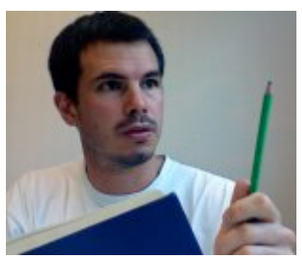
Graphite sous (très) fort champ magnétique

Benoît Fauqué

Quantum Matter Group LPEM

Kamran Behnia
CNRS

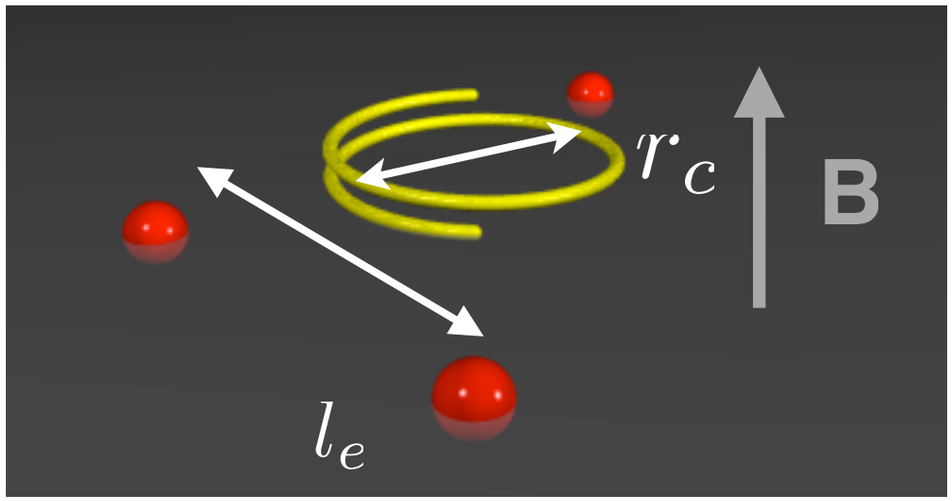


David Leboeuf
LNCMI Toulouse

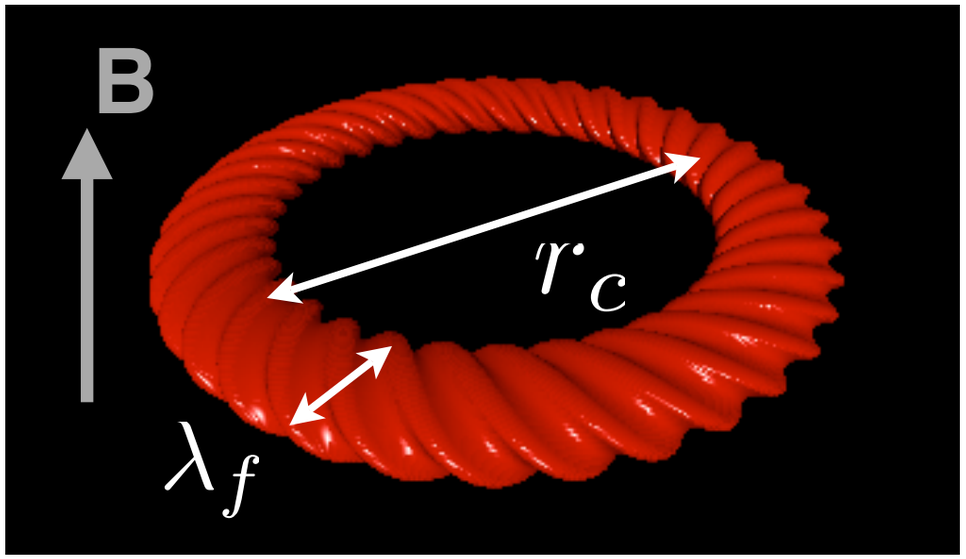
S. Kramer

T.Murphy

Motivation - Limite quantique



Semi-Classical limit



Quantum limit

B

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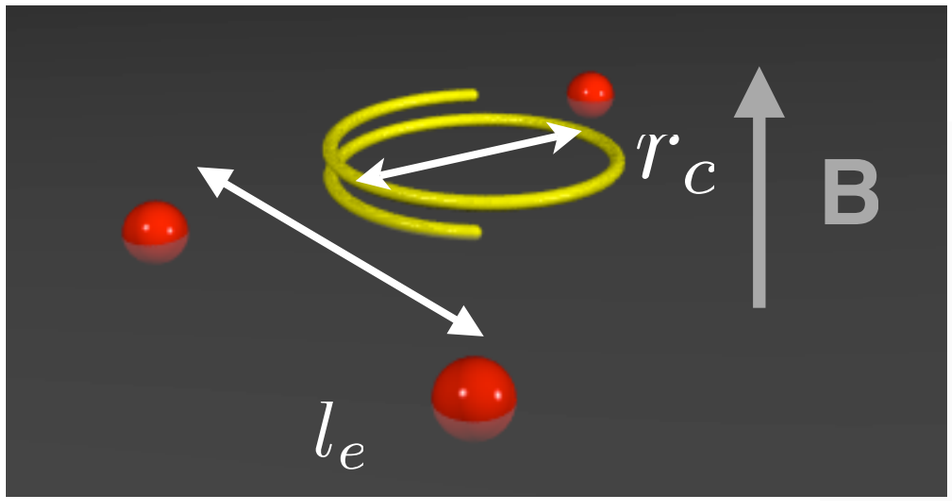
Motivation - Limite quantique



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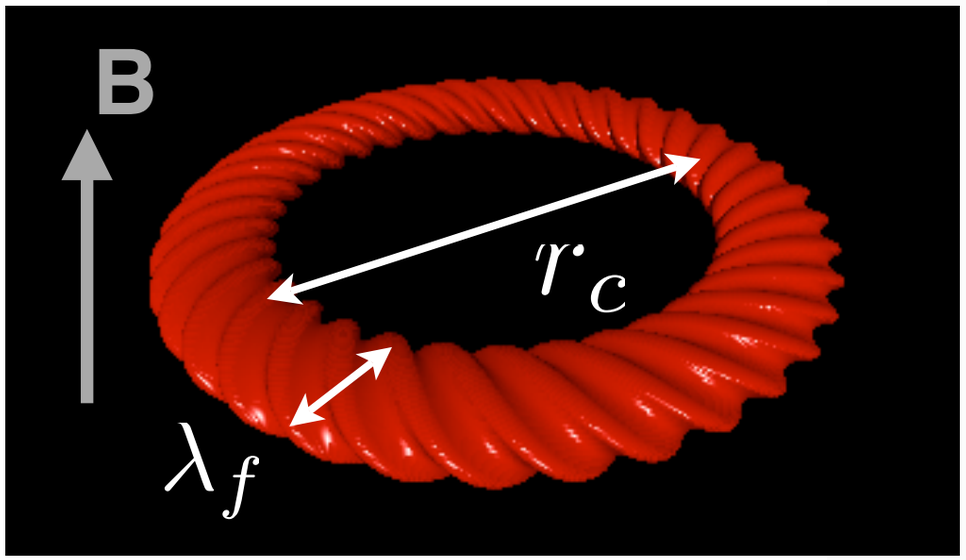
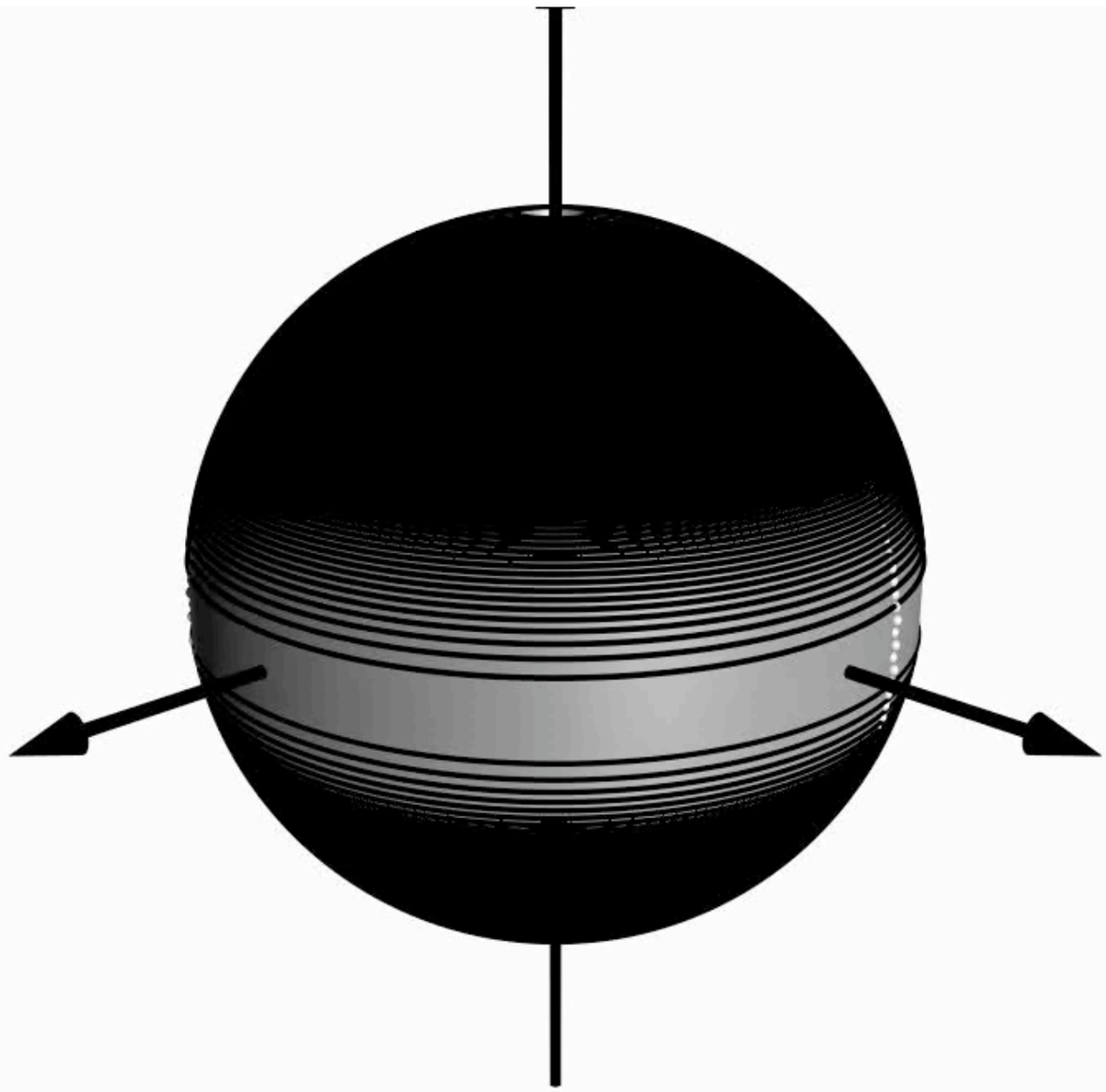


Quantum limit



B

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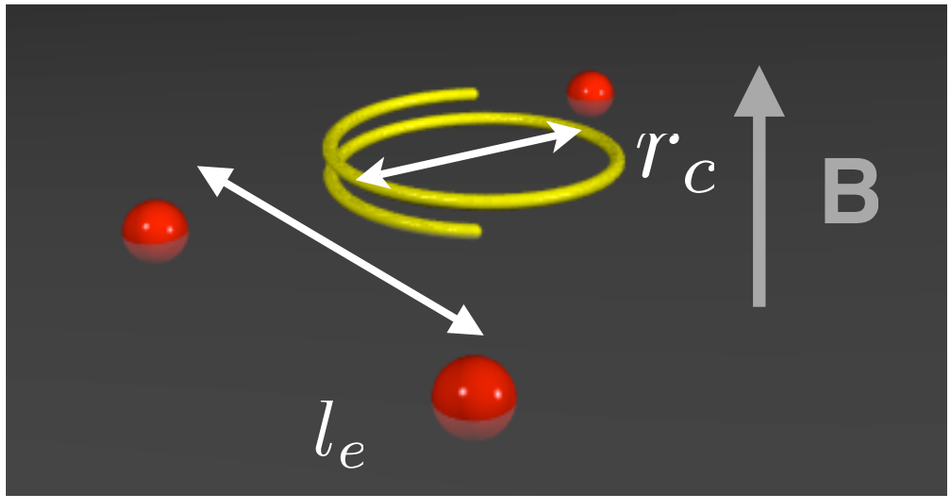
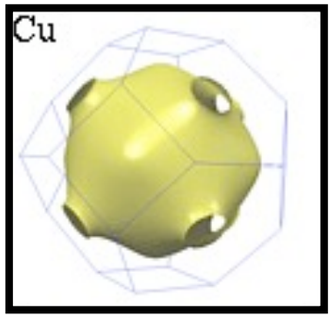
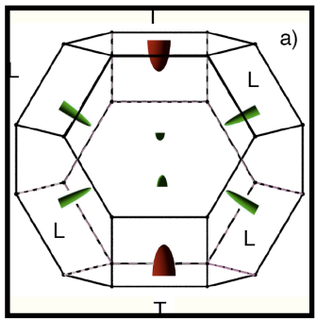
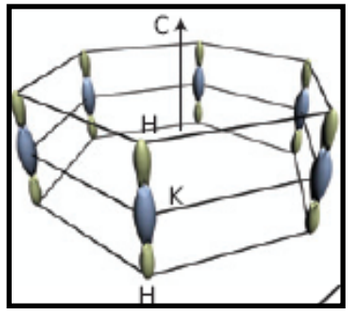


Semi-Classical limit

	Cuivre	Bismuth	Graphite
			
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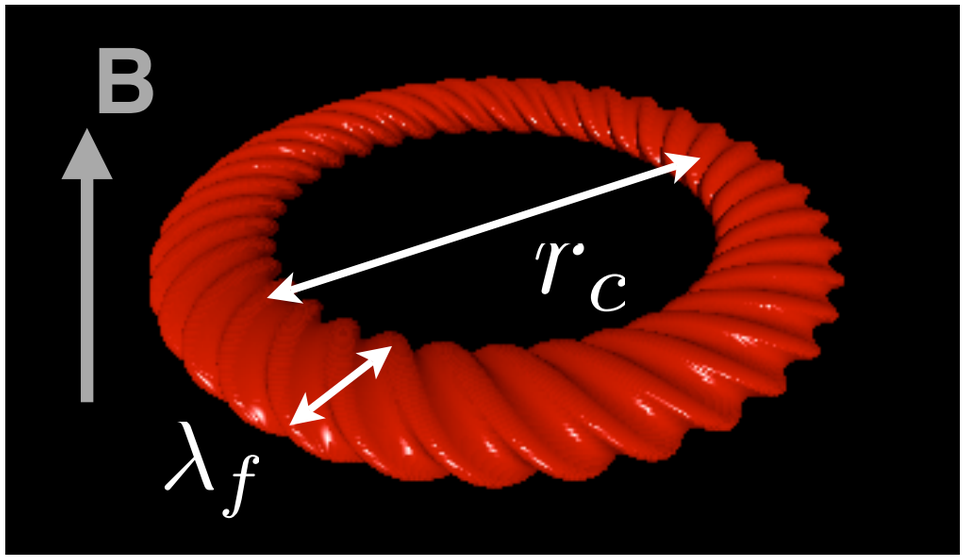
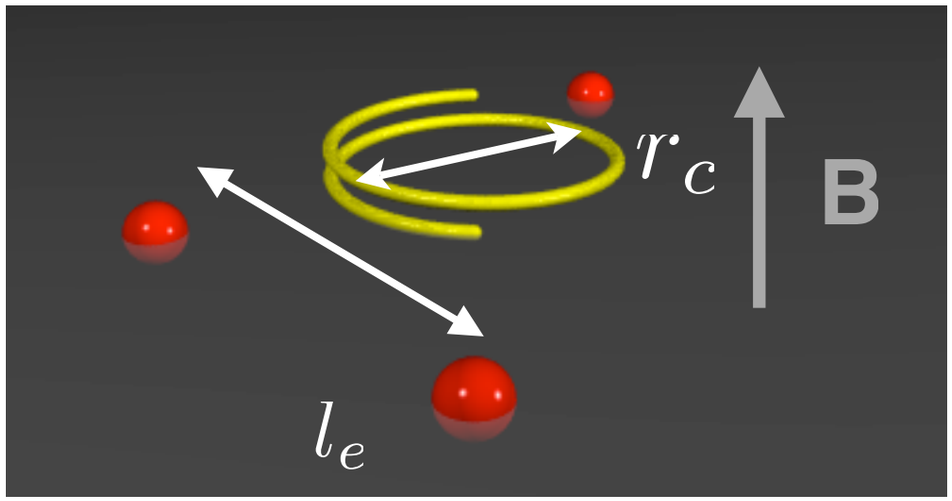
	~5000T	~9T	~7.5T



Quantum limit

B

Motivation - Limite quantique



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	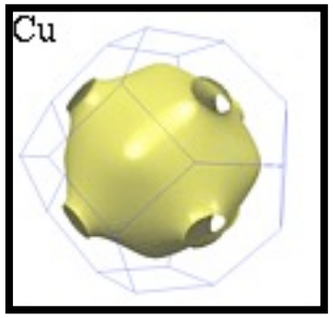	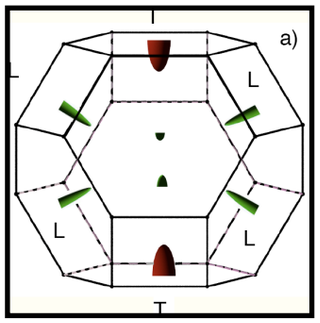	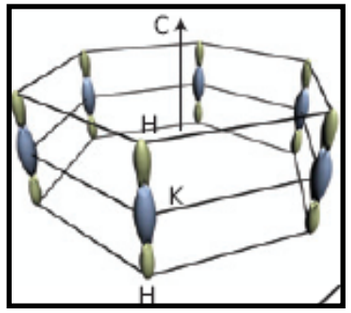
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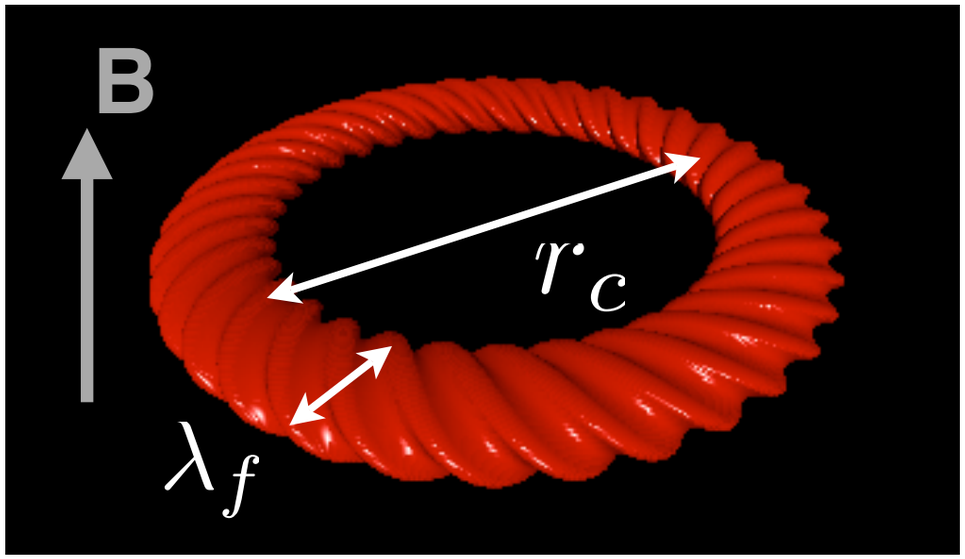


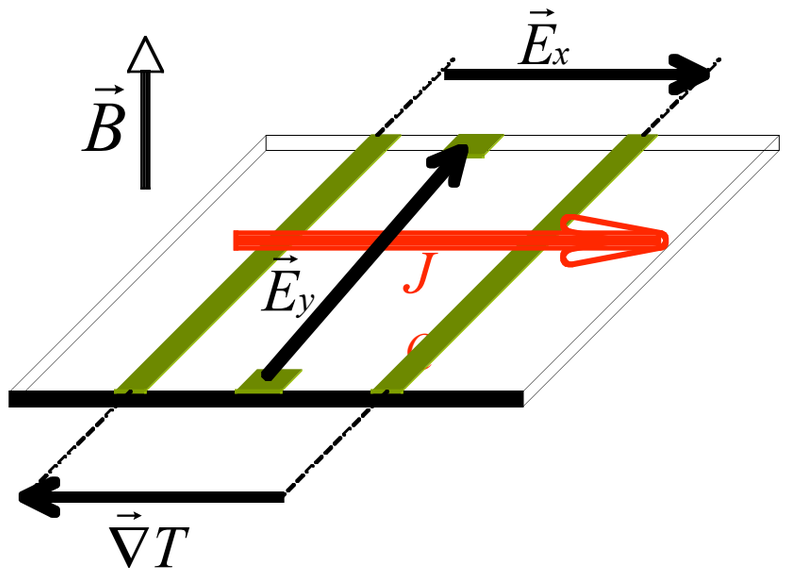
Quantum limit

Quel est l'état fondamental électronique d'un système 3D lorsque l'on atteint la limite quantique ?

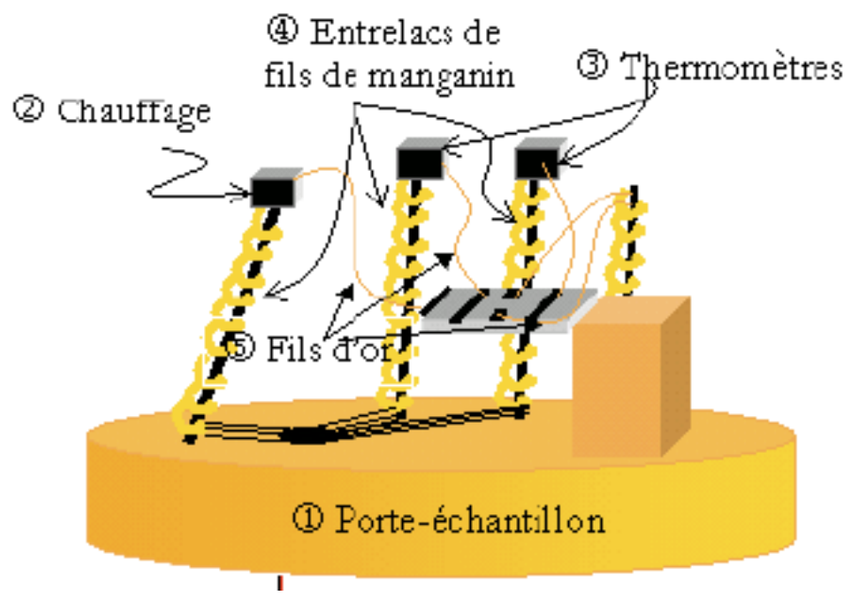
B

Propriétés thermoélectriques : les effets Nernst et Seebeck

En présence d'un gradient thermique, les électrons produisent un champ électrique



Thèse R. Bel (2004)



Effet Seebeck : composante longitudinale du champ électrique $S_{xx} = \dfrac{-E_x}{\nabla_x T}$

Effet Nernst : composante transverse du champ électrique $S_{xy} = \dfrac{-E_y}{\nabla_x T}$

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Motivations

Transport d'entropie dans le graphite

Transport électrique jusqu'à 80T : R_{xx} vs R_{zz}

Conclusion

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Conclusion

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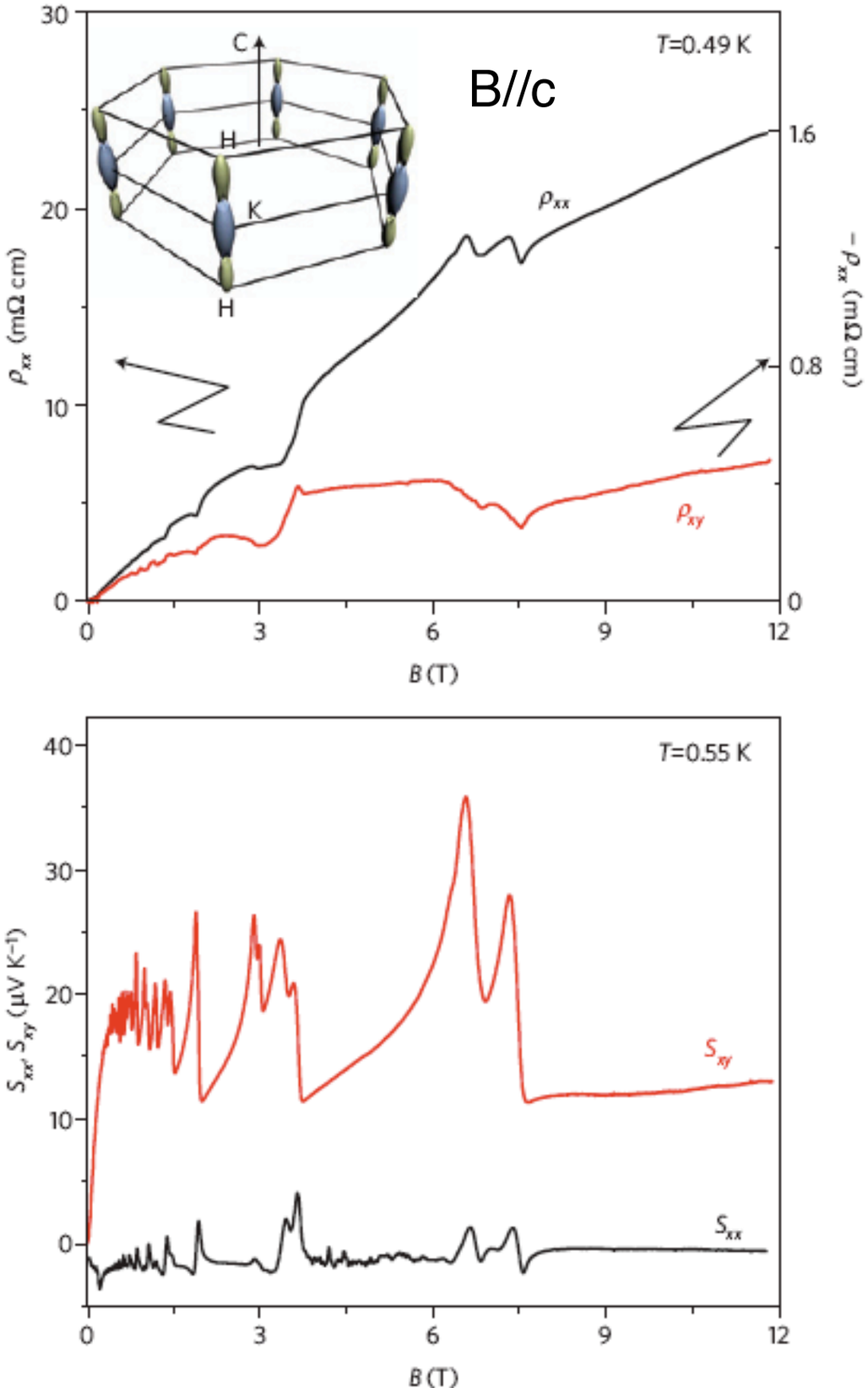
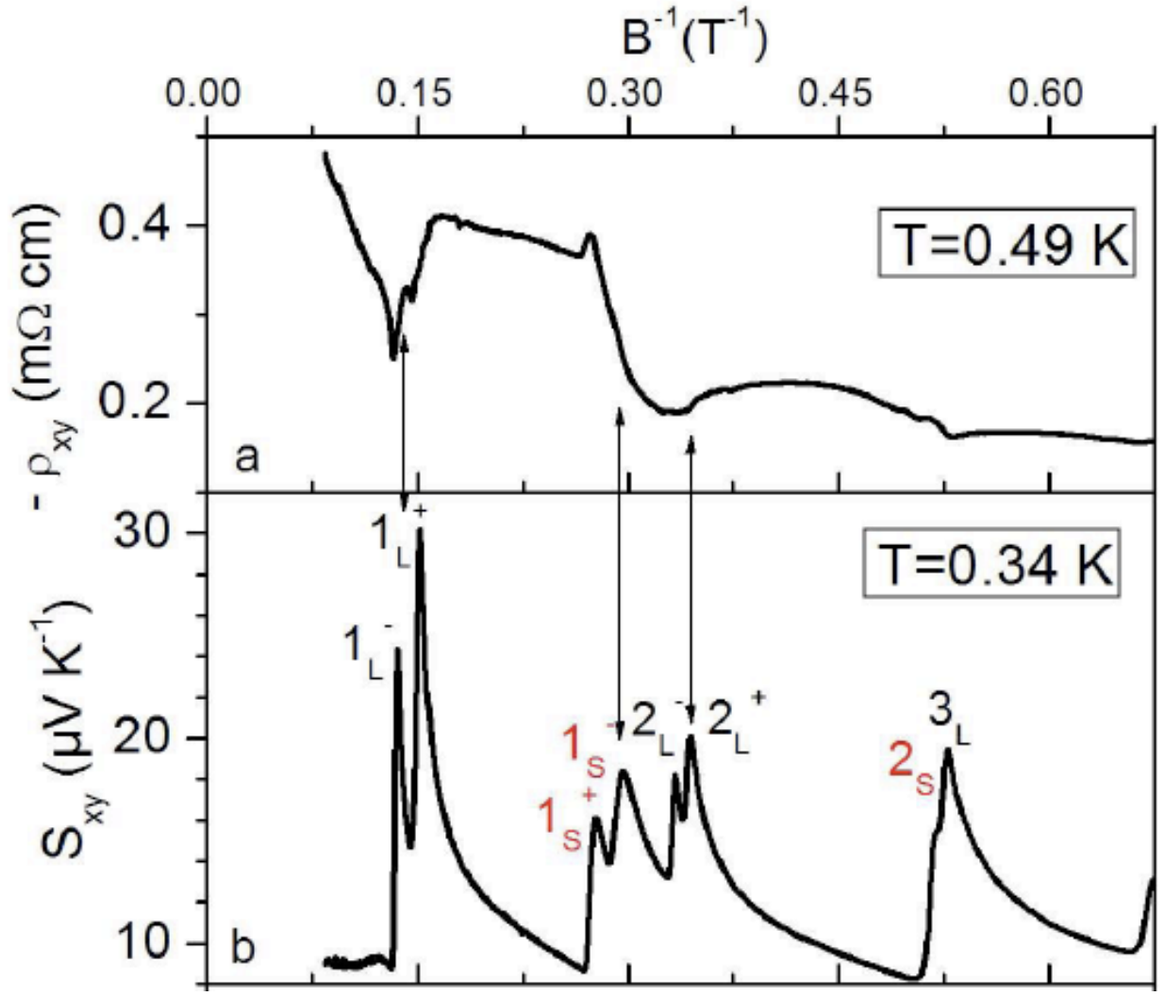
Graphite

(HOPG) Z.Zhu et al.,Nature Physics **4**,166602 (2009)

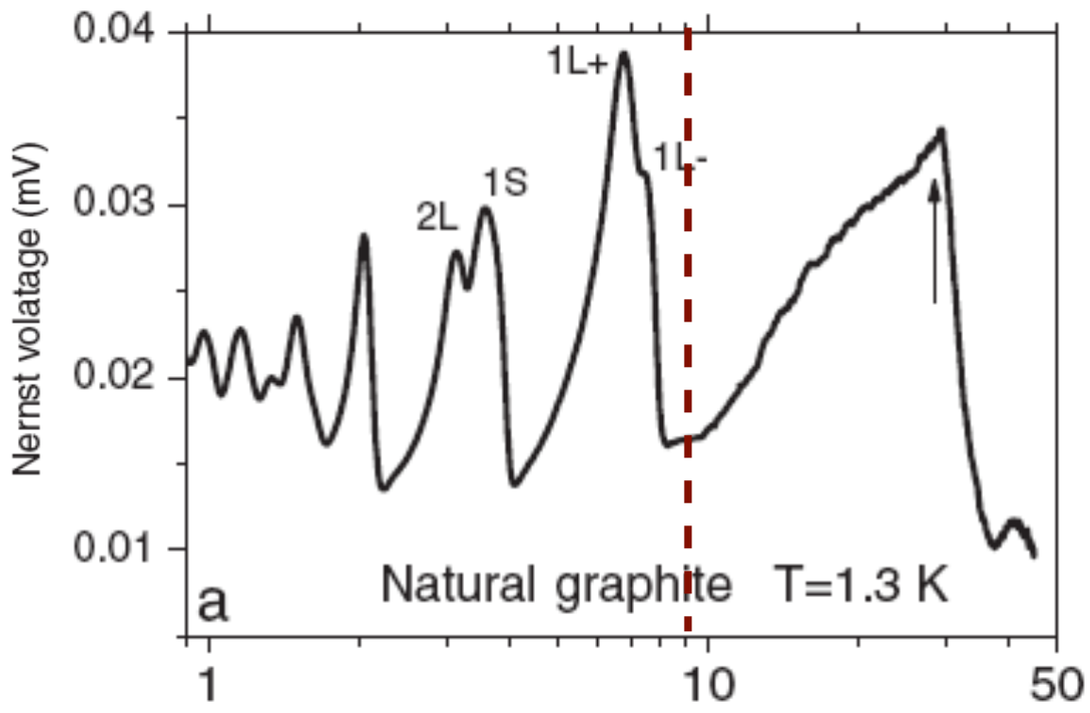


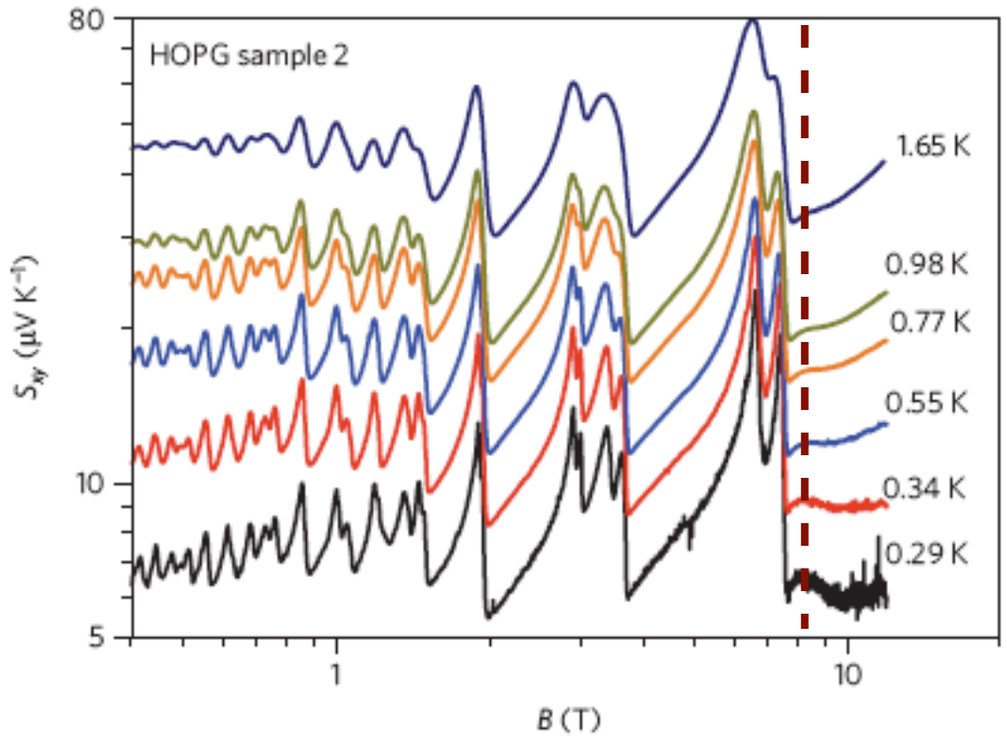


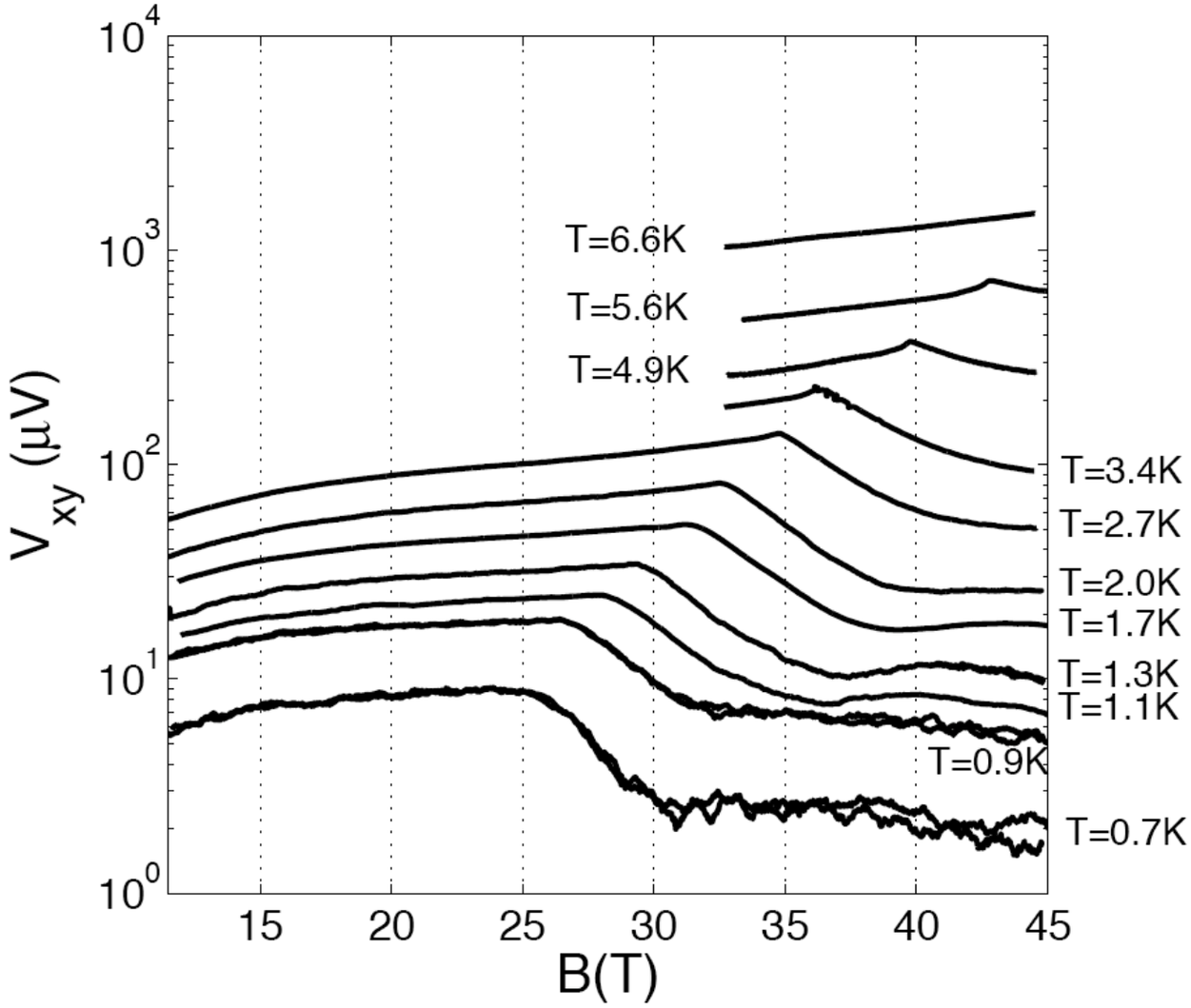
L'effet Nernst comme sonde de la limite quantique

Graphite: effet Nernst au-delà de la limite quantique

B//c Natural Graphite







B. Fauqué et al, PRL, **106**, 246405 (2011)

Graphite: effet Nernst au-delà de la limite quantique

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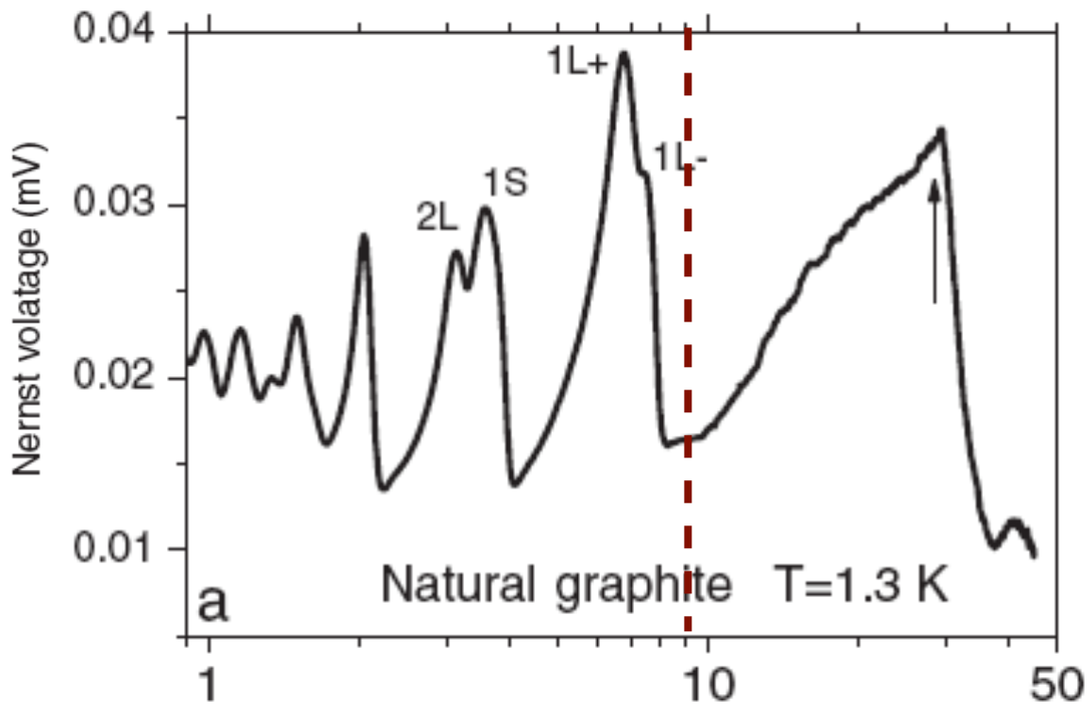

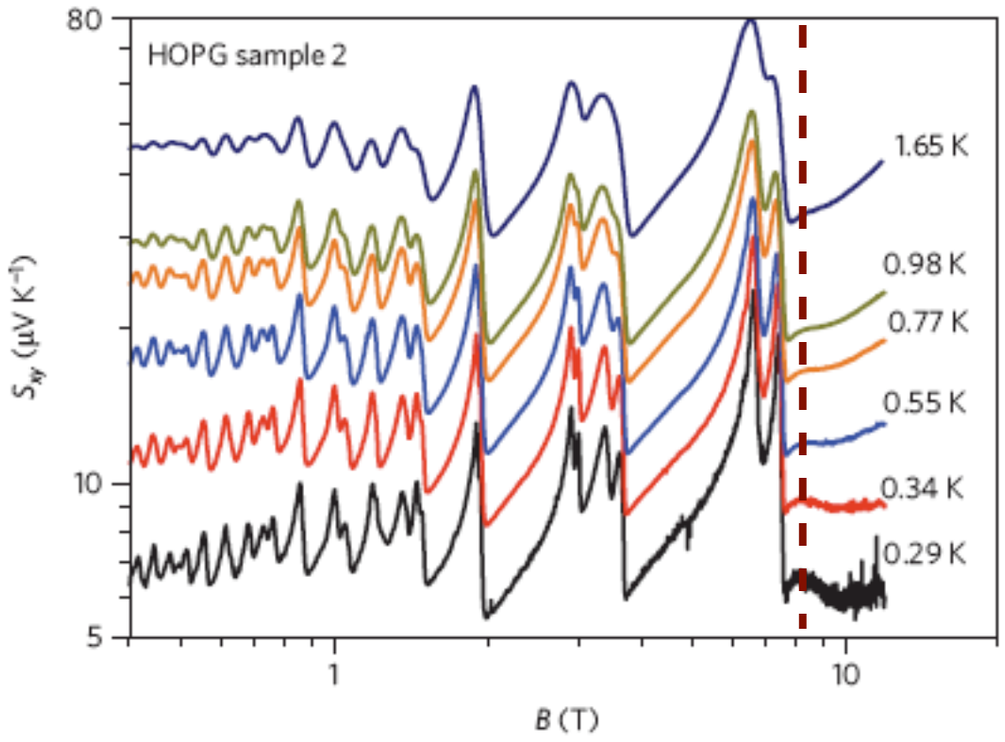

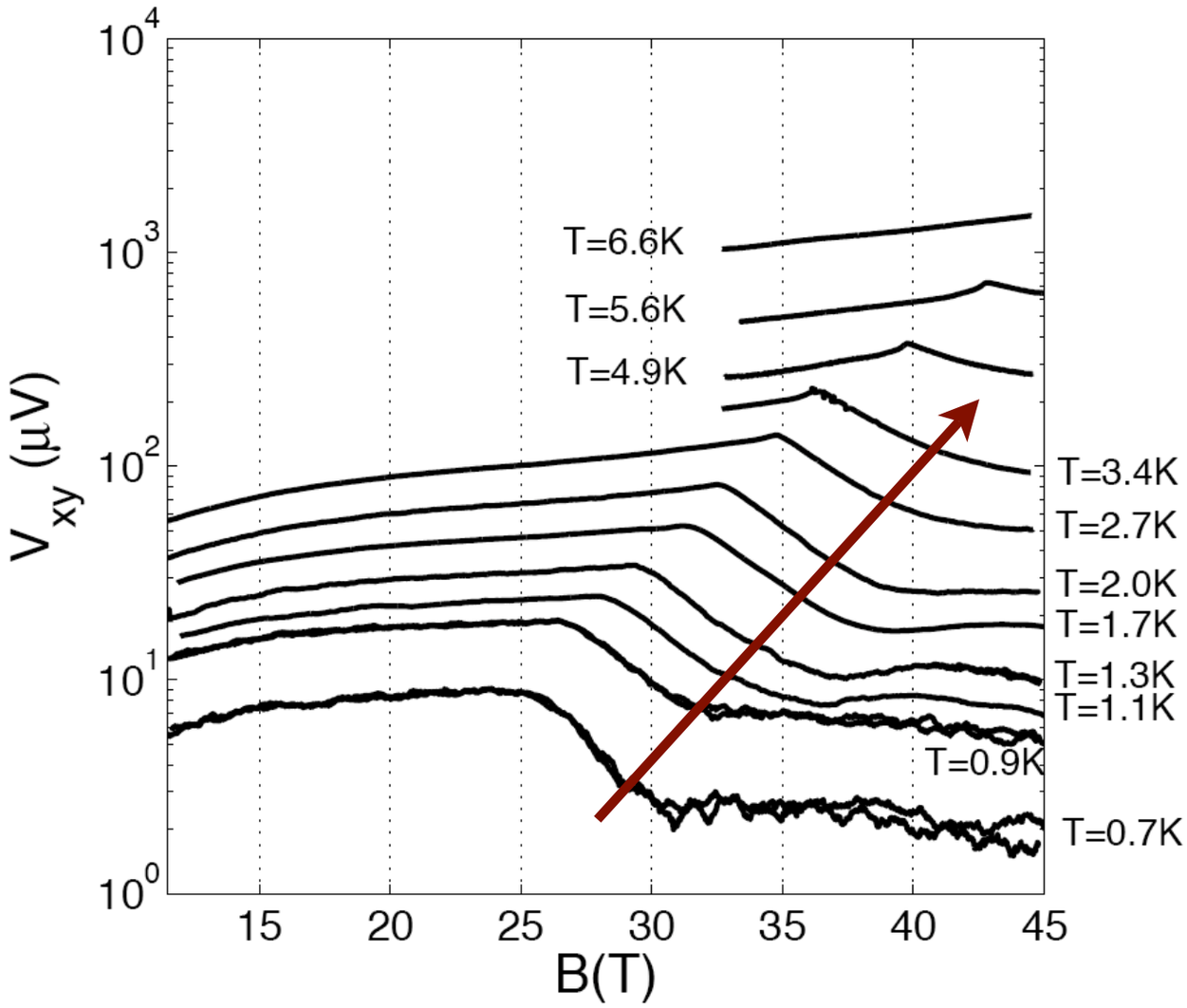

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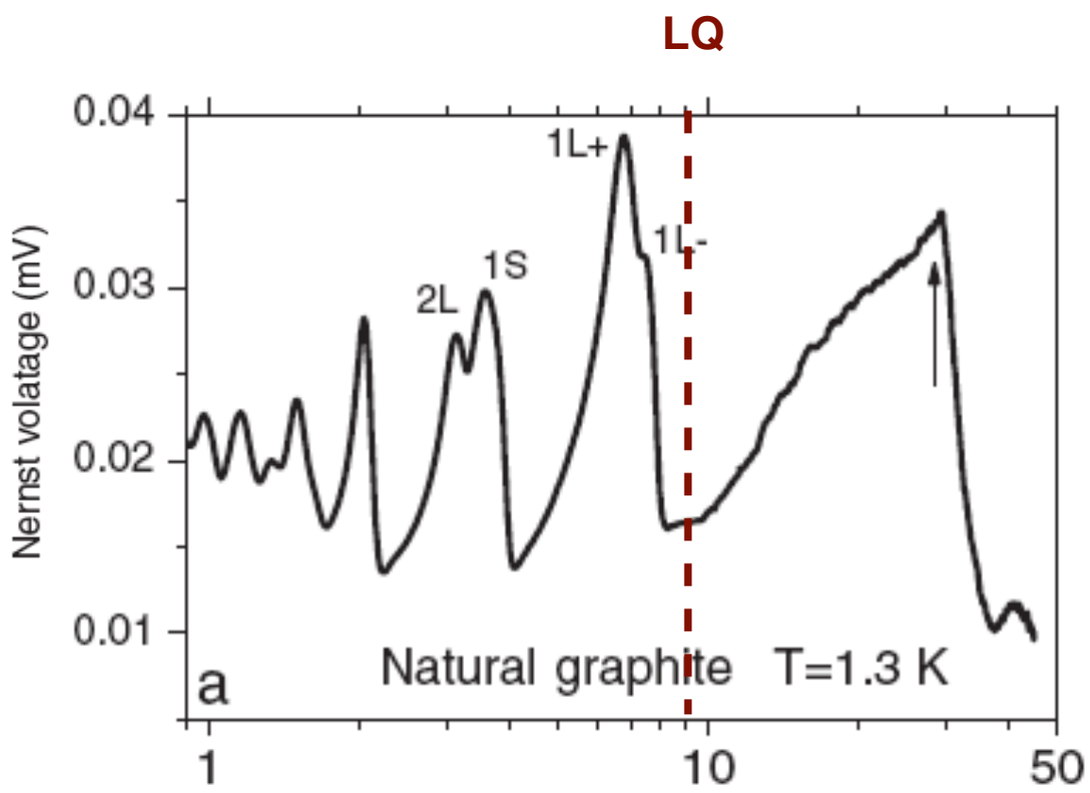

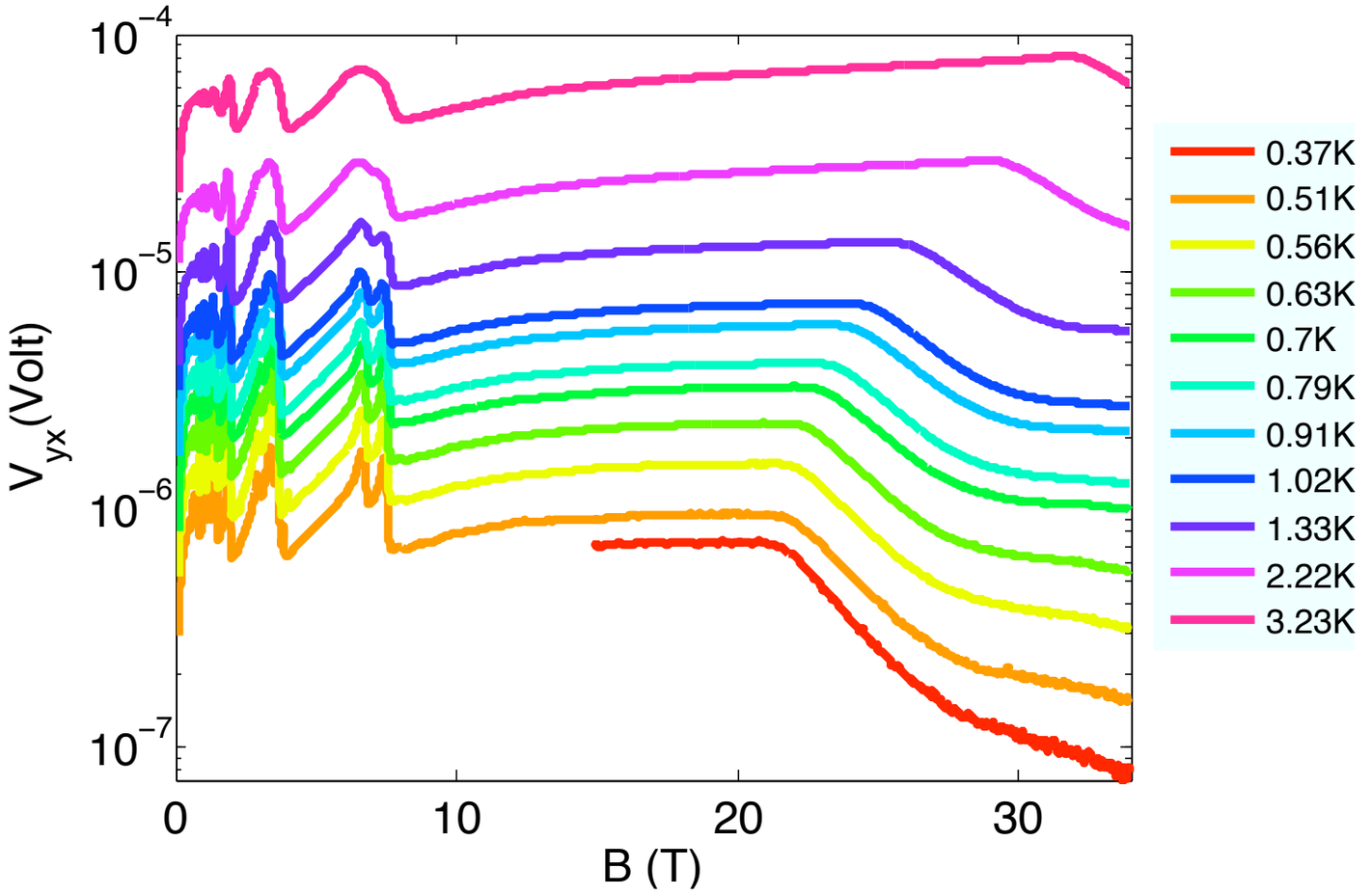

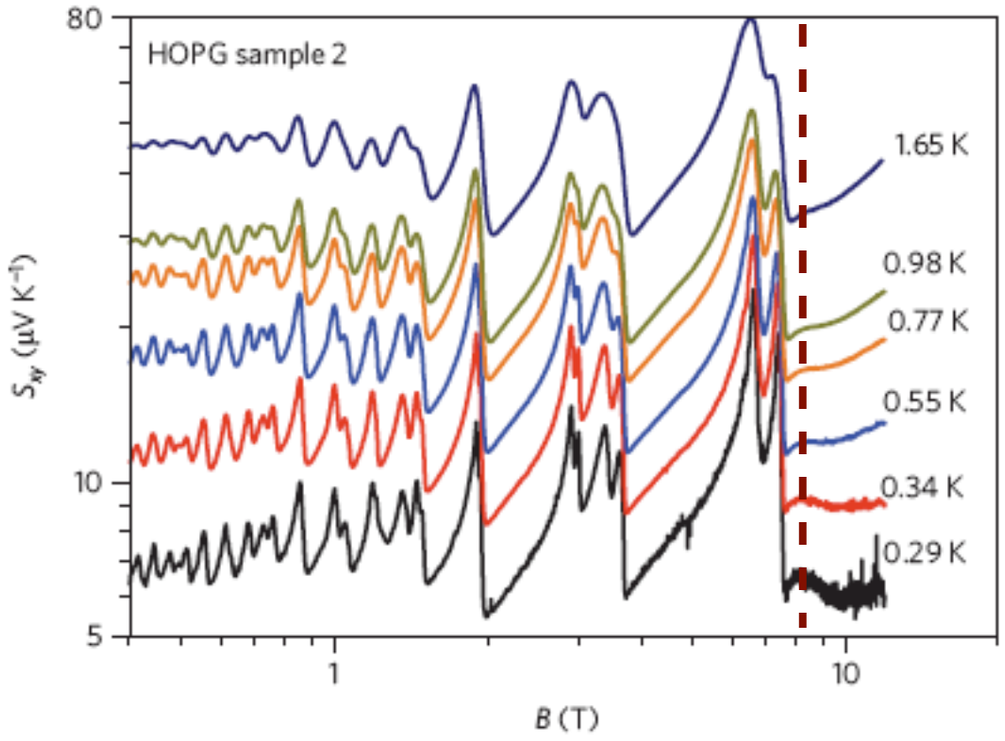

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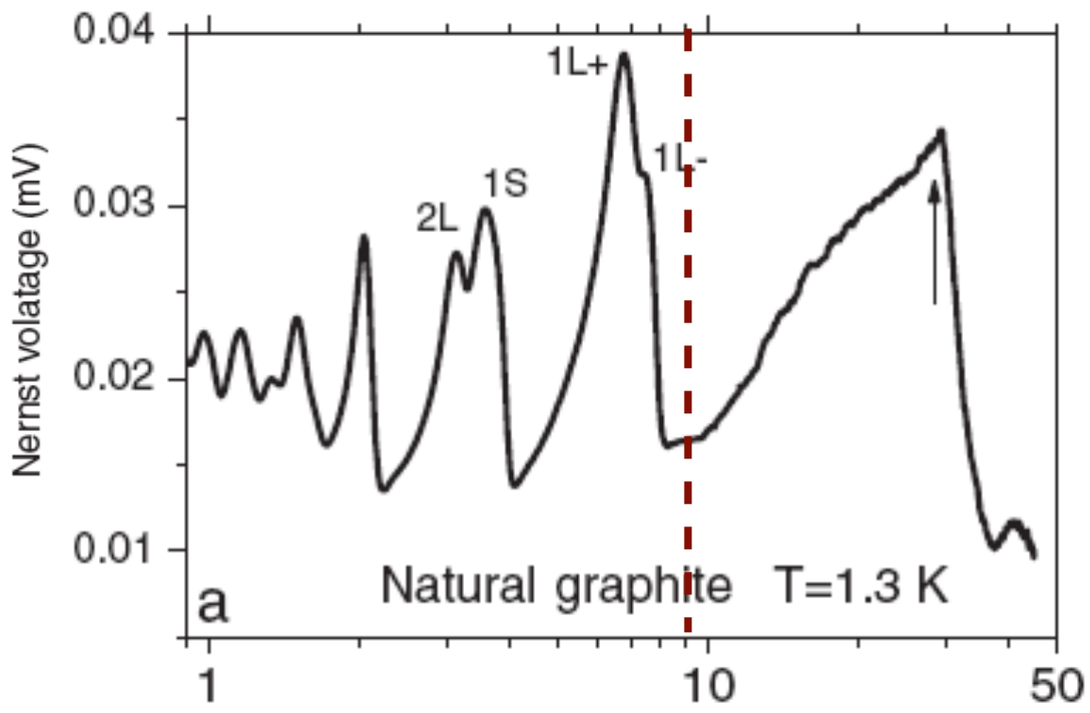
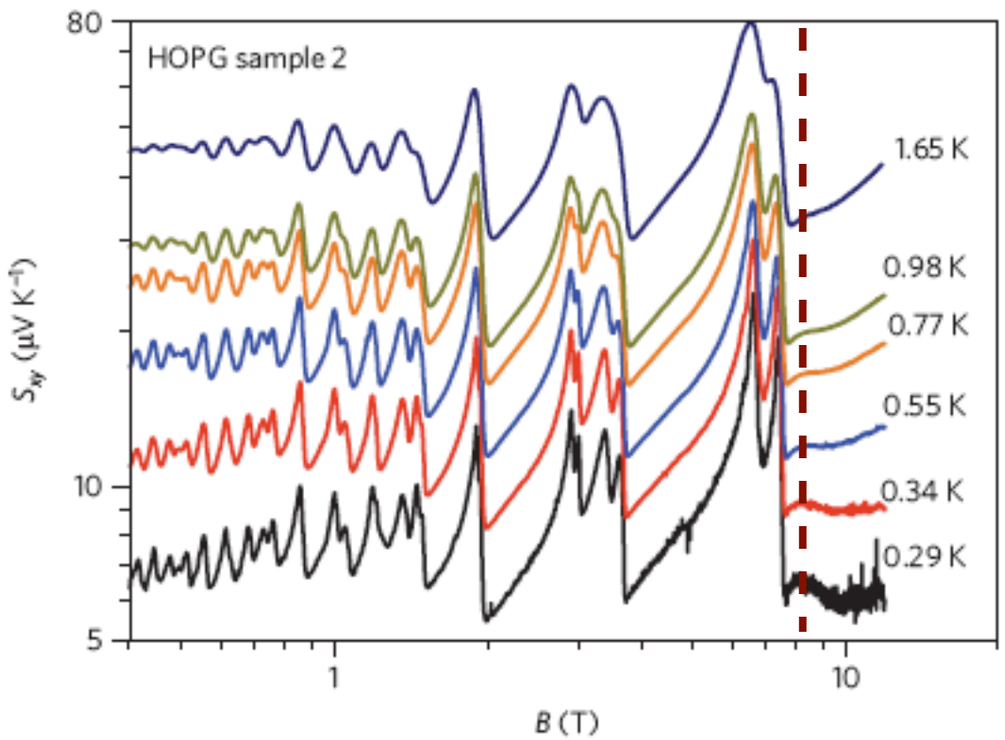
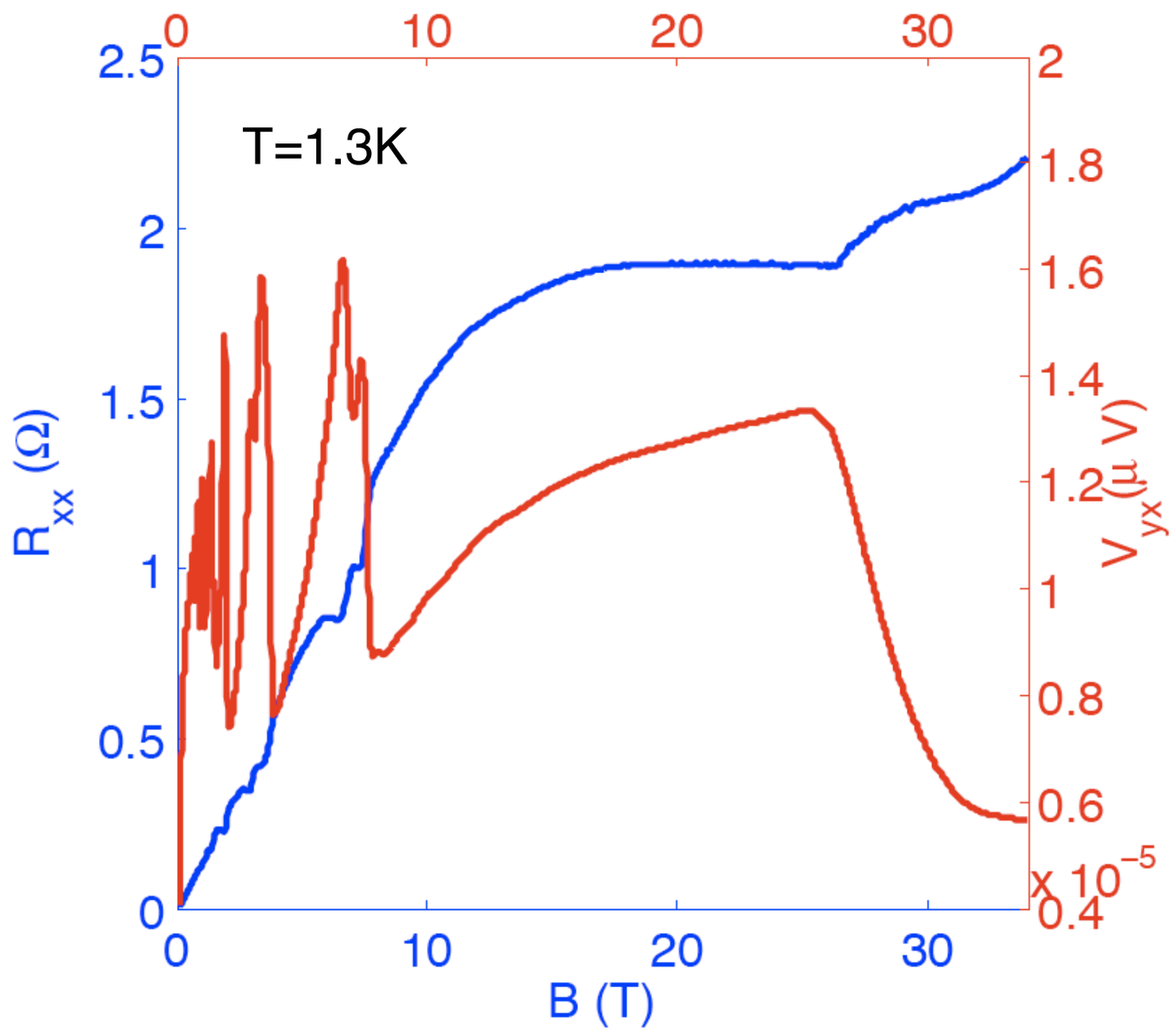
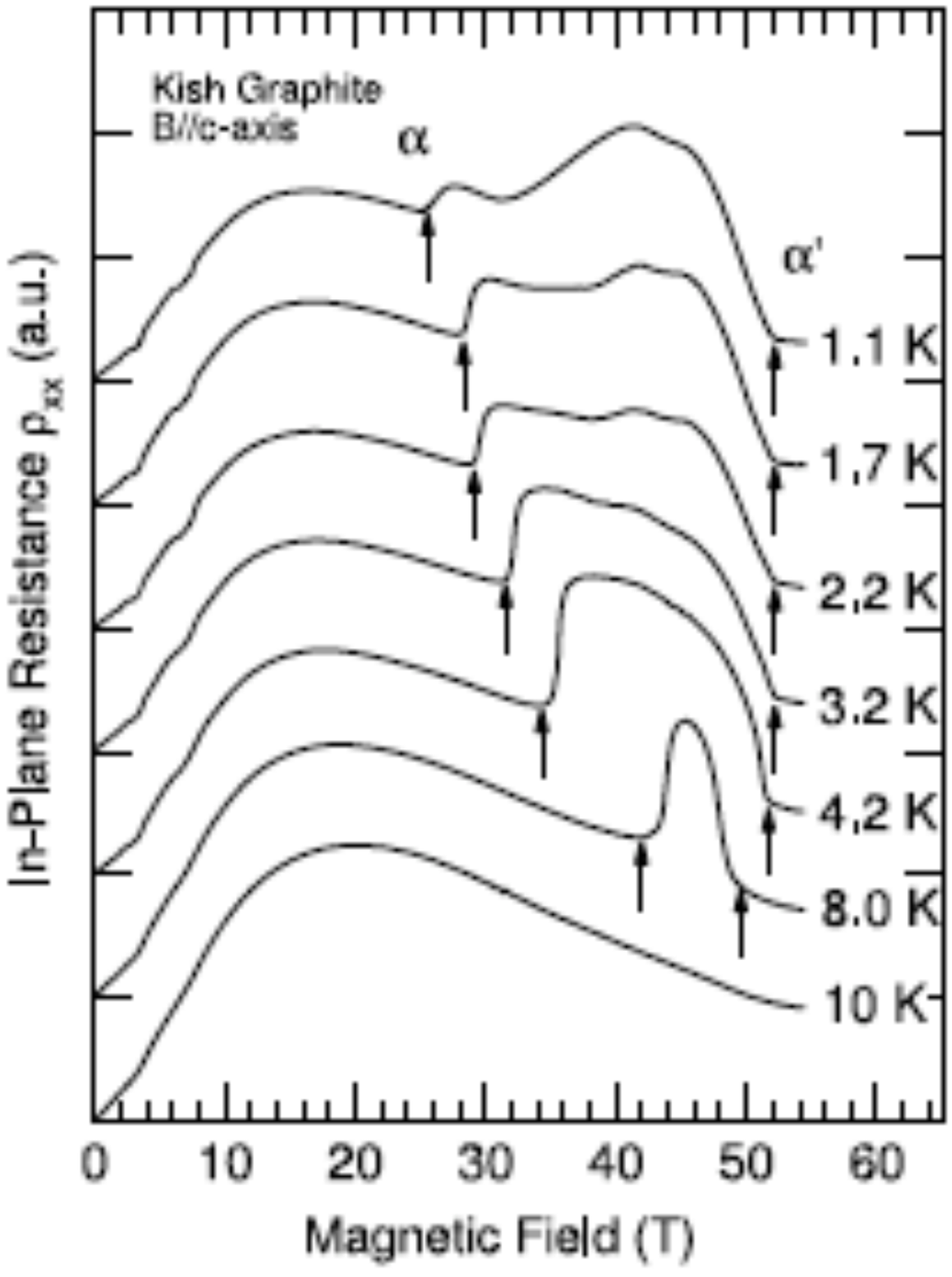






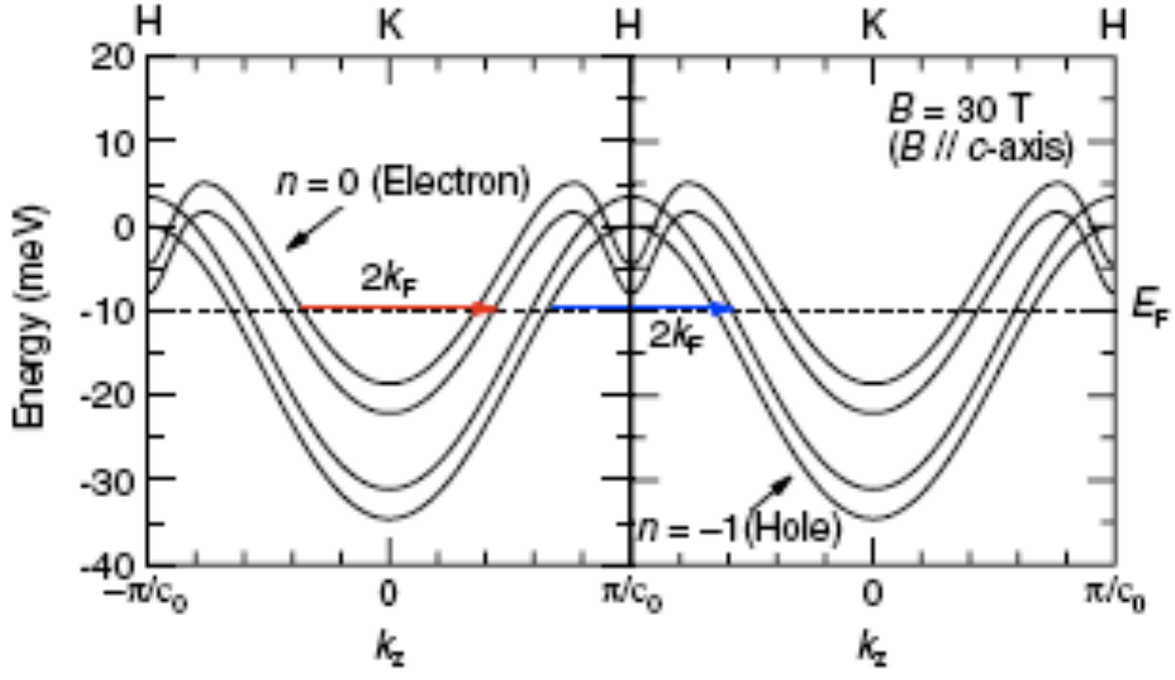
Graphite: effet Nernst au-delà de la limite quantique

H. Yaguchi et al, PRL **81**,5193 (1998)



$$E_{n,s} = (n + \frac{1}{2})\hbar\omega_c + \frac{1}{2}\frac{k_z^2}{m} \pm \frac{1}{2} g\mu_B B^2$$

Nesting vector for both pockets along the c axis (Yoshioka-Fukuyama scenario)



La ré-entrance de la transition est attribuée au passage du niveau de Landau (0,+) des électrons et (0,+) des trous.