Bi  
Z=83, group VA  ; structure: RHL

two atoms per unit cell => 10 electrons per unit cell

Bi has:

- the **highest Hall coefficient**, $R_H = -1/(nec)$, is several orders of magnitude higher than expected with that $n$.

- the **second lowest thermal conductivity** (after Hg)

- a **high electrical resistance** (or low electrical conductivity)  
  (look for instance at Tab 1.2 and 1.6 of A&M)

**Why?**

*Is the “effective” electron concentration $n$ for some reason much lower than the calculated one?*
Figure 1: Electronic structure of Bismuth. (a) Bulk band dispersion in different directions of the Brillouin zone (b) Schematic band structure of the bands crossing the Fermi energy. (c) Density of states.
**Bi**  \( Z=83 \), group VA; structure: RHL

The effect of the presence of both holes and electrons on the Hall constant can be understood qualitatively from the expression for \( R_H \):

\[
R_H = \frac{p\mu_h^2 - n\mu_e^2}{e(p\mu_h + n\mu_e)^2}
\]

(see: Ashcroft-Mermin: problem 12.4; written test of January 16, 2012 - problem n. 3)

(qualitative picture!)