

# SOLID-STATE PHYSICS: SUPERCONDUCTIVITY

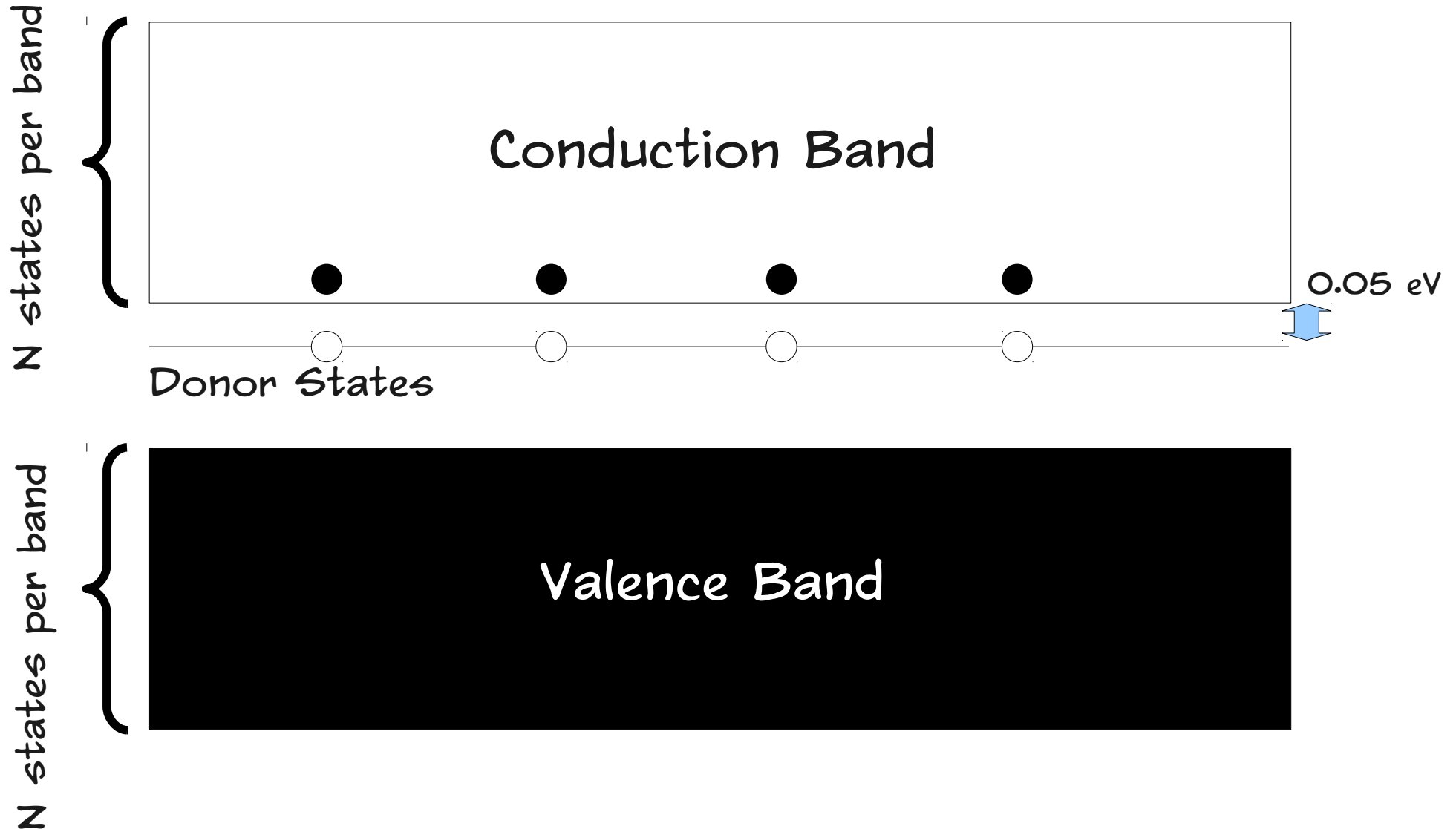
Prof. Stephen Sekula  
(4/1/2010)

Supplementary Material for  
PHY 3305 (Modern Physics)  
Harris, Ch. 10.9

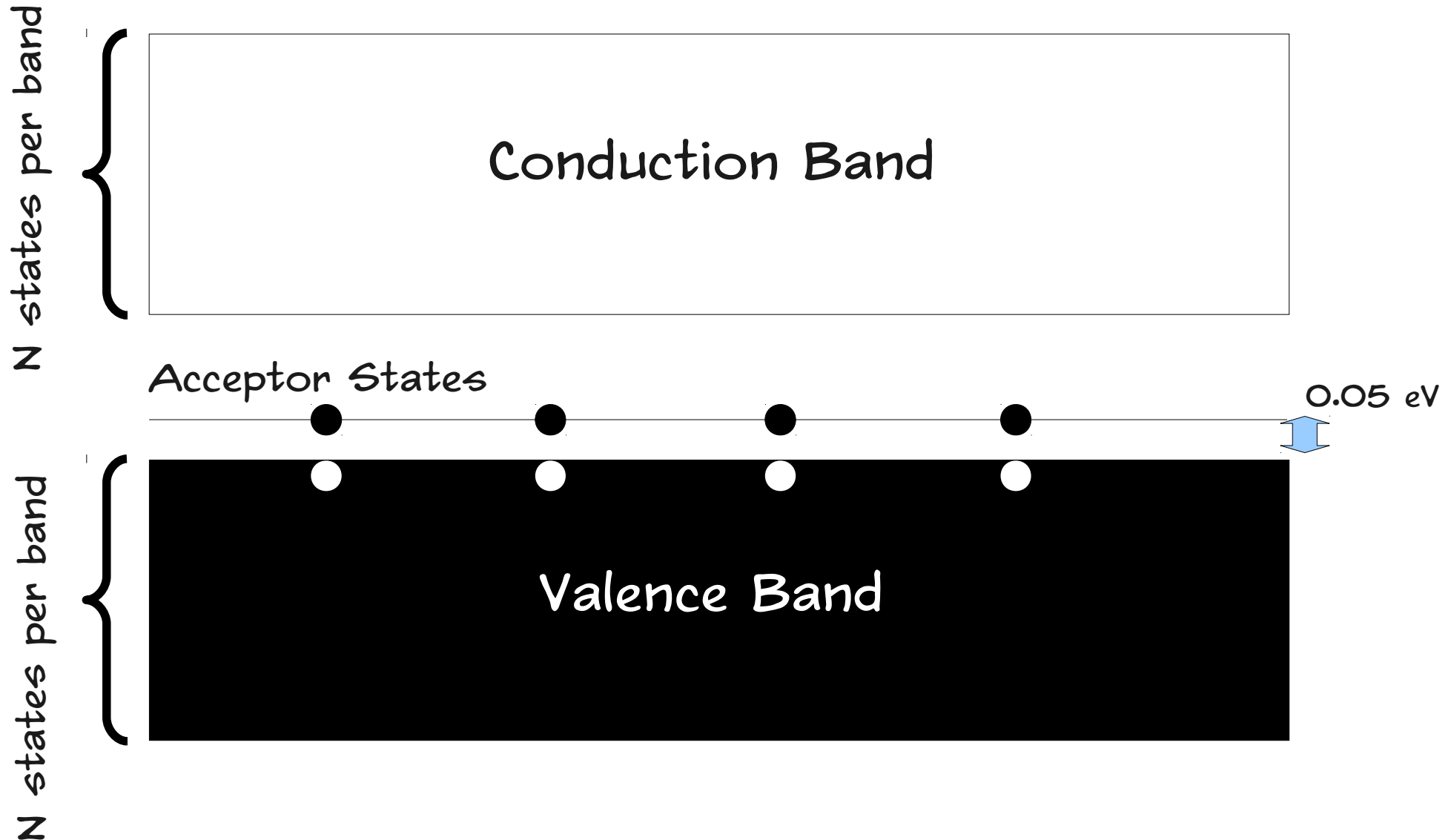
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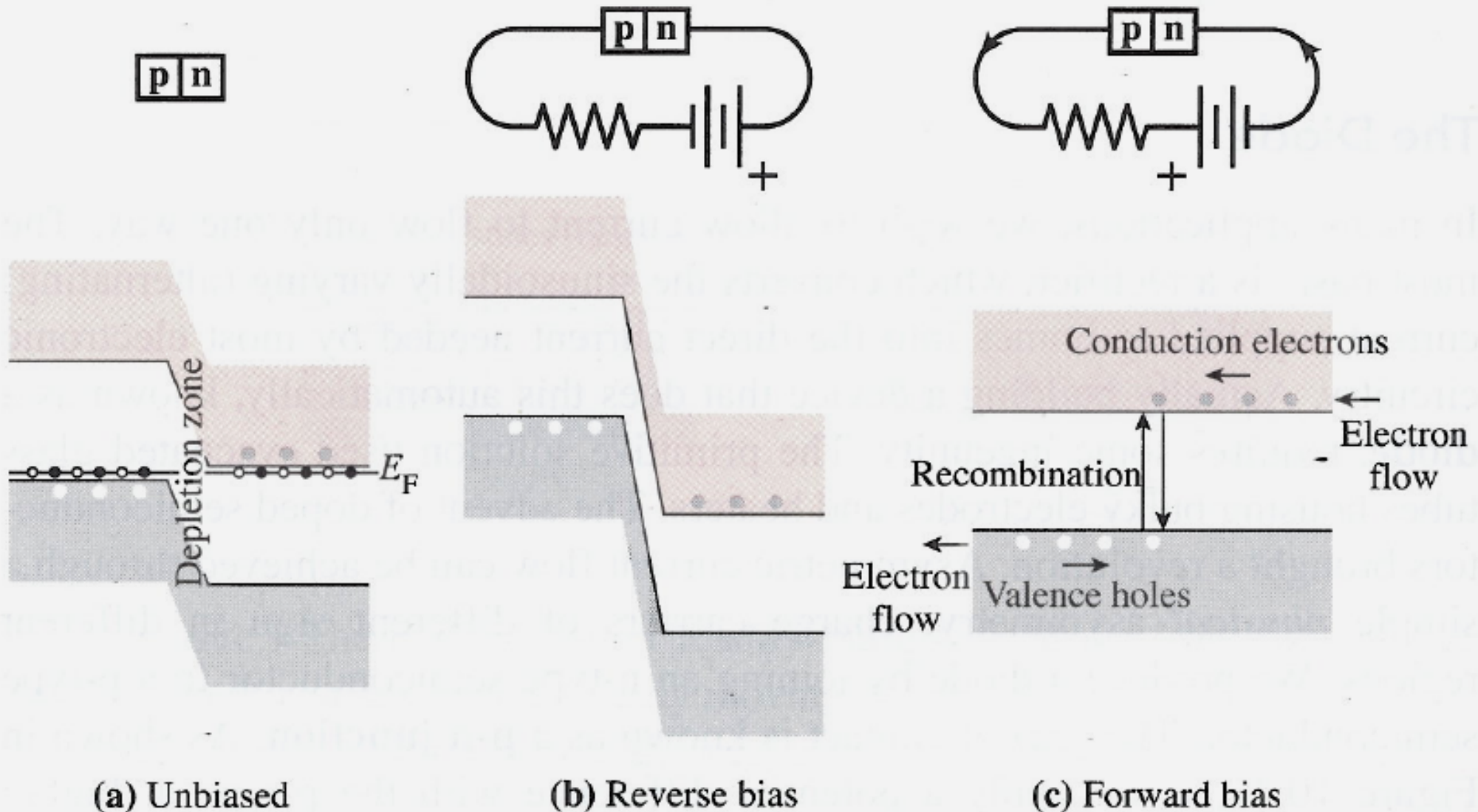
# N-TYPE EXTRINSIC SEMICONDUCTOR ( $T > 0$ )



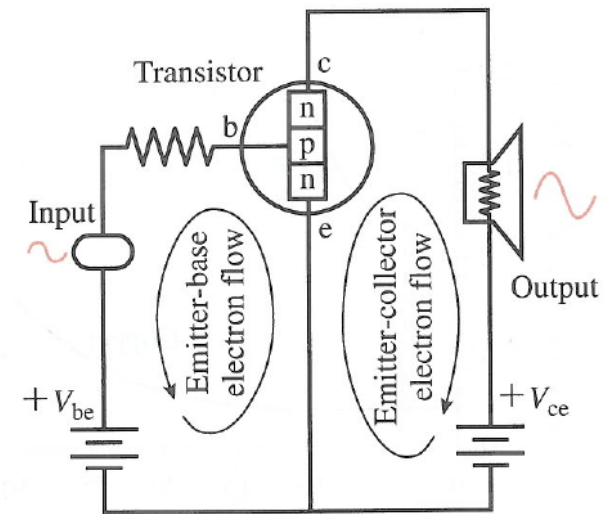
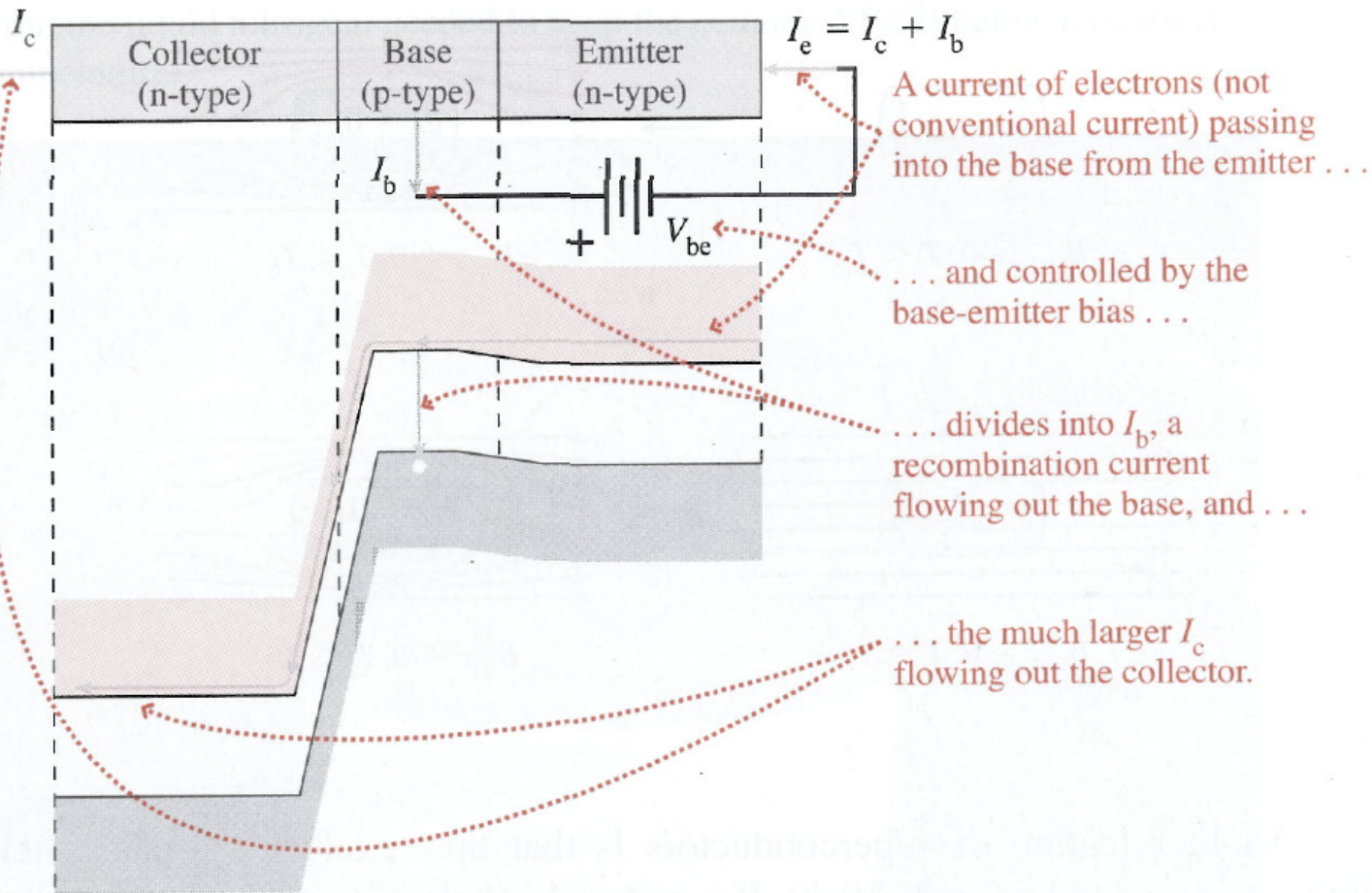
# P-TYPE EXTRINSIC SEMICONDUCTOR ( $T > 0$ )



# ENERGY BAND PICTURE



# TRANSISTOR





## The Nobel Prize in Physics 1956

"for their researches on semiconductors and their discovery of the transistor effect"



**William Bradford Shockley**

🕒 1/3 of the prize

USA

Semiconductor  
Laboratory of Beckman  
Instruments, Inc.  
Mountain View, CA, USA



**John Bardeen**

🕒 1/3 of the prize

USA

University of Illinois  
Urbana, IL, USA



**Walter Houser Brattain**

🕒 1/3 of the prize

USA

Bell Telephone  
Laboratories  
Murray Hill, NJ, USA









## The Nobel Prize in Physics 1972

"for their jointly developed theory of superconductivity, usually called the BCS-theory"



**John Bardeen**

🕒 1/3 of the prize

USA

University of Illinois  
Urbana, IL, USA



**Leon Neil Cooper**

🕒 1/3 of the prize

USA

Brown University  
Providence, RI, USA



**John Robert  
Schrieffer**

🕒 1/3 of the prize

USA

University of  
Pennsylvania  
Philadelphia, PA, USA

MRI machines are commonplace

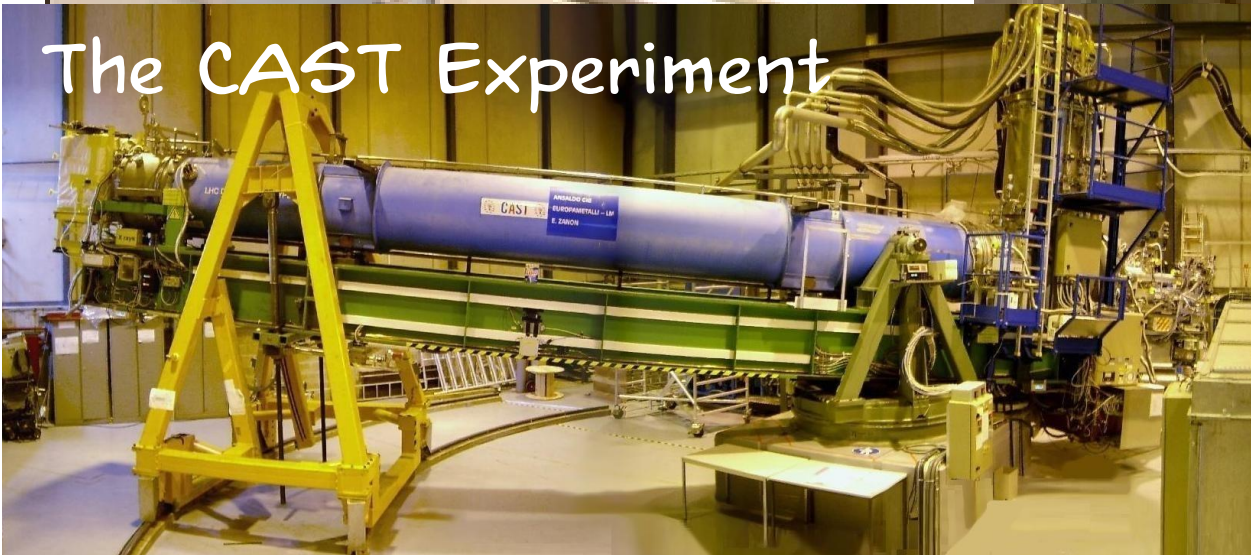


*Large Hadron Collider uses  
1232 superconducting dipole  
magnets*



*15 meters  
long, weighing  
35 tons*

The CAST Experiment



# NEXT TIME

- Nuclear Physics
  - new dimensions, new forces
- Reading for next time: Harris Ch. 11.1-11.3