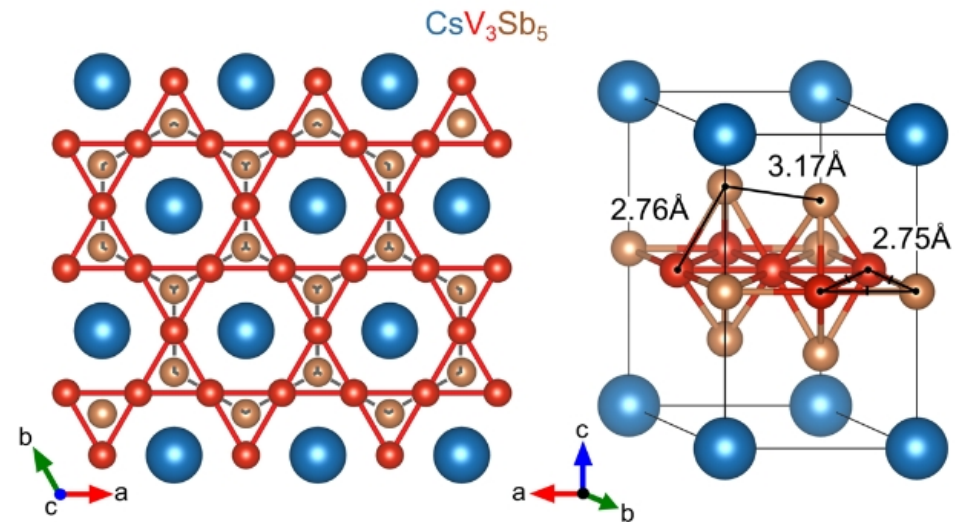
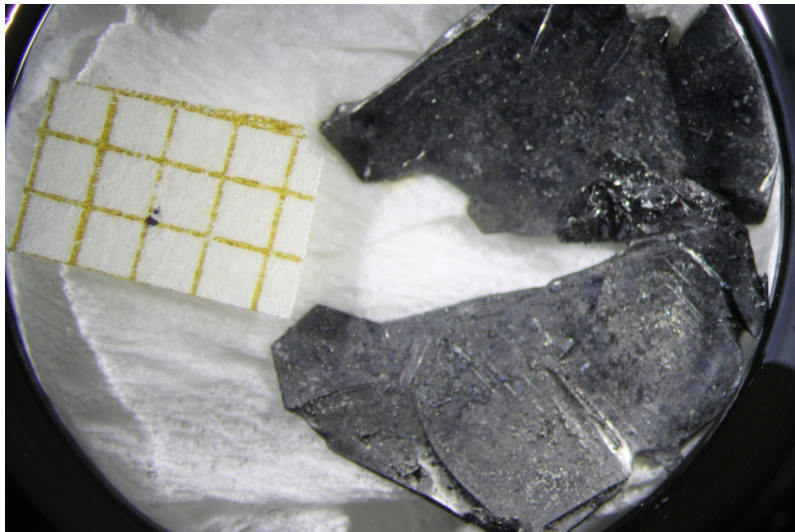


# $\text{CsV}_3\text{Sb}_5$

## Summary of relevant work and future plans

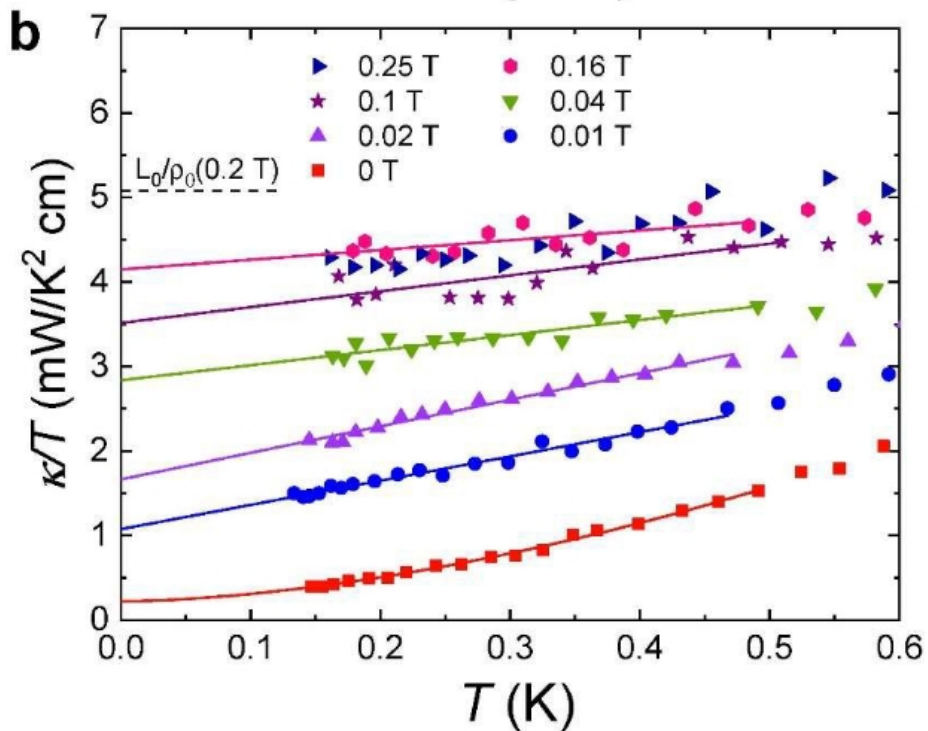
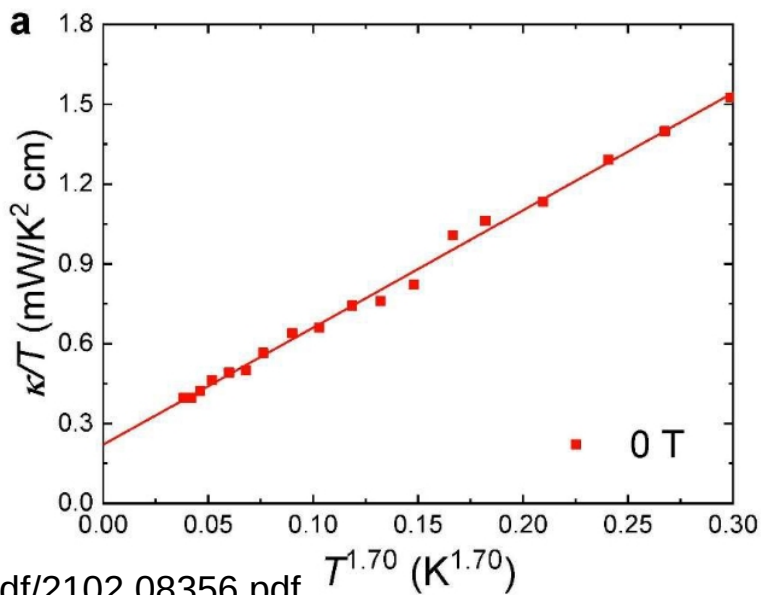


# Overview of material

- Kagome metal –  $AV_3Sb_5$  family
- $T_c = 2.5K$
- $H_{c2}(0K) \sim 4 \text{ kOe}$
- CDW at 94K
- Possibly nodal superconducting gap
- **All 17 ArXiv papers posted in 2021**

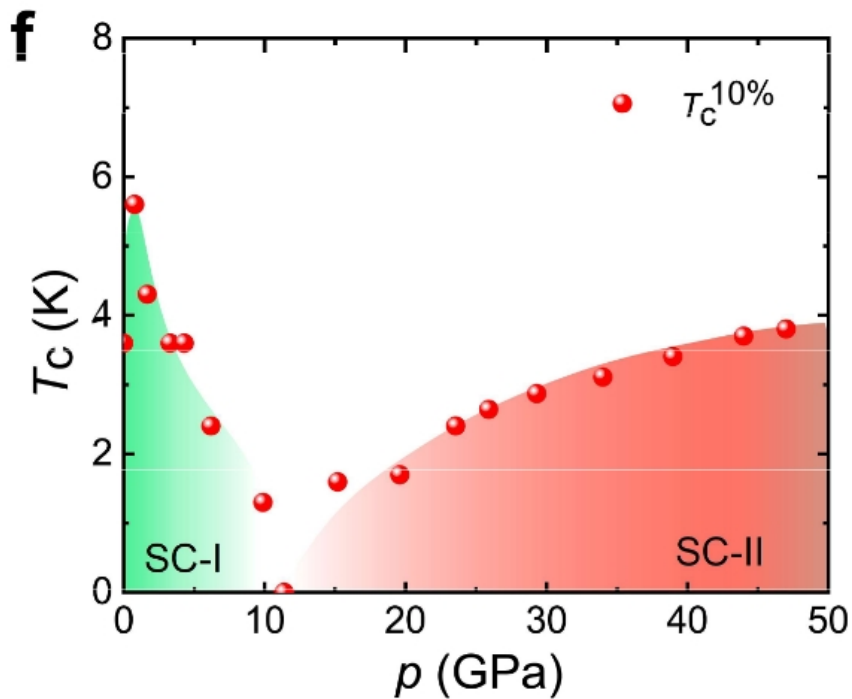
## Past work: Thermal Conductivity

- Evidence for nodal SC gap
- $B = 100$  Oe gives large enhancement of  $K$  below  $T_c$ 
  - Recall  $H_{c2} \sim 4$  kOe
  - Volovik effect?

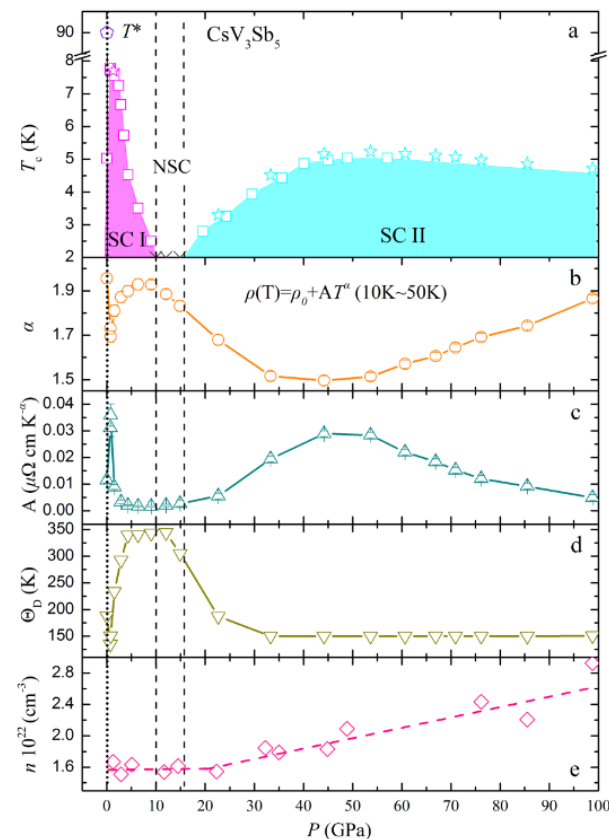


# Past work: Multiple SC Domes

- $\rho$  vs  $P$  vs  $T$  reveals re-emerging SC with pressure



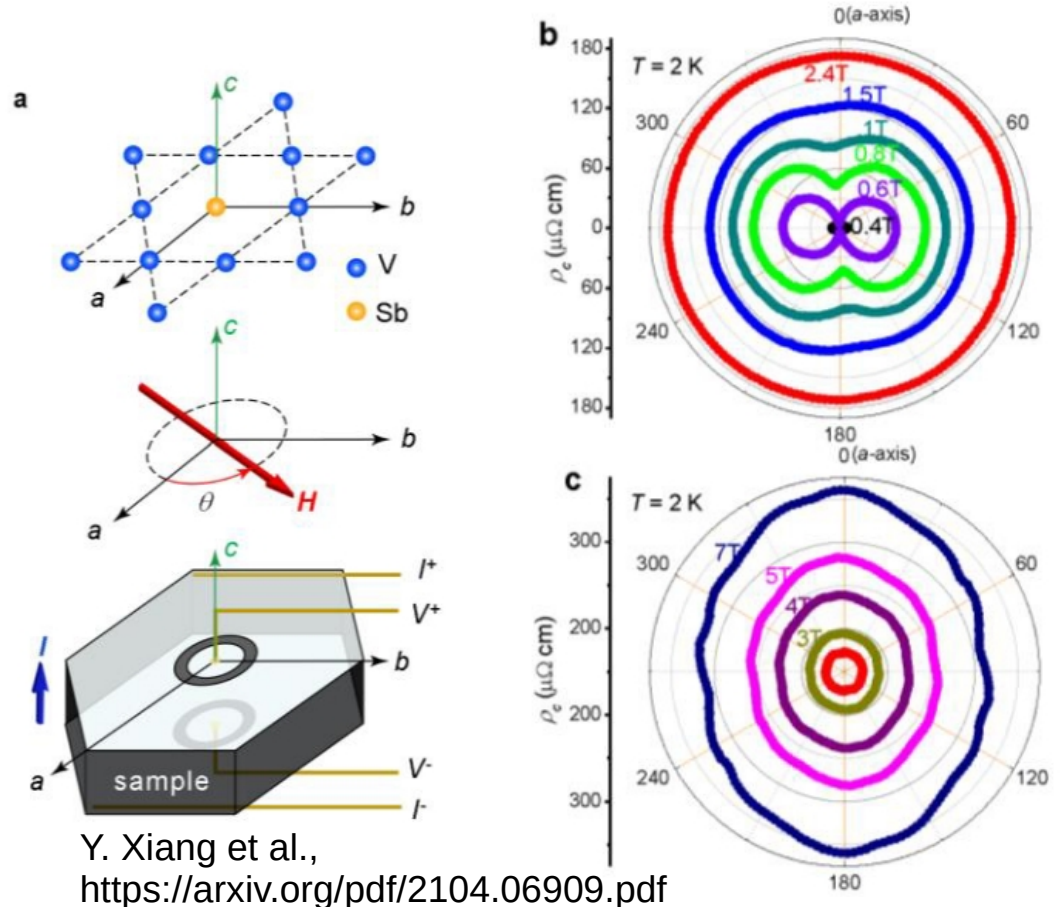
C. C. Zhao et al.,  
<https://arxiv.org/pdf/2102.08356.pdf>



X. Chen et al.,  
<https://arxiv.org/pdf/2103.13759.pdf>

# Past work: Magnetic field rotator $\rho_c$

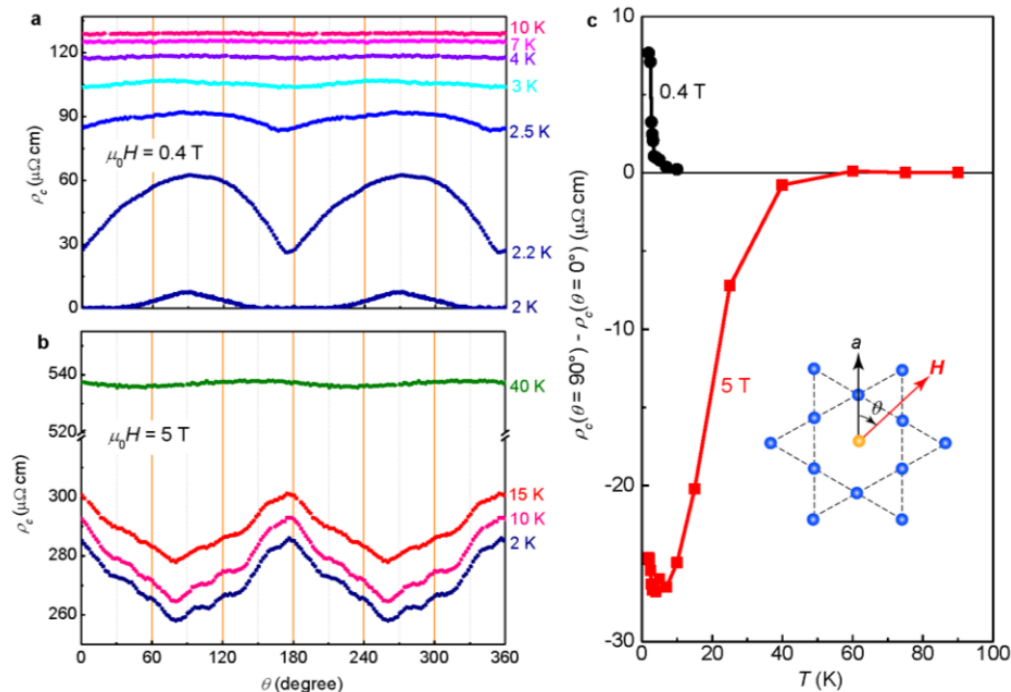
- $\rho_{\text{out-of-plane}} = 23 * \rho_{\text{in-plane}}$
- Gap maxima *may* be along a-axis (?)
- 2 fold symmetry in transport
- *Theory*: chiral flux phase (?)
  - predicts TRS broken
  - predicts anomalous hall
  - Based on lowest energy phase giving reported charge ordering



Y. Xiang et al.,  
<https://arxiv.org/pdf/2104.06909.pdf>

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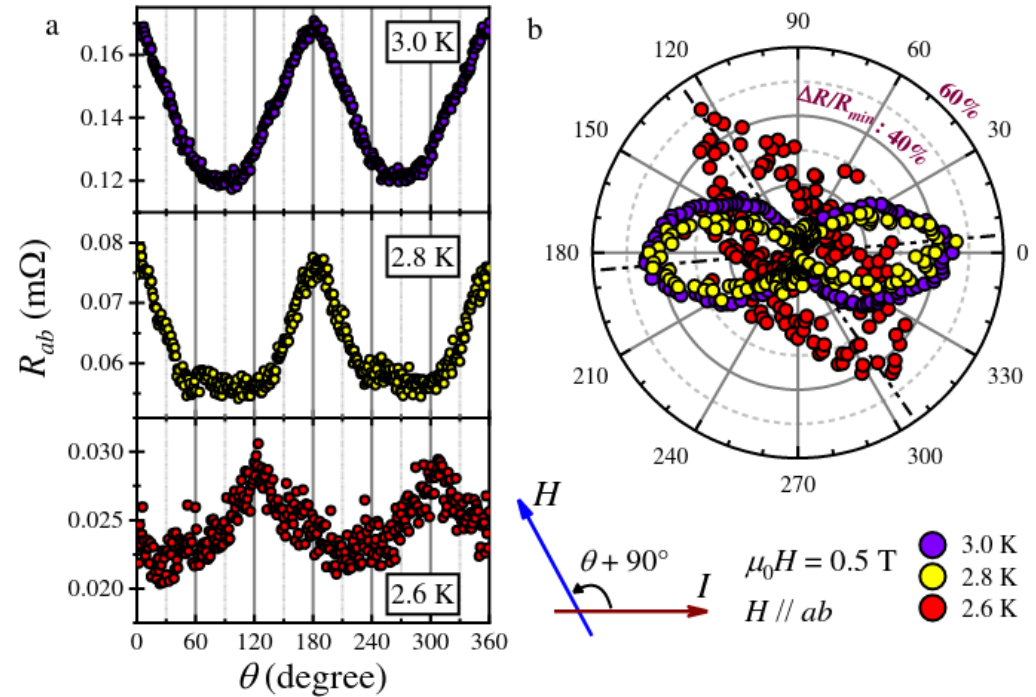


Y. Xiang et al.,  
<https://arxiv.org/pdf/2104.06909.pdf>

# Past work: Magnetic field rotator $\rho_{ab}$

- Another paper reporting similar symmetries in transport
- In this case, the current is in-plane (rather than out-of-plane as previously reported)

Figure 4



Shunli Ni et al.,  
<https://arxiv.org/pdf/2104.00374.pdf>

# Past work: Pair Density Wave

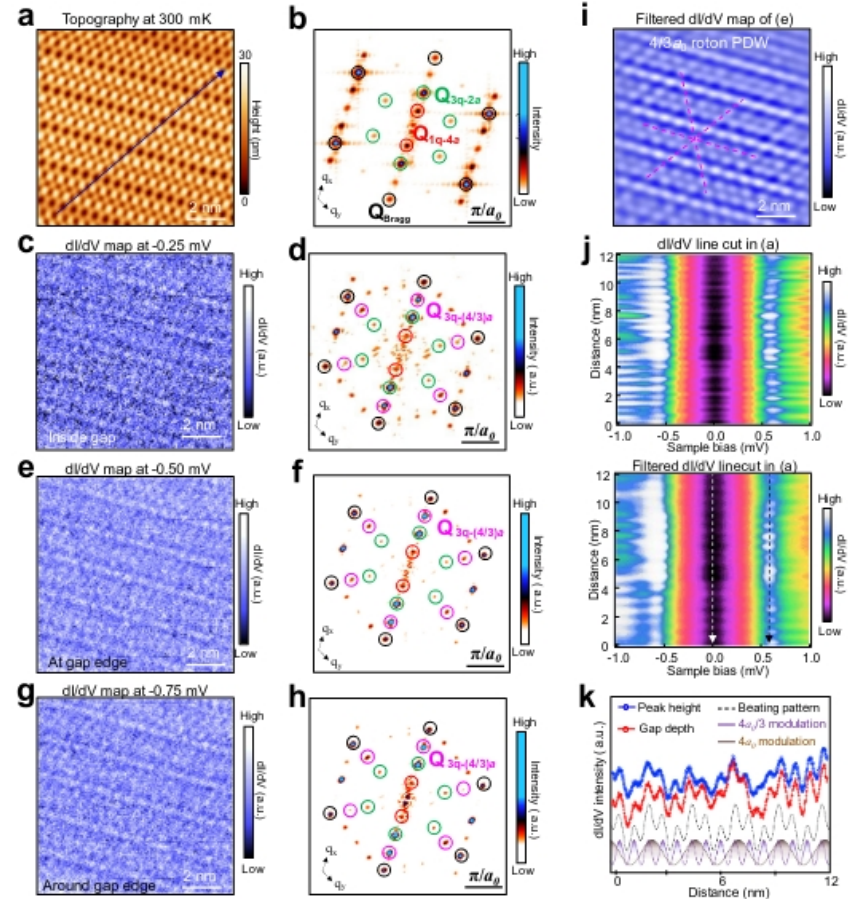
I need to read this more, but I think the basis is:

## Normal State:

- $4a_0$  unidirectional charge order
- $2 \times 2$  charge order

## Superconducting State:

- $4a_0/3$  bidirectional PDW
- “Roton-PDW that can produce a commensurate vortex-antivortex lattice to account for the observed conductance modulations”





# Measurement plans (?)

- Questions to address:
  - Multi-component order parameter? (if we can resolve it in TC)
  - What is the gap symmetry?
- Potentially useful vector magnet experiment:
  - At base T:  $K_{ZF}$  then  $K(100 \text{ Oe})$  angular dependence?
  - Temperature sweeps at field angles determined by  $K(100 \text{ Oe})$  angular dependence

# Useful ArXiv references

- Thermal conductivity – possibly nodal SC gap function  
<https://arxiv.org/pdf/2102.08356.pdf>
- Competition between CDW and SC in P,T phase diagram  
<https://arxiv.org/pdf/2103.03118.pdf> ← SC, CDW, metal phase diagram (single SC phase)  
<https://arxiv.org/pdf/2102.09328.pdf> ← SC, CDW, metal phase diagram (re-entrant SC phase)  
<https://arxiv.org/pdf/2103.13759.pdf>  
<https://arxiv.org/pdf/2103.12507.pdf>
- Charge order and Superconducting gap from STM  
<https://arxiv.org/pdf/2105.04542.pdf>  
<https://arxiv.org/pdf/2104.08810.pdf> ← multi-gap in dI/dV spectra  
<https://arxiv.org/pdf/2103.09188.pdf> ← pair-density-wave in SC  
<https://arxiv.org/pdf/2103.03118.pdf> ← multiple symmetry breaking states
- Anisotropic superconductivity from angle-dependent transport  
<https://arxiv.org/pdf/2104.00374.pdf>
- ARPES  
<https://arxiv.org/pdf/2105.01689.pdf> ← vanHove Singularity  
<https://arxiv.org/pdf/2104.08042.pdf> ← mostly about the CDW

# Overview of ArXiv papers

**5** Superconductivity under pressure

2 CDW transition

1 Oxidized / defects

1 Thickness study

2 Anomalous hall

**4** STM

2 ARPES

1 NMR

2 Quantum Oscillations

1 2-fold symmetry in transport

1 Thermal conductivity