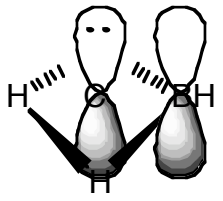
Answers to Problem 8, Chemistry 301X - 2006

The key is that filled nonbonding orbital. Electrons in it are not contributing to bonding. Thus, one way to stabilize planar methane would be to get those "wasted" electrons into a bonding orbital. To do that we need overlap of the filled nonbonding $2p_z$ orbital with an empty $2p$ orbital. Therefore boron, with its empty $2p$ orbital will work fine but nitrogen with a filled $2p$ (or hybrid) orbital would be disastrous.



side view this time