Welcome to Chen group !

www.arpes.org.uk

Visualizing Electronic Structures of Quantum Materials

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Now admitting

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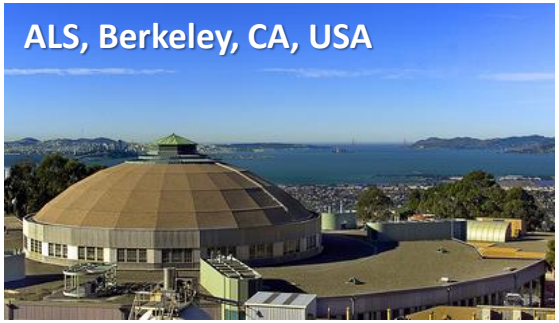
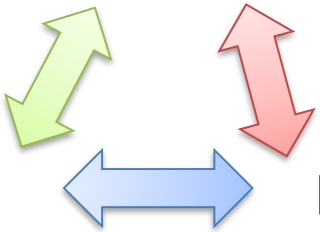
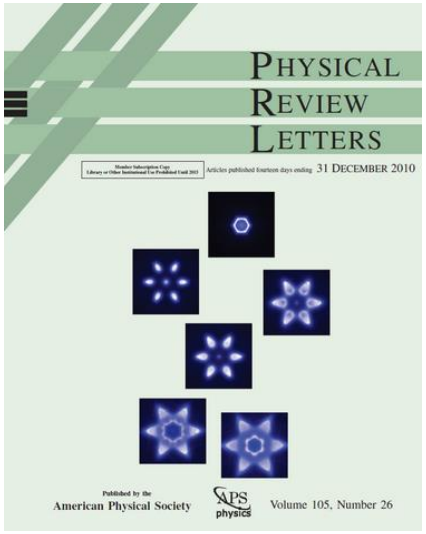
What's our everyday life?

Travel around the world to collect data

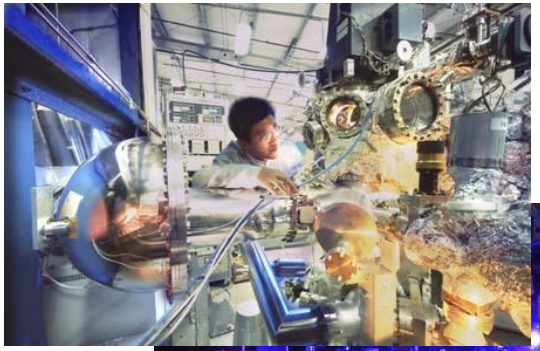




Data analysis



Instrument development



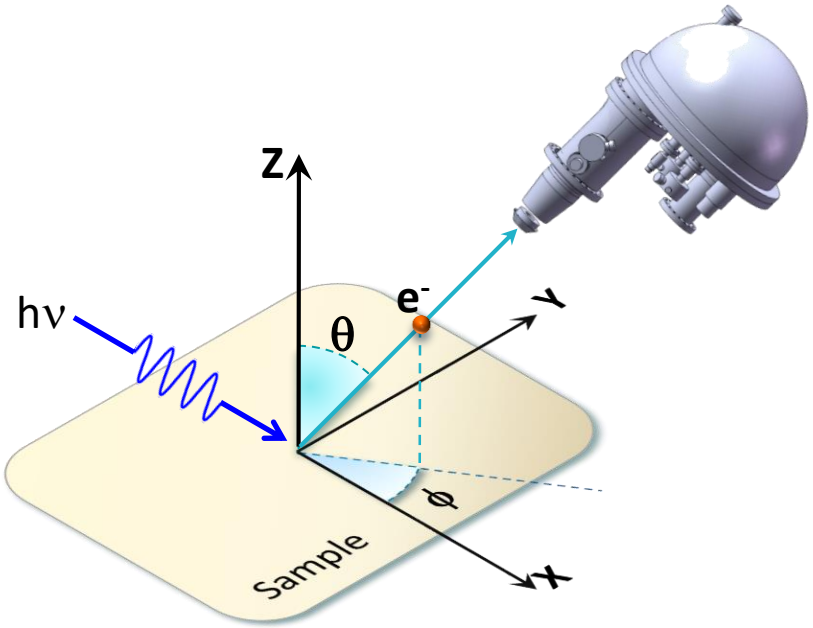
How to “see” band structures

Angle Resolved Photoemission Spectroscopy (ARPES)

Complete description of electronic state

$f_{(k, E, t, r, \sigma)}$

- Momentum
- Energy
- Time
- Position
- Spin



Energy Conservation

$$E_B = h\nu - E_{kin} - \Phi$$

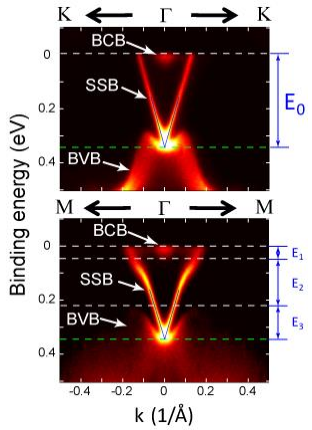
Momentum Conservation

$$K_{||} = k_{||} + G_{||}$$

Examples: A powerful tool to study TQMs

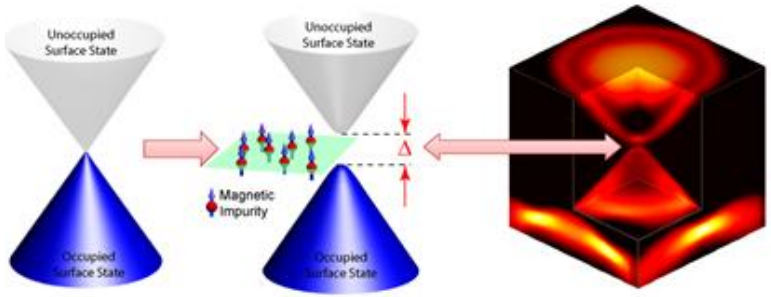
Large gap 3D topological insulator

Science 325, 178 (2009)



Massive Dirac Fermion state in TI

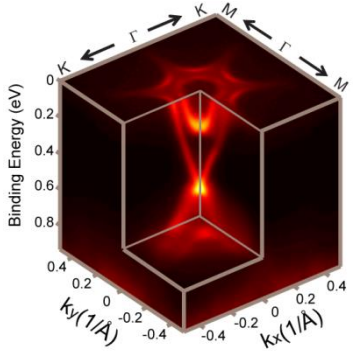
Science 329, 659 (2010)



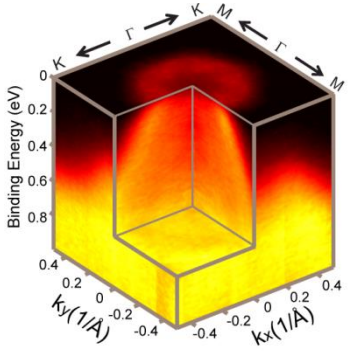
Strong inversion asymmetric TI

Nature Physics. 9, 704 (2013)

Top surface



Bottom surface

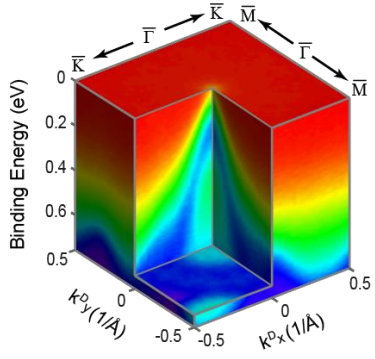


3D Topological Dirac semi-metals

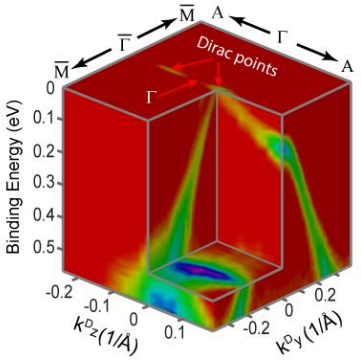
Science, 343, 864 (2014)

Nature Materials, 13, 677 (2014)

(kx, ky, E sub-space)



(ky, kz, E sub-space)



Topics we are interested:

- **Topological quantum materials:**
  - Topological insulators
  - Topological Dirac Semimetals
  - Topological Weyl Semimetals
  - Topological Superconductors

- **Low dimensional electron systems:**
  - Graphene functional structures/devices
  - Transition metal dichalcogenides
  - Novel mesoscopic materials (Nano ribbons, plates, rods, etc.)
  - Thin films and hetero/super structures

- **Advanced Scientific Instrumentation development**
  - High efficiency Spatially and Spin resolved ARPES spectrometer (S^2ARPES)
  - Time-resolved ARPES spectrometer

Some of our recent works

Also see: http://arpes.org.uk/Publication.html

In Collaboration:

Nature Physics, 11, 645 (2015)
Nature communications, 6, 6142 (2015)
Nature Nanotechnology, 9, 111 (2014)
Nature Communication, 3, 838 (2012)
Nature Chemistry, 4, 281 (2012)
Nature Materials, 9, 225 (2010)

ARPES:

Nature Materials, 15, 27 (2016)
Nature Physics, 11, 728 (2015)
Nature Materials, 13, 677 (2014)
Science, 343, 864 (2014)
Nature Physics, 9, 704 (2013)
Frontiers of Physics, 7, 175 (2012) ***(Review)***
Nature Nanotechnology, 6, 705 (2011)
Science, 329, 659 (2010)
Science, 325, 178 (2009)