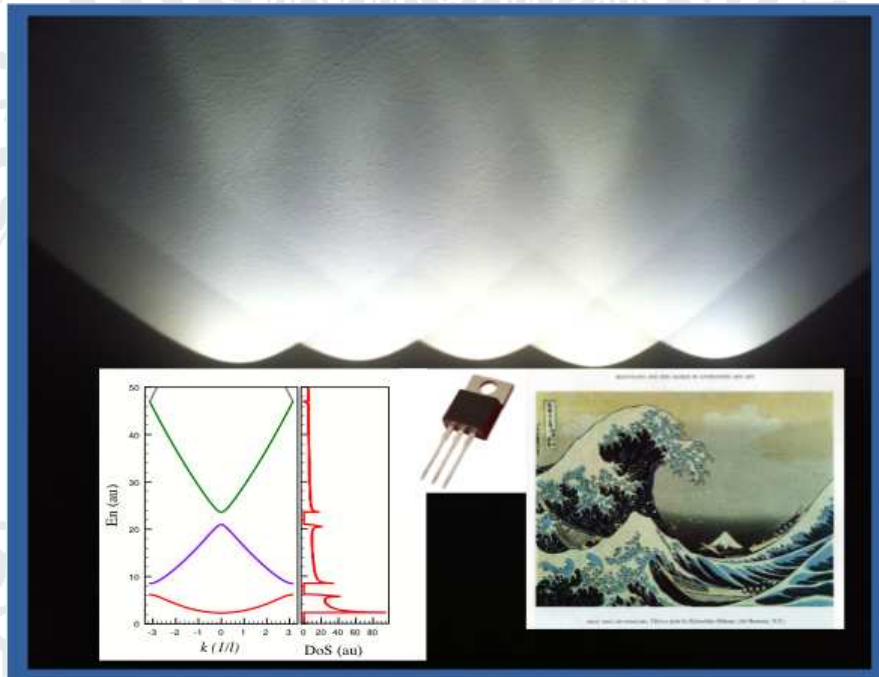


# PHYSIKALISCHES KOLLOQUIUM

## ANTRITTSVORLESUNG

AM 4. FEBRUAR 2013 UM 17 UHR C.T.  
IM GROßEN HÖRSAAL



## TIGHT-BINDING METHOD: AN INSPIRING JOURNEY

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In this talk I will review the basic principles of the tight-binding method. In solid-state physics, it allows to calculate the electronic band structure using an approximate set of quantum wave functions based upon superposition of atomic wave functions. Within this method it is straightforward to understand gap openings in the energy spectrum of electrons in periodic potentials — this is fundamental in order to account for the correct functioning of daily electronic devices.

In addition, the tight-binding models are a marvelous playground for the study topological effects in quantum systems. Such effects can be observed, for instance, in optical lattices filled with cold atoms and/or trapped ions. The tight-binding models are also extremely efficient at investigating the electronic properties of graphene.