

## Research Project for Physics 140

Fall 2018: Solid State Physics

Research an experimental technique, a solid state system, or a physical phenomenon. Topics include:

Hall effect

transmission electron microscopy

scanning electron microscopy

heat capacity measurements

molecular beam epitaxy

superconductivity, conventional or Fe-based

carbon nanotubes

thermoelectrics

piezoelectrics

some recent physics Nobel prizes in solid state:

[Isamu Akasaki](#), [Hiroshi Amano](#) and [Shuji Nakamura](#) “for the invention of efficient blue light-emitting diodes which has enabled bright and energy-saving white light sources”

[Andre Geim](#) and [Konstantin Novoselov](#) “for groundbreaking experiments regarding the two-dimensional material graphene”

[Willard S. Boyle](#) and [George E. Smith](#) “for the invention of an imaging semiconductor circuit – the CCD sensor”

[Albert Fert](#) and [Peter Grünberg](#) “for the discovery of Giant Magnetoresistance”

[Clifford G. Shull](#) “for the development of the neutron diffraction technique”

[J. Georg Bednorz](#) and [K. Alexander Müller](#) “for their important break-through in the discovery of superconductivity in ceramic materials”

[Gerd Binnig](#) and [Heinrich Rohrer](#) “for their design of the scanning tunneling microscope”

[Klaus von Klitzing](#) “for the discovery of the quantized Hall effect”

Due: 8-minute presentation Due: \_\_\_\_\_

4-page paper (single spaced, the page limit includes equations and diagrams). Due: \_\_\_\_\_

The presentation and paper should address the following:

- (1) What is this phenomenon, system or technique? Describe it, and one of its applications or current research questions in this area.
- (2) Describe one or two aspects of this topic in detail. Focus on physics. This should be the main part of your presentation/paper.

Include appropriate references. Cite where you found your information. Give preference to *reputable* and *stable* sources.