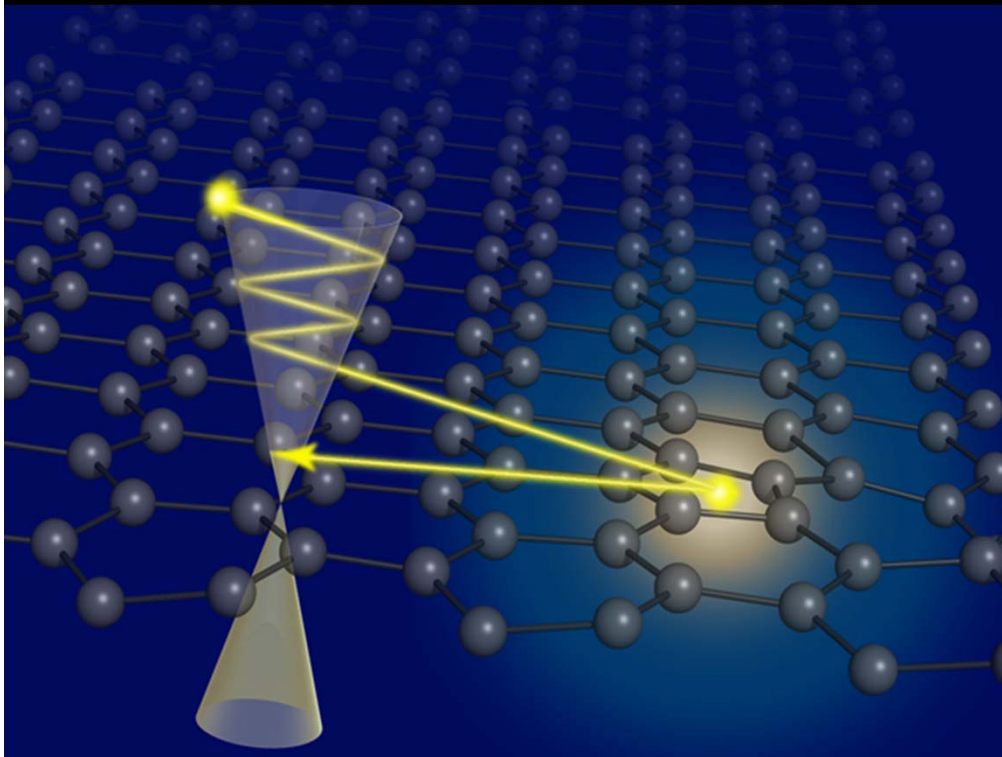


Photocurrent measurements of supercollision cooling in graphene

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PH427 Journal Club Presentation
Matt Graham
March 4, 2010

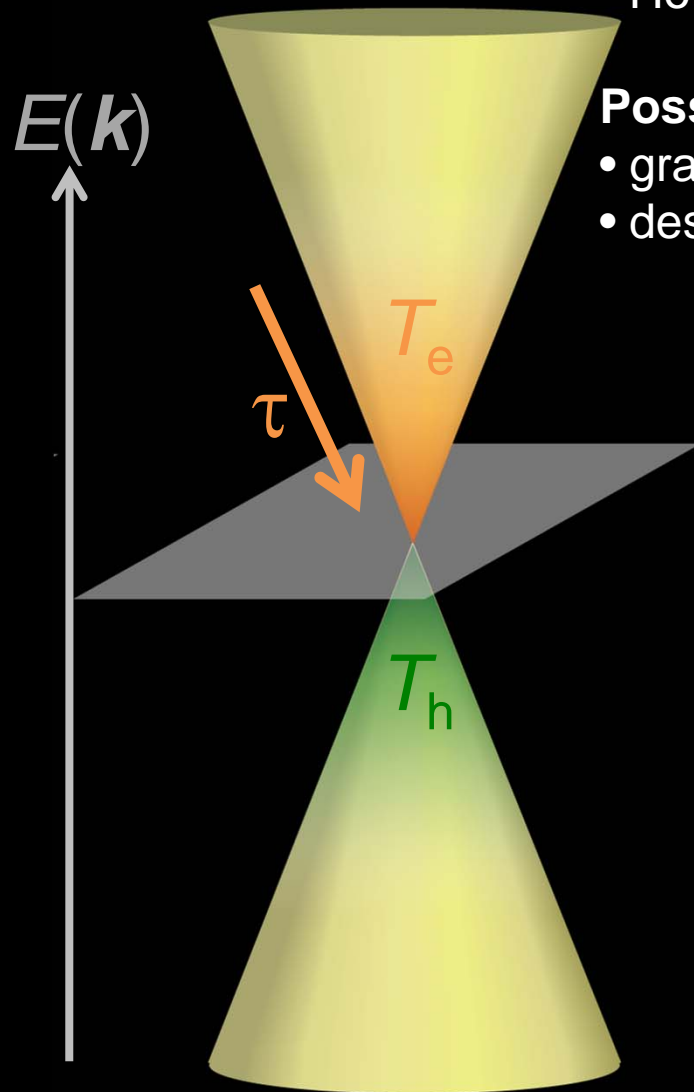
Motivation

Fundamental Physics

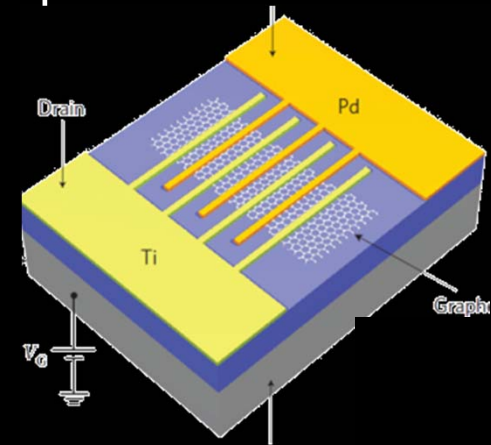
- How do electrons in graphene lose their energy?

Possible applications

- graphene bolometers and photosensors
- designing graphene electronics

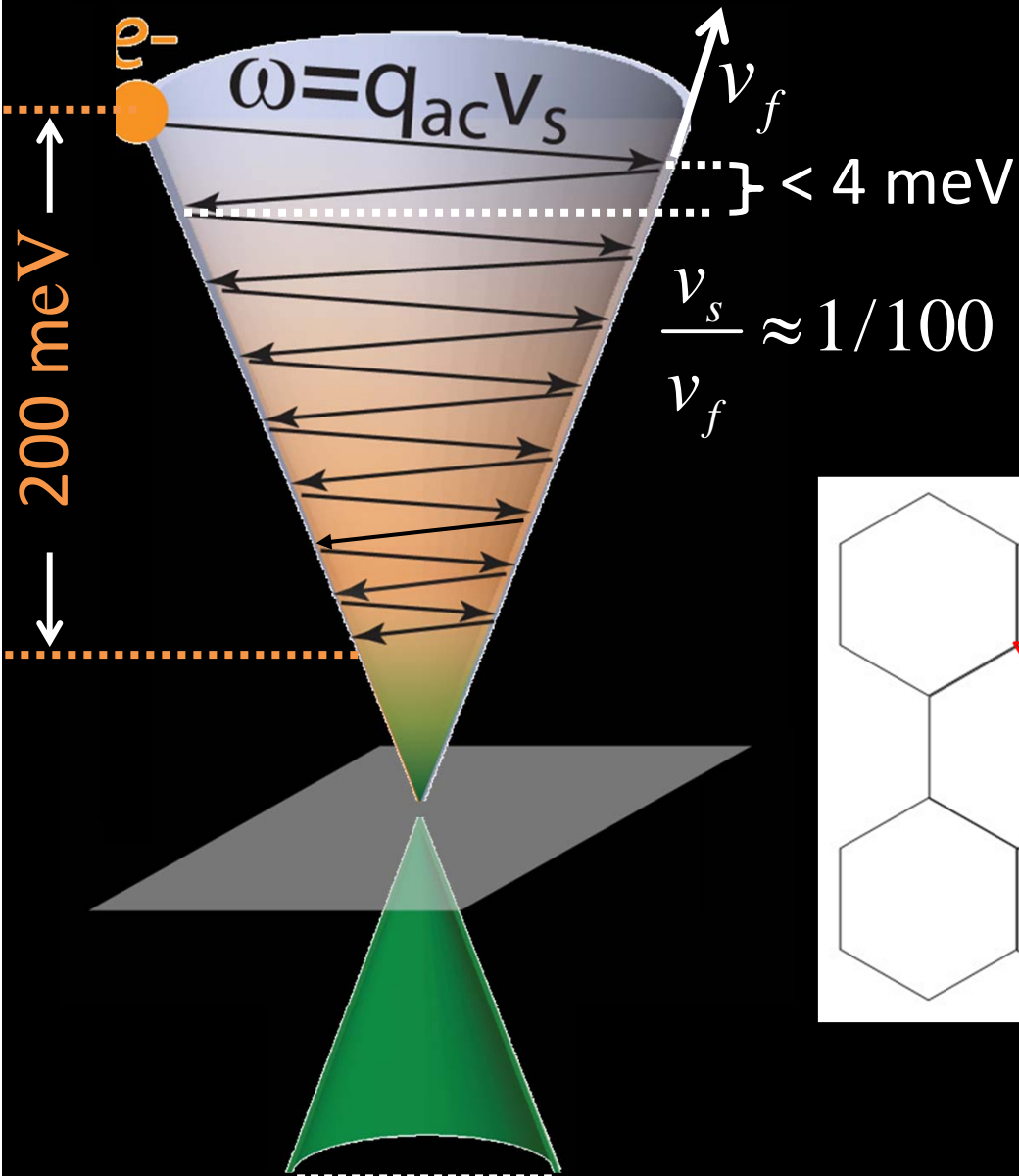


Graphene Photodetector

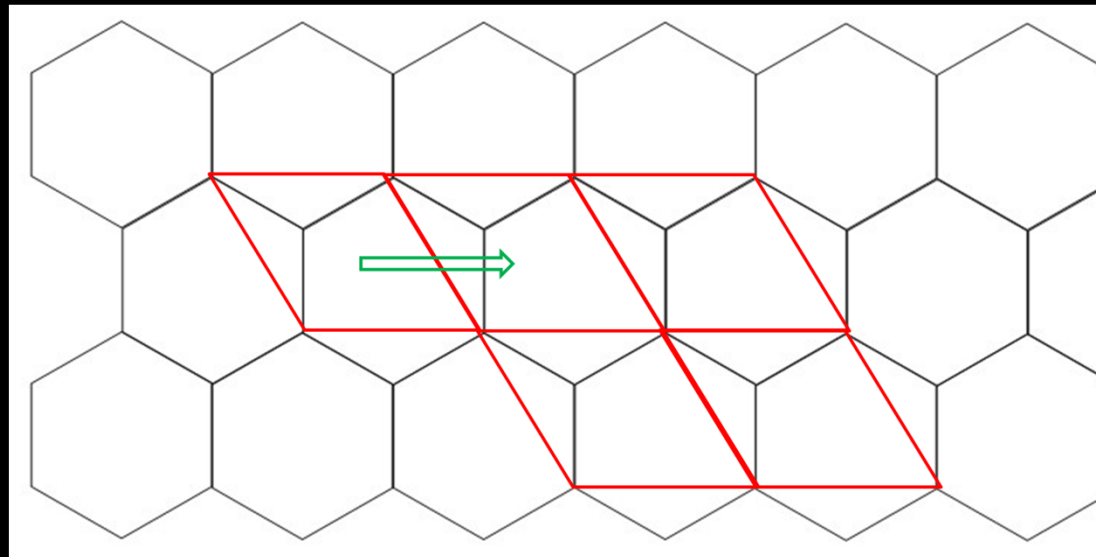


T. Mueller *et al.*,
Nature Photonics 4, 297-301
(2010).

How do hot electrons relax in graphene?

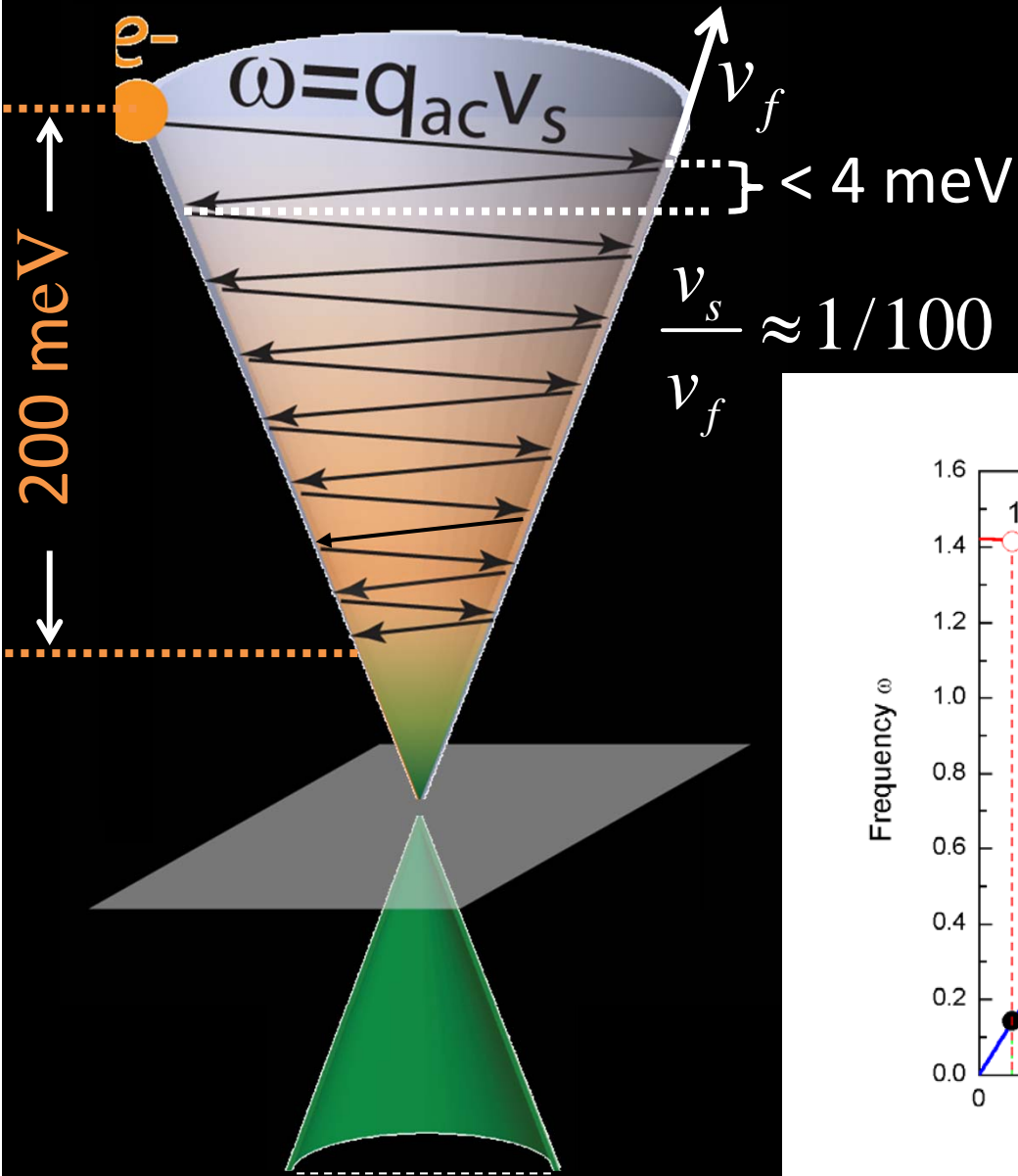


Acoustic phonons or optical phonons?

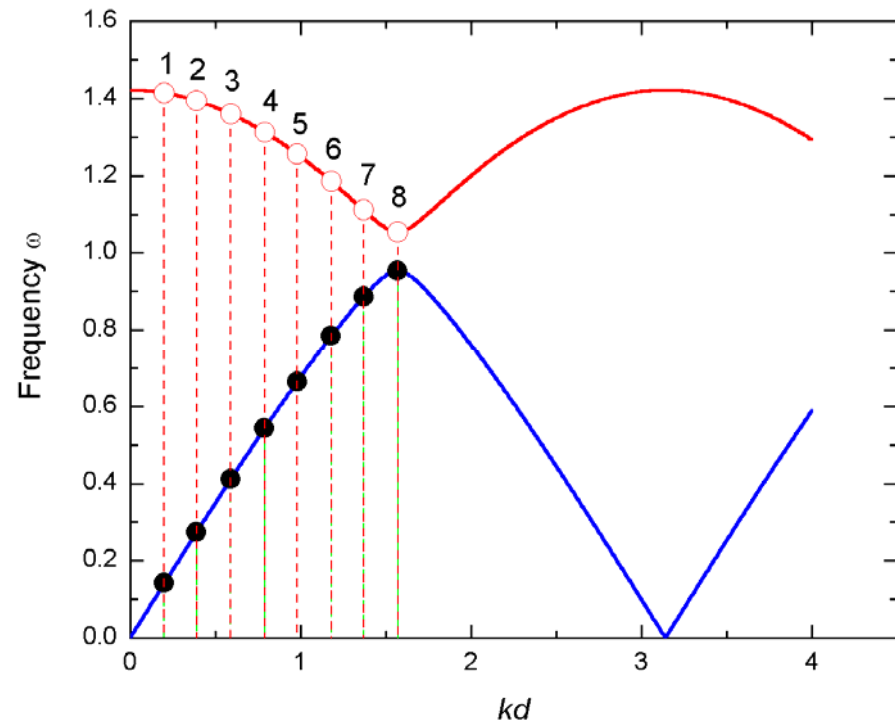


Relationship with class material

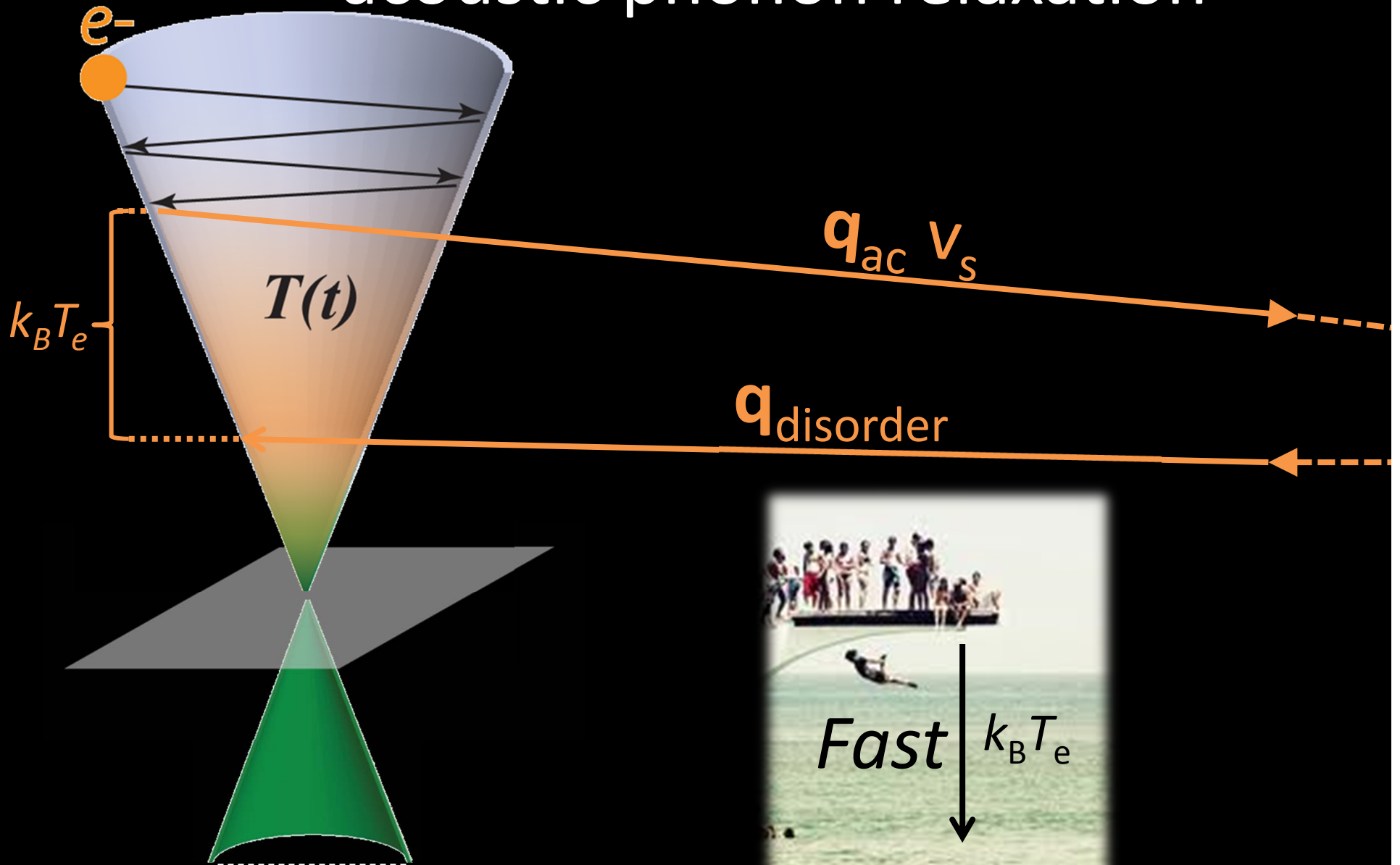
How do hot electrons relax in graphene?



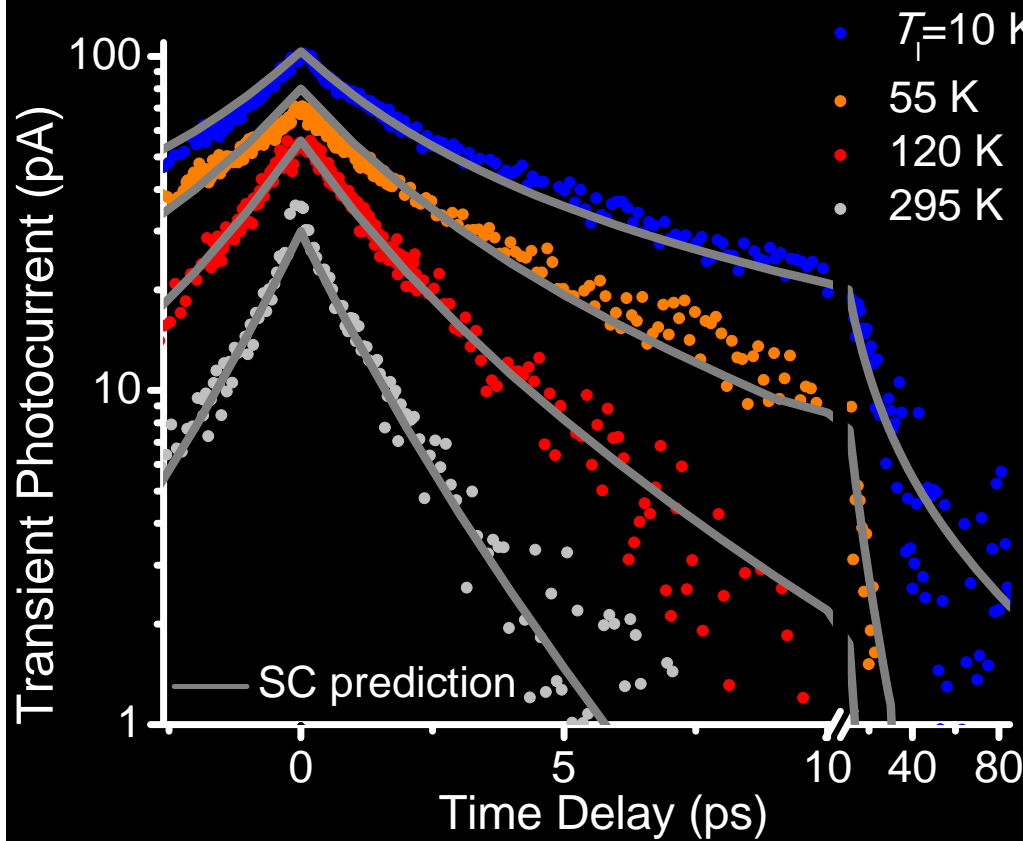
Acoustic phonons or optical phonons?



Supercollision acoustic phonon relaxation

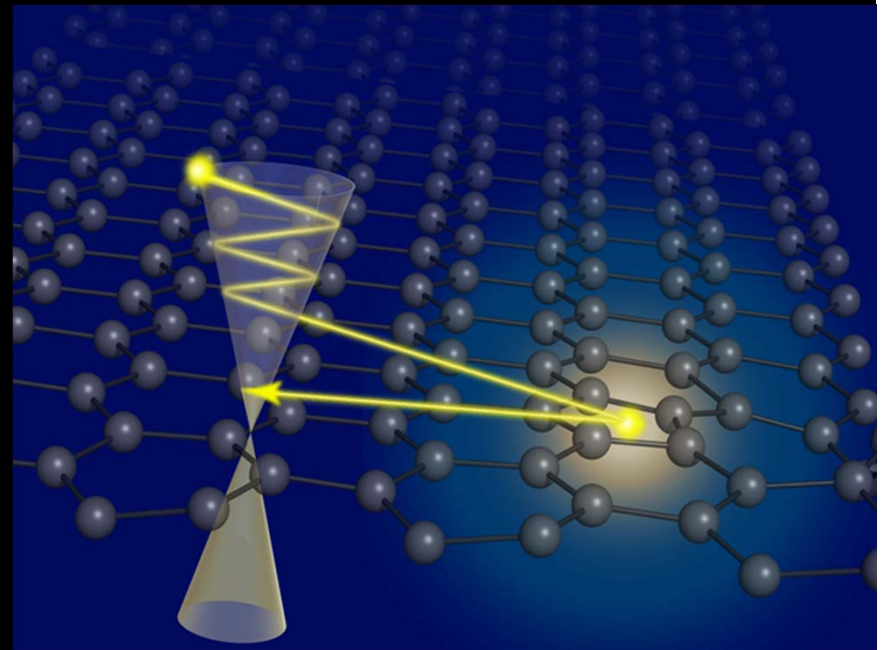


Result From Paper: supercollision acoustic model predict how electrons relax



electrons relax

Conclusions: a new model and physical process of how electrons relax in graphene has been developed



$$\langle n_e \rangle = \frac{1}{e^{\hbar\omega/k_B T_e} + 1}$$

$$\frac{dT_e}{dt} = -A(T_e^3 - T_l^3)/T_e$$