

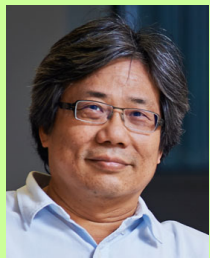
# **Overview of the Quantum Materials Physics group**

# Quantum Materials Physics (QMP) Group

## 2024

### Distinguished Research Fellow

Maw-Kuen Wu    Yeu-Kuang Hwu    Sungkit Yip    Chii-Dong Chen  
吳茂昆        胡宇光        葉崇傑        陳啟東



### Research Fellow

Shang-Fan Lee    Yang-Yuan Chen    Ing-Shouh Hwang    Wei-Bin Su    Wei-Li Lee  
李尚凡        陳洋元        黃英碩        蘇維彬        李偉立



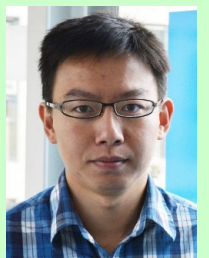
### Associate Research Fellow

Hsin Lin    Tien-Ming Chuang  
林新        莊天明



### Assistant Research Fellow

Yu-Chieh Wen    Chung-Ting Ke    Chen-Hsuan Hsu  
溫昱傑        柯忠廷        徐晨軒



### Research Scientist

Kung-Hsuan Lin    Min-Nan Ou    Raman Sankar  
林宮玄        歐敏男

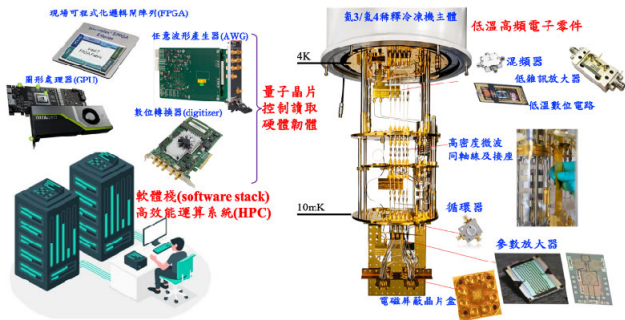


# Fulfill social responsibilities in crucial areas (based on highlights)

## 2 Alpha projects, AS

## 前瞻基礎建設/綠能建設 Executive Yuan

### Quantum computing



Chii-Dong Chen  
陳啟東



Chung-Ting Ke  
柯忠廷



5-qubit superconducting quantum computer

### CO<sub>2</sub> emission reduction



Yang-Yuan Chen  
陳洋元



Min-Nan Ou  
歐敏男

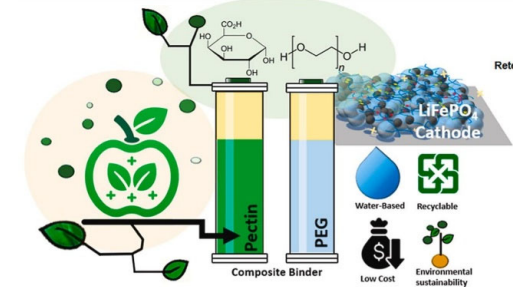


methane pyrolysis equipment

Maw-Kuen Wu  
吳茂昆



### Li-ion battery with pectin (果膠)



environmentally friendly

# International Collaboration (based on highlights)

Yeu-Kuang Hwu  
胡宇光



## Human brain connectome



**Physics Reports, 999,1-60 (2023)**  
A roadmap to brain imaging

Shang-Fan Lee  
李尚凡



**Anisotropic Excitons Reveal Local Spin Chain Directions in a van der Waals Antiferromagnet (USA, China, France)**  
**Advanced Materials, 35, 2206585 (2023)**

Kung-Hsuan Lin  
林宮玄



**Bulk Photovoltaic Effect in Single Ferroelectric Domain of SnS Crystal and Control of Local Polarization by Strain (Japan)**  
**Advanced Functional Materials, 34, 2406140 (2024)**

Wei-Li Lee  
李偉立



**Nonlinear and Nonreciprocal Transport Effects in Untwinned Thin Films of Ferromagnetic Weyl Metal SrRuO<sub>3</sub> (USA)**  
**Physical Review X 14, 011022 (2024)**

Hsin Lin  
林新



**Quantum metric nonlinear Hall effect in a topological antiferromagnetic Heterostructure (USA, India, Japan, Canada)**  
**Science 381, 181–186 (2023)**

Raman Sankar



**Giant chiral magnetoelectric oscillations in a van der Waals multiferroic (USA, Germany, Spain)**  
**Nature 632, 273 (2024)**



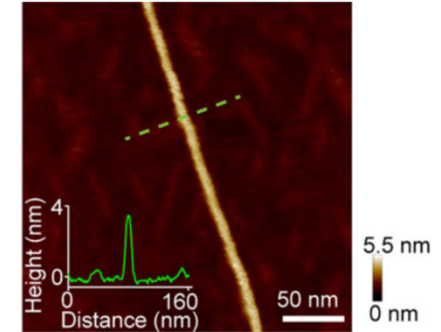
# Domestic Collaboration (based on highlights)

Ing-Shouh Hwang  
黃英碩



**Engineered droplet-forming peptide as photocontrollable phase modulator for fused in sarcoma protein**  
**(contribute technique of AFM in liquid)**

**Nature Communications 15, 5685 (2024)**

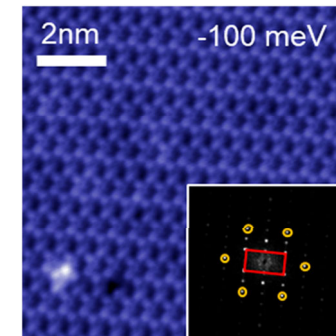


Tien-Ming Chuang  
莊天明



**Dirac Nodal Line in Hourglass Semimetal  $\text{Nb}_3\text{SiTe}_6$**   
**(contribute technique of UHV-LT-STM)**

**Nano Letters 23, 380–388 (2023)**



# Go it alone (based on highlights)

Sungkit Yip  
葉崇傑



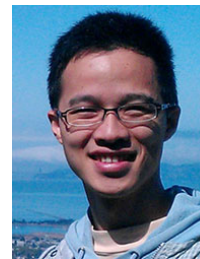
**Coupling of acoustic phonons to spin-orbit entangled pseudospins**

**Physical Review B 108, 165116 (2023)**

**Single Author**

**Theoretical insight of how phonons couple to a magnetic field**

Yu-Chieh Wen  
溫昱傑



**Momentum-dependent sum-frequency vibrational spectroscopy of bonded interface layer at charged water interfaces**

**Science Advances, 9, eadg2823 (2023)**

Chen-Hsuan Hsu  
徐晨軒



**Interaction- and phonon-induced topological phase transitions in double helical liquids**

**Nanoscale Horizons 9, 1725-1731 (2024)**

**Single Author**

**Theoretical insight into topological phase transitions**

Wei-Bin Su  
蘇維彬



**Tip-induced local Fermi level alignment: A Stark shift in vacuum level in scanning tunneling microscope configurations**

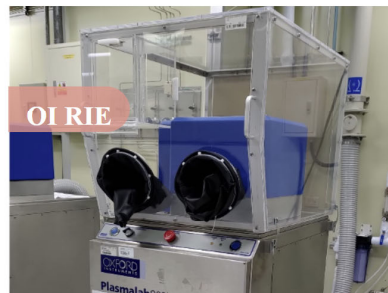
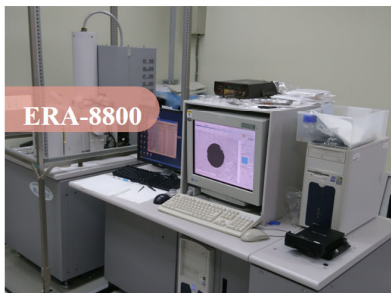
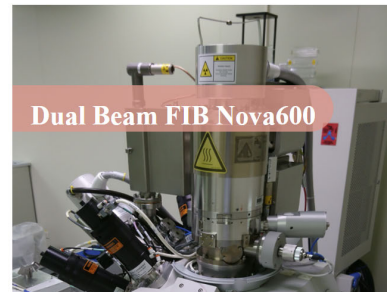
**Field emission resonance in STM**

**Chinese Journal of Physics, 92, 877 (2024)**



## 量子材料公用實驗室 Quantum Material Shared Facilities

### Fabrication: e-beam writer, laser writer, ion etching, evaporator, FIB

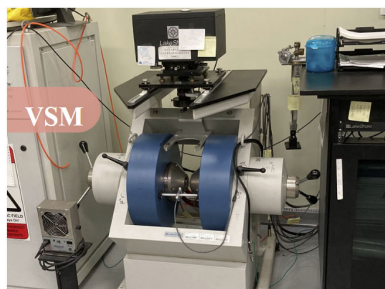






# 量子材料公用實驗室 Quantum Material Shared Facilities

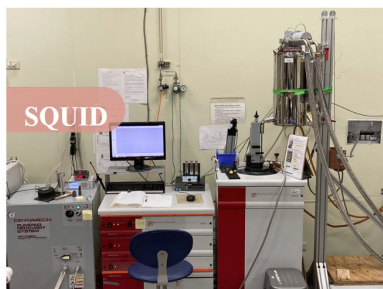
## Characterization: PPMS, SQUID, AFM, X-ray, VSM, SEM



VSM



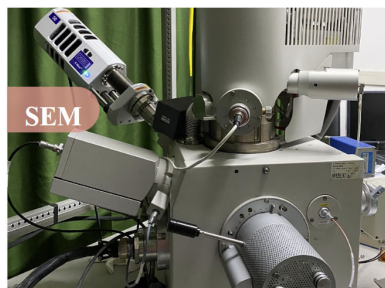
PPMS



SQUID



AFM



SEM



X-ray 1 (Empyrean)



X-ray 2 (X'Pert PRO)



X-ray 3 (X'Pert MRD)



反射式勞厄散射儀



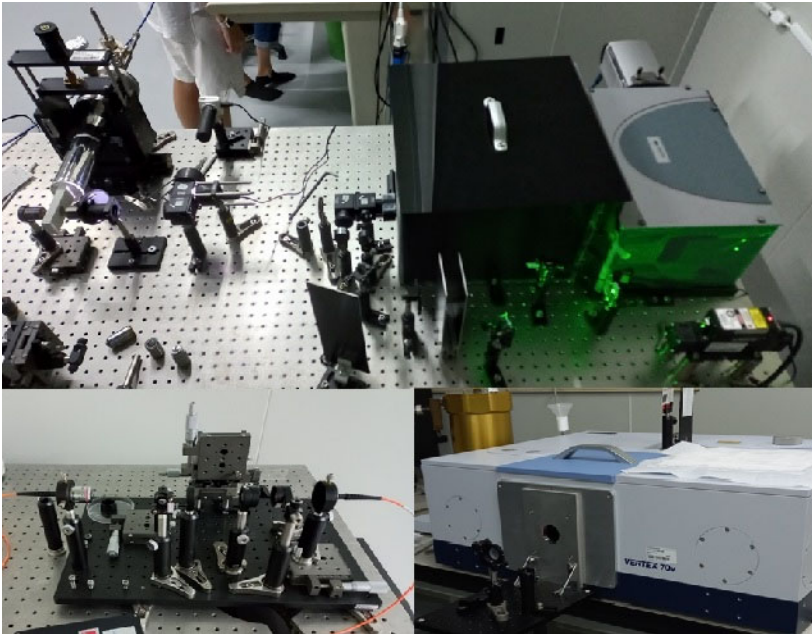
代管儀器 (SQUID-VSM)



# Shared facility

## Optical spectroscopy facility

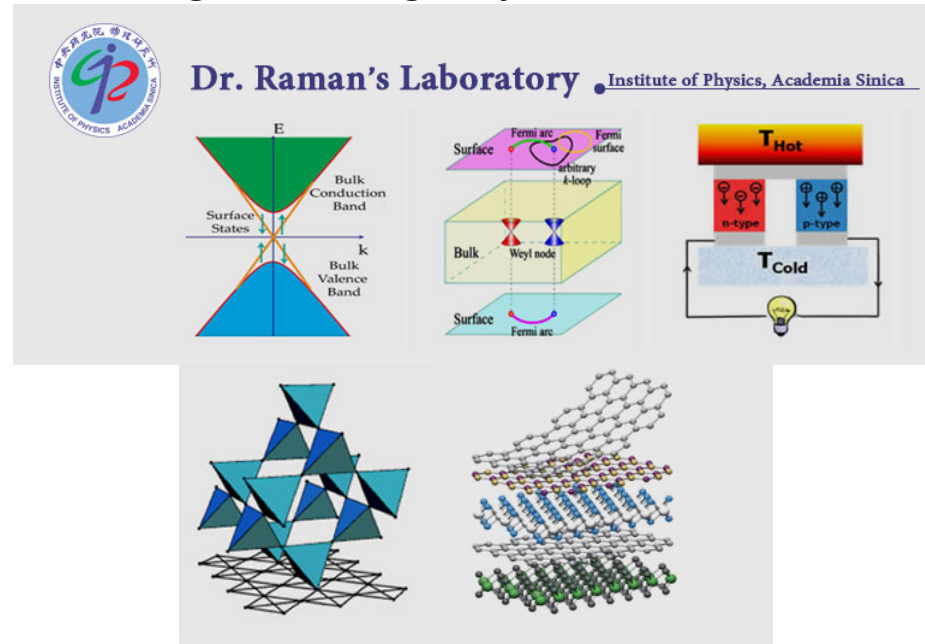
FTIR, Raman spectroscopy.....



Lin, Kung-Hsuan  
Wen, Yu-Chieh

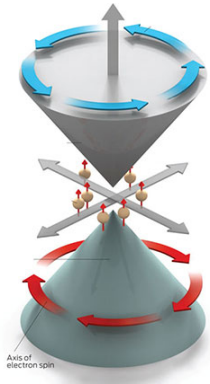
## Single Crystal Synthesis Lab

Providing various single crystals



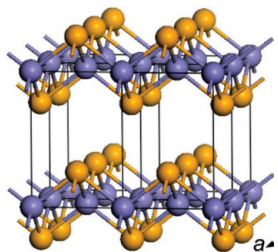
Raman Sankar

# Future research plans



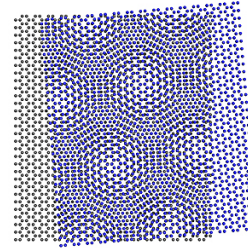
## **Topological materials**

Hsin Lin  
Sungkit Yip  
Chen-Hsuan Hsu  
Chung-Ting Ke  
Chia-Seng Chang  
Tien-Ming Chuang  
Shang-Fan Lee  
Wei-Li Lee  
Yu-Chieh Wen  
Raman Sankar



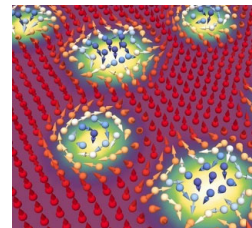
## **FeSe Superconductivity**

Maw-Kuen Wu



## **2D materials**

Chung-Ting Ke  
Chia-Seng Chang  
Chen-Hsuan Hsu  
Wei-Bin Su  
Kung-Hsuan Lin  
Raman Sankar  
Shang-Fan Lee



## **Magnetism & Spintronics**

Shang-Fan Lee  
Wei-Li Lee  
Hsin Lin  
Kung-Hsuan Lin  
Raman Sankar



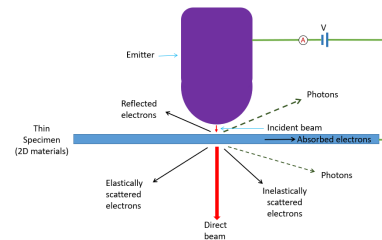
## **Superconductivity under high pressure**

Maw-Kuen Wu  
Yang-Yuan Chen  
Min-Nan Ou

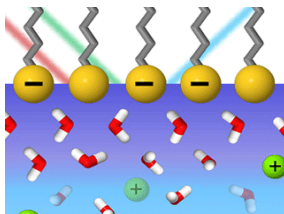
# Future research plans



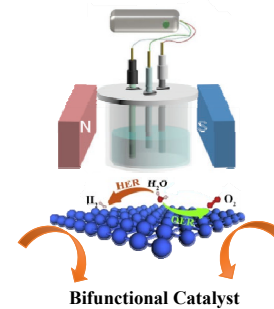
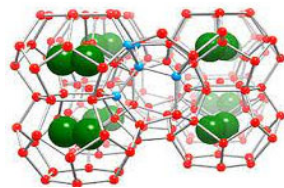
**Thermoelectrics**  
Maw-Kuen Wu  
Yang-Yuan Chen  
Raman Sankar  
Min-Nan Ou



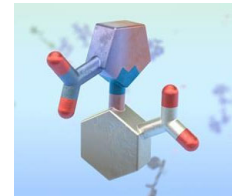
**Proximity scanning transmission electron microscopy**  
Ing-Shouh Hwang, Wei-Bin Su



**Water interface**  
Ing-Shouh Hwang  
Yu-Chieh Wen



**Magnetic-Spin Enhanced Electrochemical Water-Splitting**  
Raman Sankar



**Thank you for your kind attention**