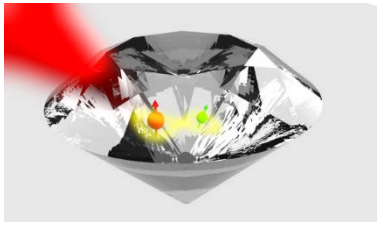
Nature Physics 2017

QM – materials in which quantum phenomena (topology, spin-orbit, confinement, symmetry) manifest over a wide range of energies and length-scales

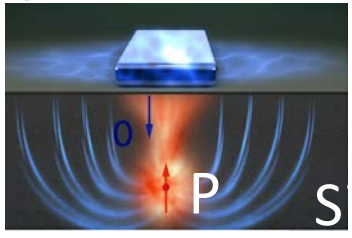
2D Josephson Junction



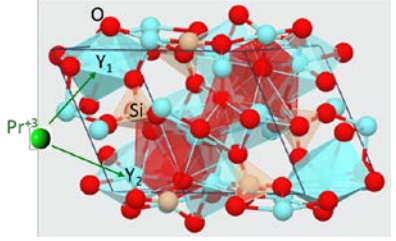
N-V center in diamond



Quantum dots in Si



Pr^{+3}:Y_2SiO_5 for q-memory

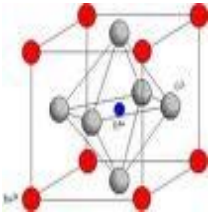


Complimentary

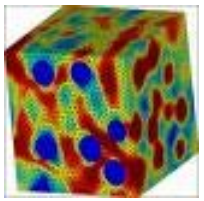
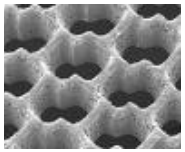
Scope of Advanced Materials

Condensed phases, including

- Ceramics
- Metals
- Polymers
- Composites
- Semiconductors
- Biomaterials
- Fluids

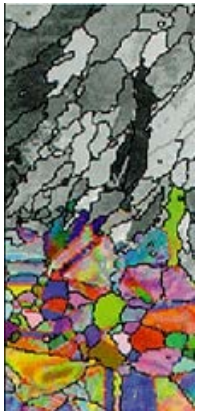
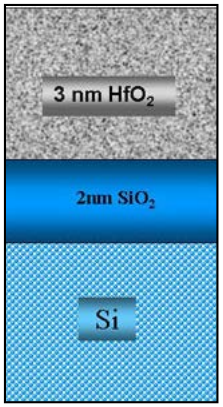


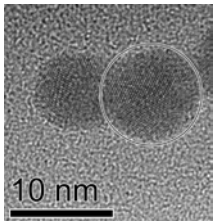


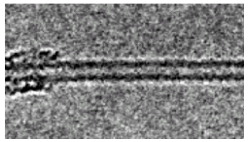
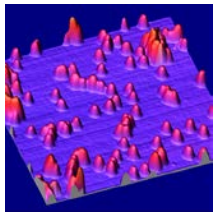




in all forms, including

- Bulk
- Multilayer
- Tube, rod
- Particulate

at all length scales

nanoscale ⟶ microscale ⟶ mesoscale ⟶ macroscale