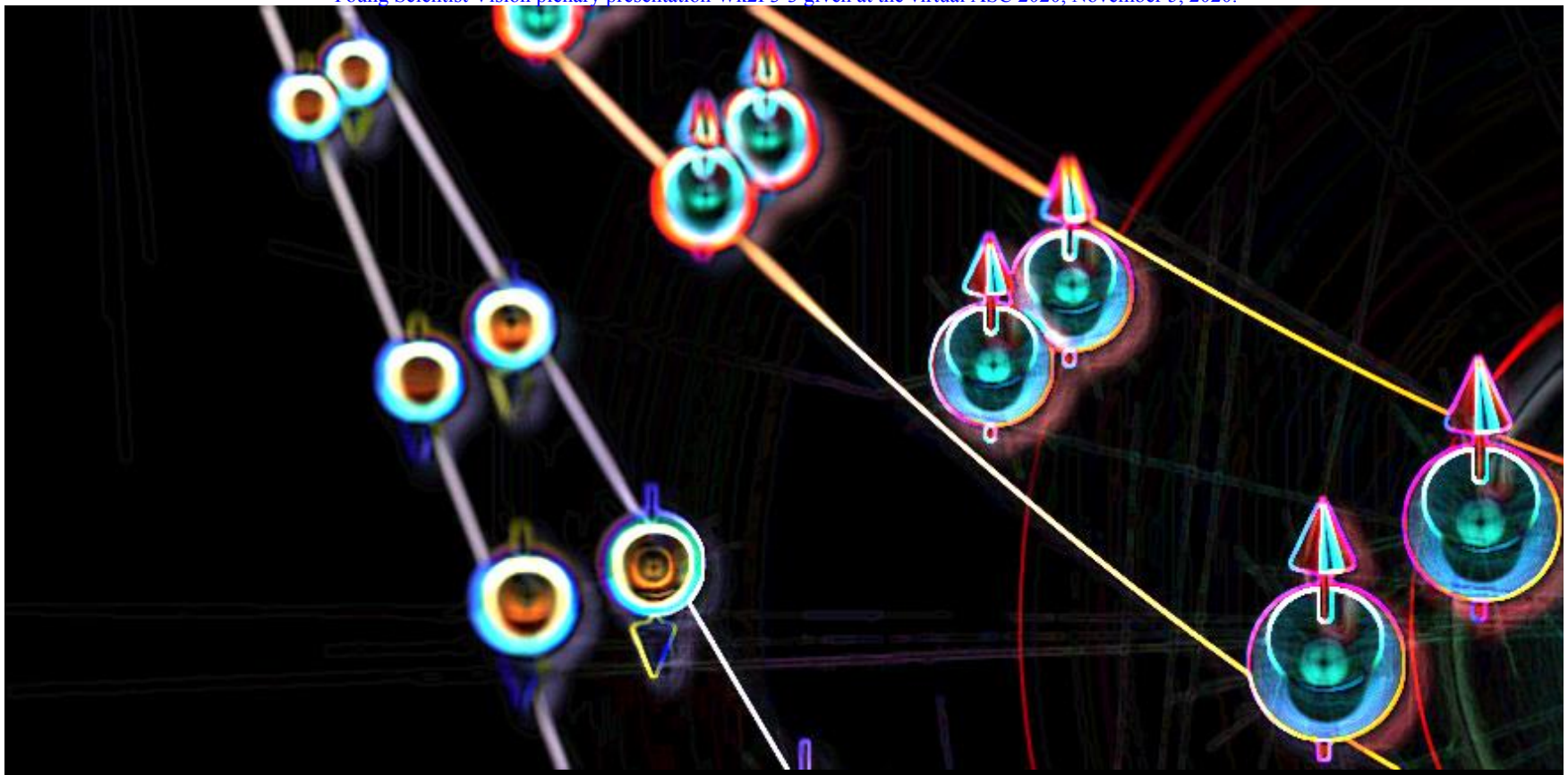
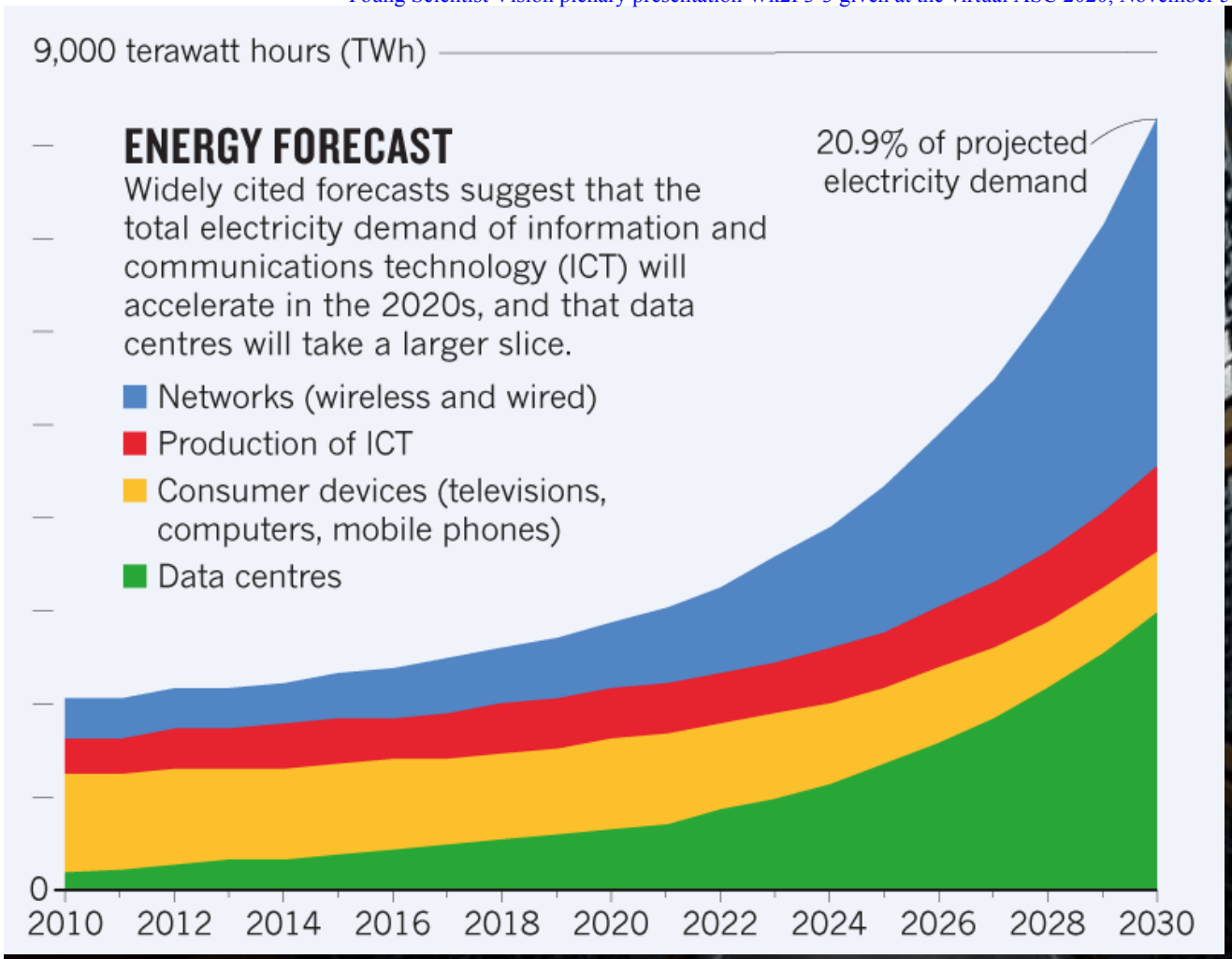


# Towards dissipationless spintronics

## —superconducting spin-transport and magnetization control—

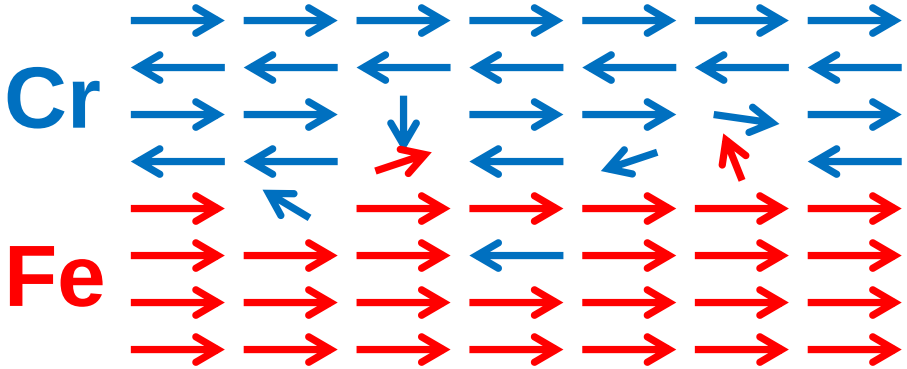
Department of Materials Science, University of Cambridge

Sachio Komori




Nicola Jones, Nature **561**, 163 (2018).

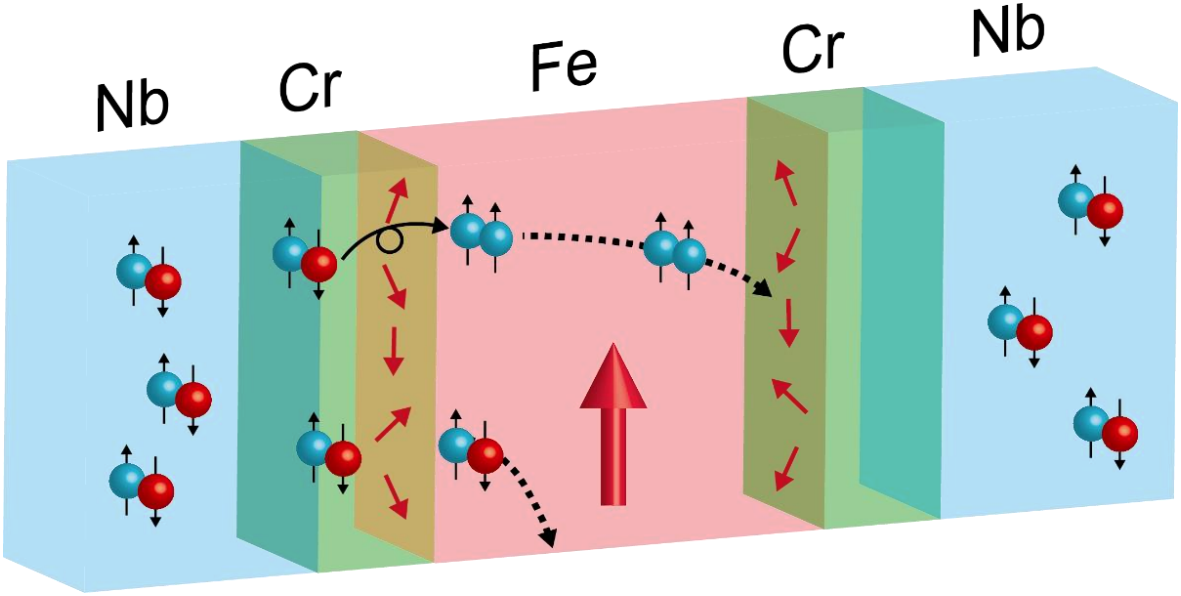
# Pair conversion from singlet to spin-aligned triplet



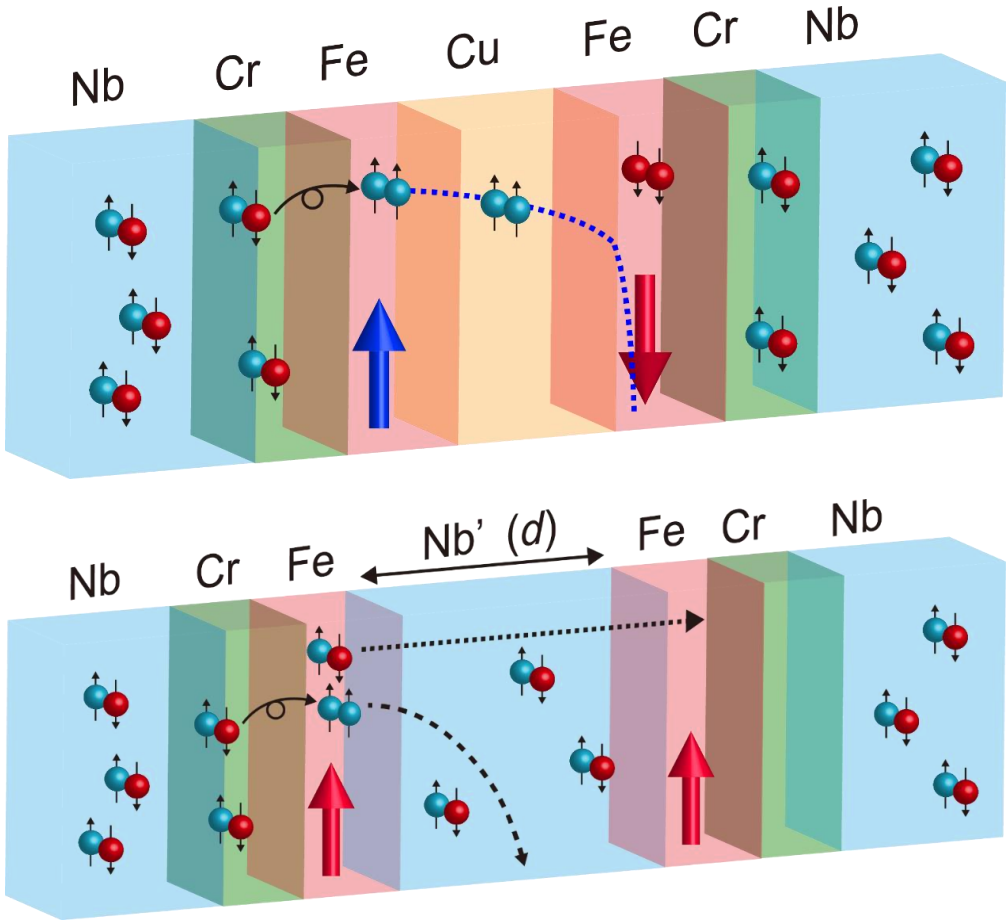

Cr/Fe spin-glass interface

S. K. Burke *et al*, J. Phys. F **13**, 441 (1983).

J. Robinson *et al,* PRB **89**, 104505 (2014).



# Demonstration of superconducting spin-transport




Antiparallel orientation of the Fe layers blocks triplet pairs

Singlet superconductivity of the central Nb' maintains singlet pairs but blocks triplet pairs

S. Komori *et al.*, arXiv:2006.16654

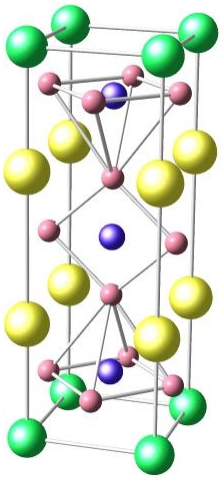
# Perspective

problem: spin-aligned triplet supercurrent density < $10^6$ A/cm$^2$

Oxides can offer materials breakthrough

Spin supercurrents from cuprates

high $T_c$, high $J_c$, large $\Delta$



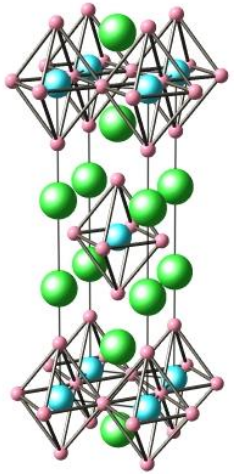
Re123

S. Komori *et al*., Phys. Rev. Lett., **121**, 077003 (2018)

A. Di Bernardo et al., Nat. Mater., **18**, 1194 (2019)

Intrinsic triplet superconductor

-doesn't require the conversion



$Sr_2RuO_4$

C. Palomares-Garcia *et al*., Comm. Mater., **1**, 23 (2020)

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**S/F oxides**

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**Pair conversion**

Dr Guang Yang
**Non-local spin-valves**

Dr Xavier Montiel
**S/F Theory**

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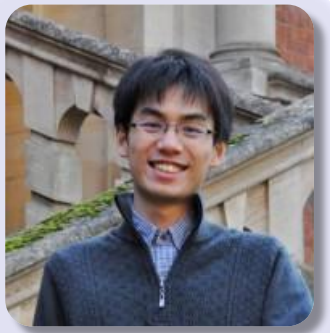
**Oxide interfaces**

Ben Stoddard-Stones
**Quasiparticle injection**

Harry Bradshaw
**Rare-earth interfaces**

Linde Olde Olthof
**S/F Theory**



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James Devine-Stoneman
**Triplet spin-mixers**