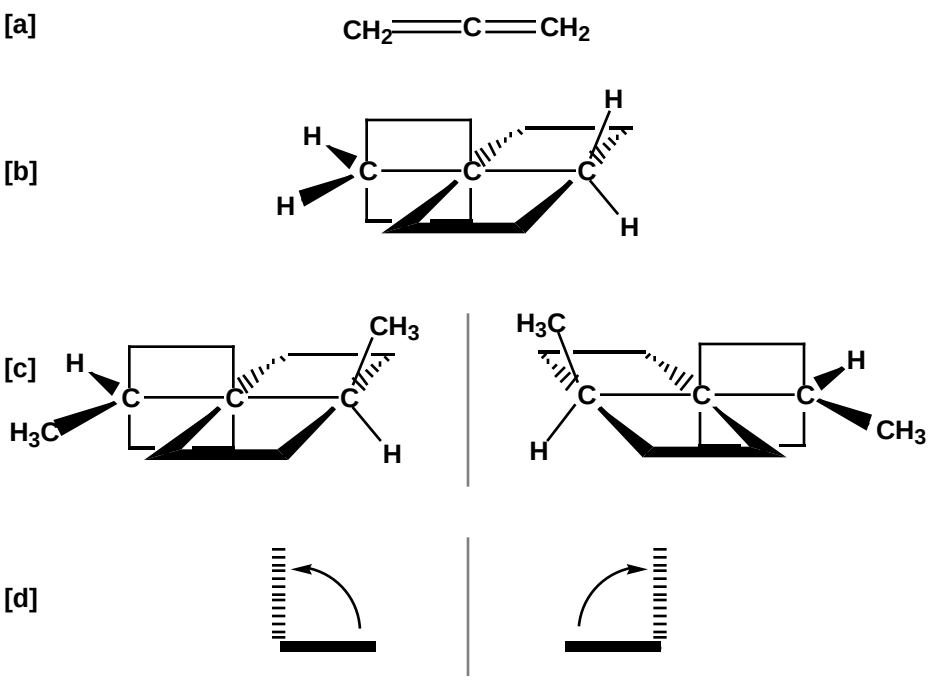
Text Related to Segment 7.06 ©2002 Claude E. Wintner

As a concluding example that unites sp^2 and sp hybridization in a geometrically interesting combination, we consider 1,2-propadiene, or allene (line a in the figure). The three carbon atoms of allene lie on a linear axis. The central carbon atom should have sp, the two outriding carbons sp^2, hybridization. As a result, in order to achieve overlap of all four p orbitals in the molecule to form two π orbitals, the planes of the two H—C—H groupings must be perpendicular to one another, because their associated π orbitals must be orthogonal (line b):



allene; chirality in 1,3-dimethylallene

This deduction is in agreement with experimental observation. A most interesting consequence of the allene geometry arises in the case of 1,3-disubstituted allenes, for example 1,3-dimethylallene (2,3-pentadiene, line c). This molecule, lacking any tetrahedral carbon atom, nevertheless is chiral! Looking down the linear axis, it becomes apparent that one enantiomer is, effectively, a

counterclockwise screw, the other a clockwise one (line d). In fact, 1,3-disubstituted allenes have been resolved.