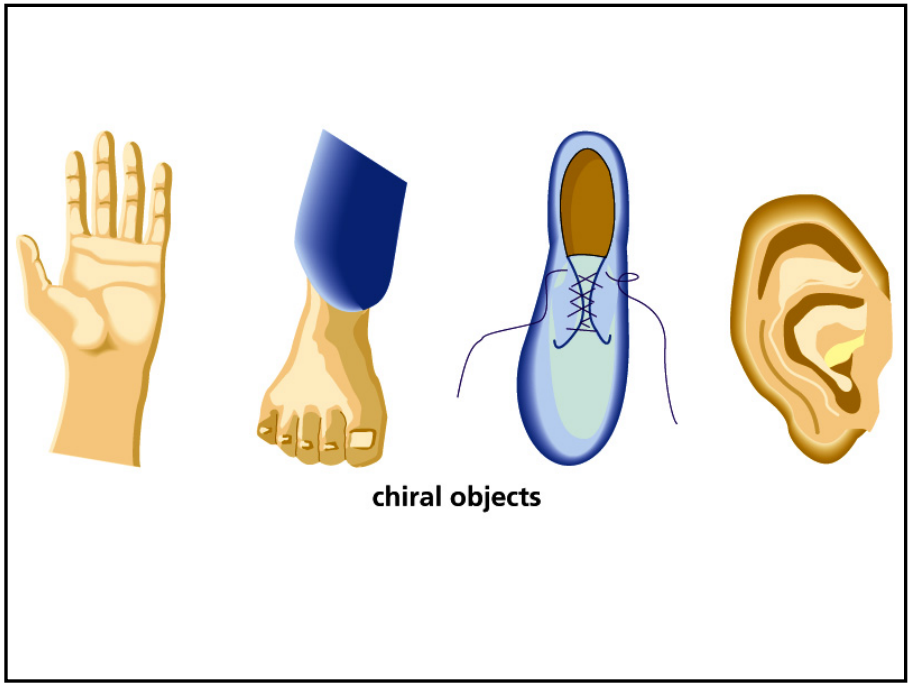
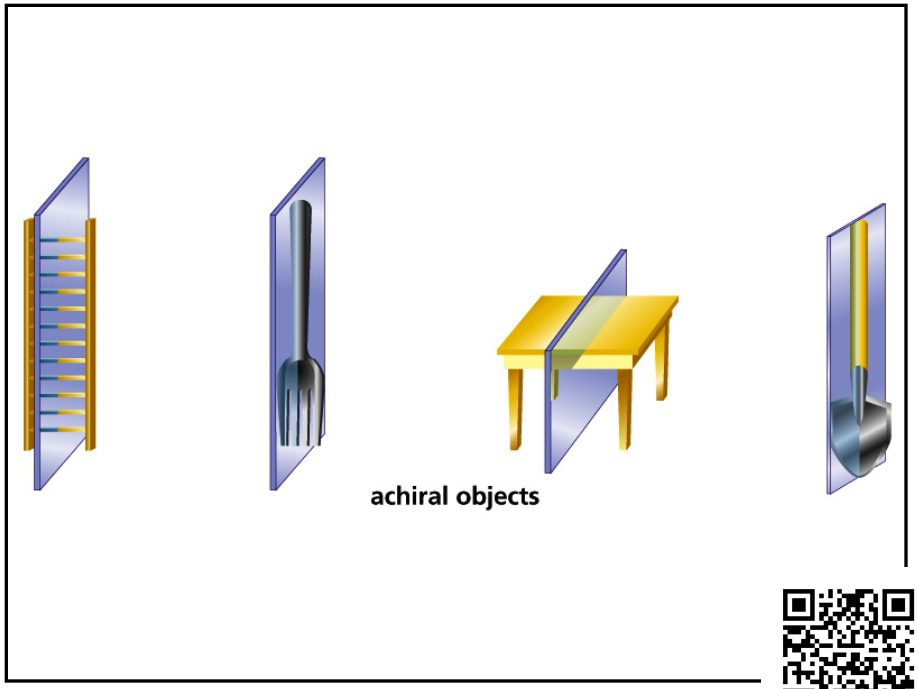
# Chirality

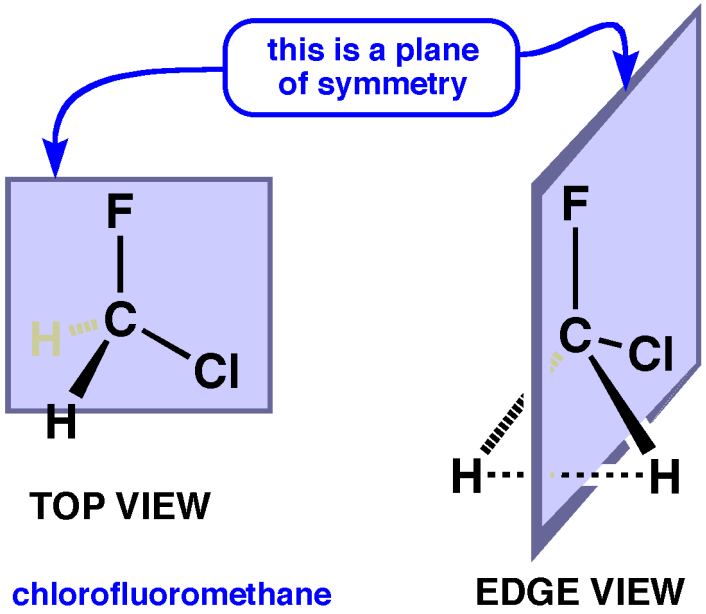
Chirality is a geometric property of an object. A chiral object is not superimposable on its mirror image. We have already encountered chiral structures in our discussion above. Specifically, each structure belonging to an enantiomeric pair, by definition, must be chiral. In contrast to enantiomers, the structures corresponding to diastereomeric pairs may or may not be chiral. One way to tell is a structure is chiral is to draw the mirror image form and see if the mirror image is superimposable on the original. If the mirror image is superimposable on the original, the structure is achiral; if it is not, the structure is chiral.

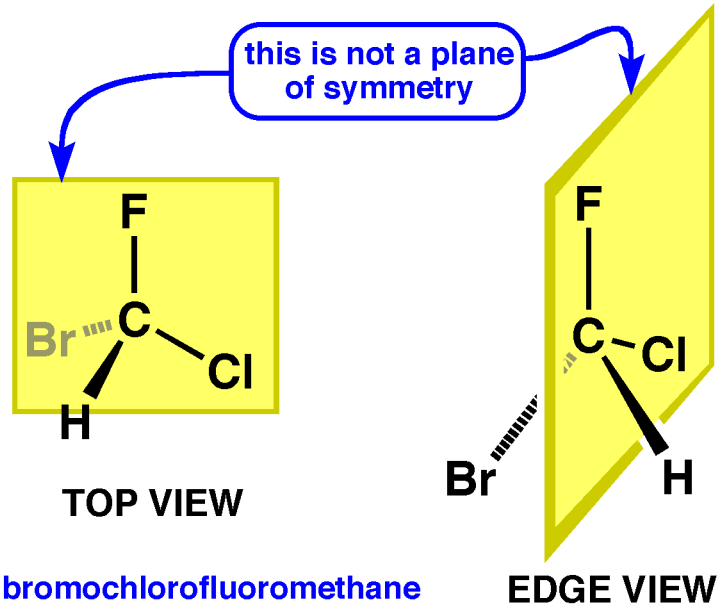


# Recognizing Chirality by Finding Symmetry Planes

An equally rigorous test for chirality is to check for the absence of either a **plane of symmetry** or an **inversion center**. Having a plane of symmetry means that the all of the atoms in one half of a molecule reflect through the symmetry plane (traveling along a direction perpendicular to the plane), coinciding exactly with and equidistant to the same atoms in the molecule's other half. Atoms that are in the plane do not have counterparts because they are part of the plane itself. For example, chlorofluoromethane possesses a plane of symmetry. In contrast, bromochlorofluoromethane does not. Chlorofluoromethane is achiral while bromochlorofluoromethane is chiral.



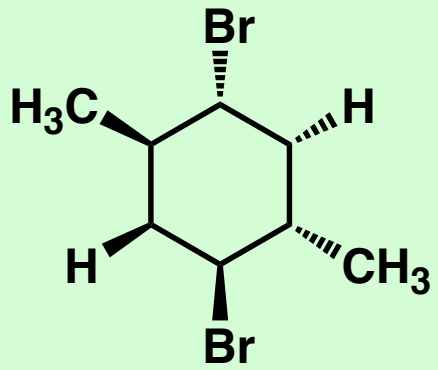



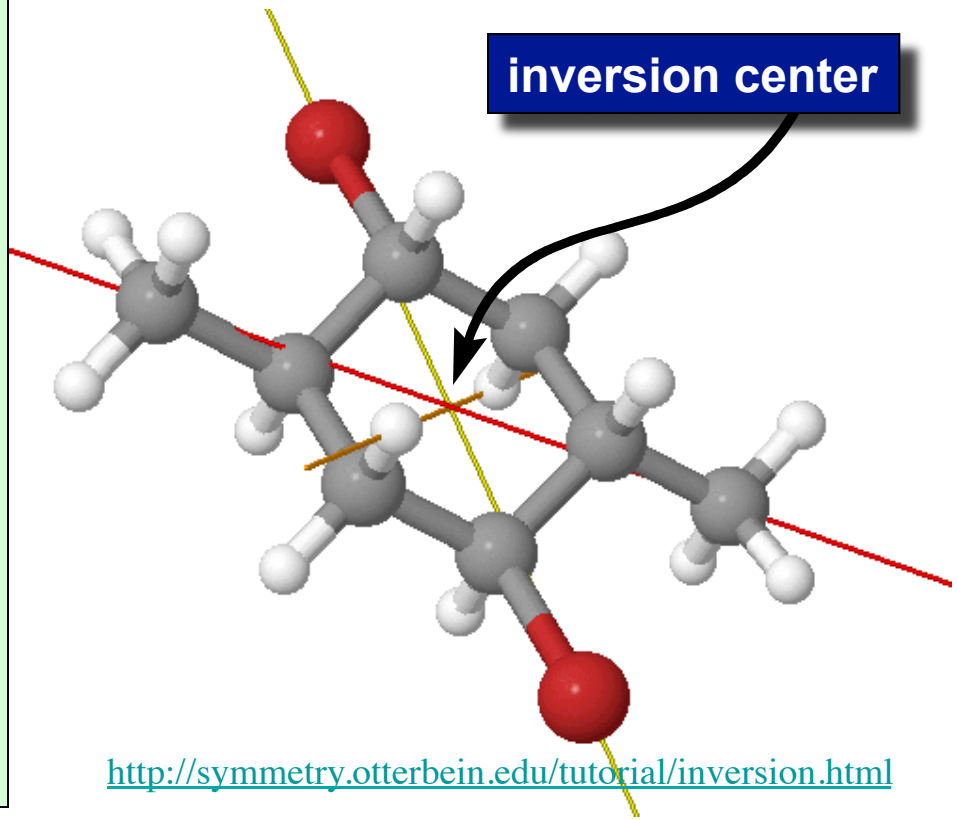

http://symmetry.otterbein.edu/gallery/index.html

# Recognizing Chirality by Finding an Inversion Center

If a molecule posses an **inversion center**, it means that each atom, when translated on a line that passes through the molecule's center, will coincide exactly with the same atom on the other side and at an equidistant position.

The structure below possesses an inversion center. It's therefore achiral even though it lacks a mirror plane. To possess an inversion center, it must be true that each atom will have an equivalent counterpart, such that all lines drawn through these atom pairs will intersect at the same point – the **inversion center**. The 3D model at the right shows the intersection of three lines drawn through three pairs of atoms. This point of intersection is the same for every pair of atoms in the structure.




http://symmetry.otterbein.edu/tutorial/inversion.html