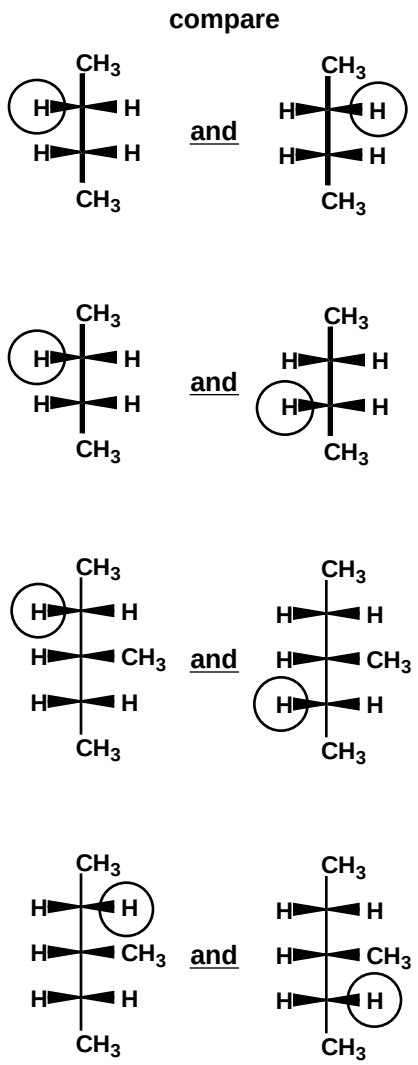
Text Related to Segment 6.03 ©2002 Claude E. Wintner

In the previous segment, in dealing with the four constitutionally identical methylene hydrogen atoms in n-butane, we chose one specific pair, and found those hydrogen atoms to be homotopic. However, had we chosen either of the other two possible pairings, we would have met with a different result, as shown in the first two lines of the following figure:



In each pair the two formulae, including the "reporter" circles, are enantiomorphs; the particular groups (hydrogen atoms) being compared are enantiotopic.

identification of enantiotopic groups

Counterintuitive as it at first may seem, the methylene hydrogens attached to a single carbon atom in n-butane are distinguishable (first line of the figure). Our test, carried out in exactly the same manner as previously, demonstrates this fact clearly. We generate two models which (including the "reporter" circles) are enantiomorphous. (The term "enantiomorph" is used to refer to objects in general, and to models; "enantiomer" refers specifically to molecular species.) Groups such as these are termed *enantiotopic.* They reside in "mirror-image" environments. The "view" from each of these two hydrogen atoms is not the same to a viewer — "reporter" (reagent) — *who is capable of distinguishing chirality.* Examination of a model will make clear that from the vantage point of *one* of the hydrogen atoms we see an ethyl group, a methyl group, and the other methylene hydrogen atom in a *clockwise* direction. From the vantage point of the *other* hydrogen atom we see the ethyl group, the methyl group, and the first methylene hydrogen atom in a *counterclockwise* direction.

The same phenomenon of enantiotopism is uncovered when we consider the two methylene hydrogens located at different carbon atoms (C-2 and C-3) in n-butane and positioned on the "same side" as considered from the perspective of a Fischer projection formula (second line of the figure). It also is found among certain of the methylene hydrogen atoms of 3-methylpentane, the third actor we already have introduced, as seen in the third and fourth lines of the figure. Once again, it needs to be stressed that the comparison between hydrogen atoms in constitutionally *different* environments — methylene and methyl, or methylene and methine — is *not* the issue here.