PROJECTIONS IN ORGANIC MOLECULES

Projections in Molecules

Visualization of molecules in three dimensions is essential for the study of organic chemistry. Molecular models play an important role in the teaching and understanding of three-dimensional structures. However, many times it is not possible to build molecular models either due to time constraints or due to the nonavailability of molecular modeling kits. Using our own hands in place of modeling kits has been shown to be an effective and viable alternative.

Projections are helpful for the analysis of organic molecules.

Projections in Molecules

Projection is a drawing used to show three dimensional structure of a molecule in two dimensional structure.

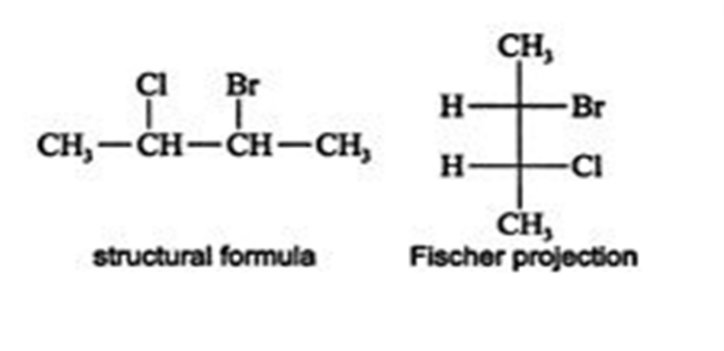
There are 3 types of projections:

1. Fischer Projection
2. Sawhorse Projection
3. Newman Projection

Fischer Projection

The **Fischer projection**, devised by Emil **Fischer** in 1891, is a two-dimensional representation of a three-dimensional organic molecule by **projection**. **Fischer projections** were originally proposed for the depiction of carbohydrates and used by chemists, particularly in organic chemistry and biochemistry.

A Fischer projection or Fischer projection formula is a convention used to depict a stereoformula in two dimension without destroying the stereochemical information, i.e., absolute configuration, at chiral centers.

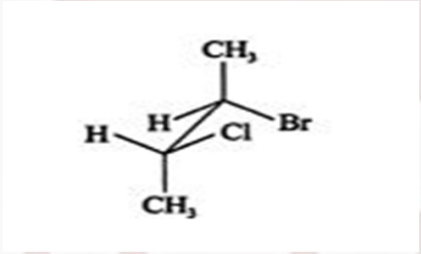


Sawhorse Projection

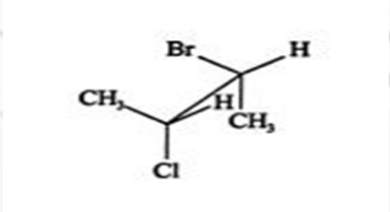
Sawhorse projection is customarily used to show interactions between groups on adjacent carbon atoms in mechanisms. In a sawhorse projection, the backbone carbons are represented by a diagonal line, and the terminal carbons are shown in groups.

Sawhorse Projection is of two types:

1. Staggered conformer : The atoms and groups attached to each backbone carbon fit in the voids around the groups on the adjacent carbon.

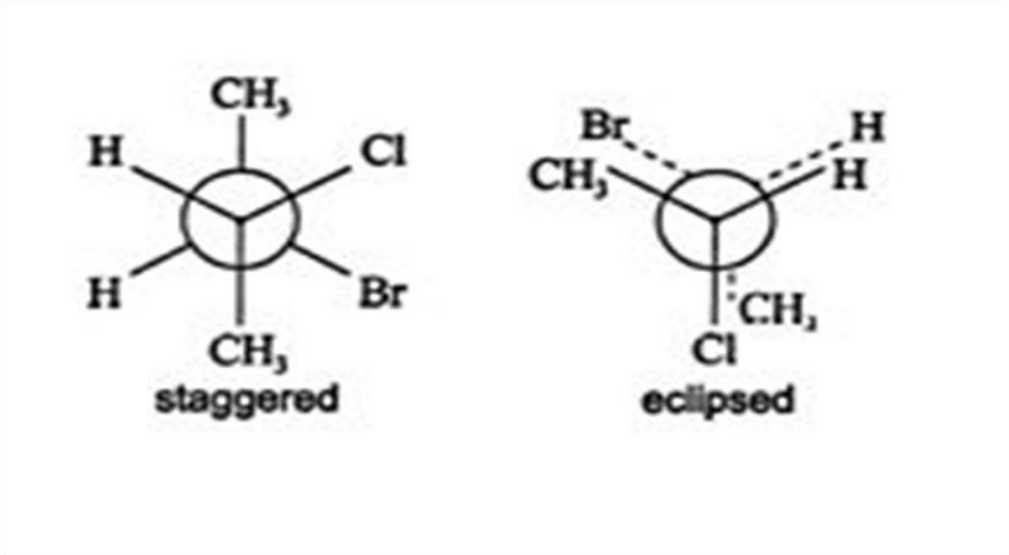


2. Eclipsed conformer : The groups and atoms on adjacent carbons are in line with each other.



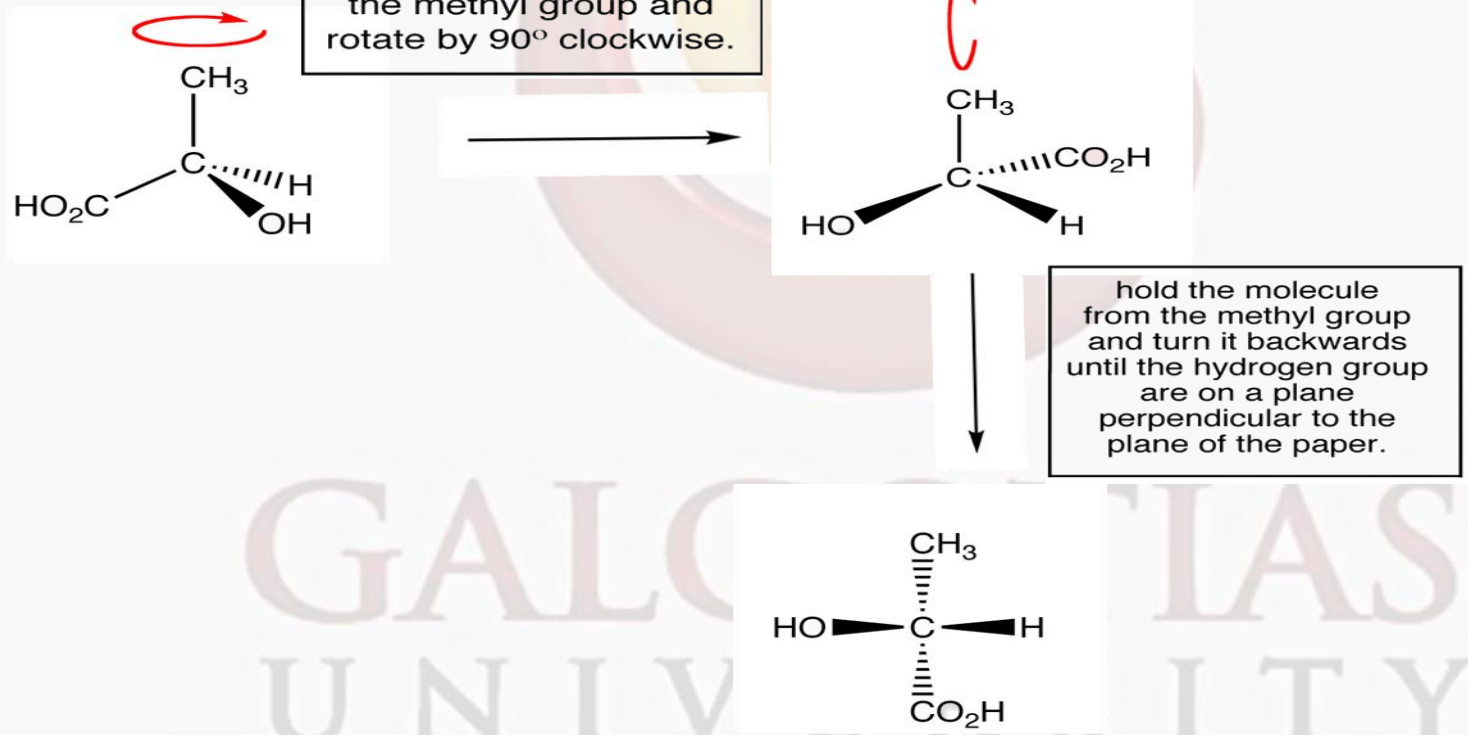
Newman Projection

This type of projection is used mainly to show interaction leading to stress between atoms or groups in three-dimensional space due to steric crowding.



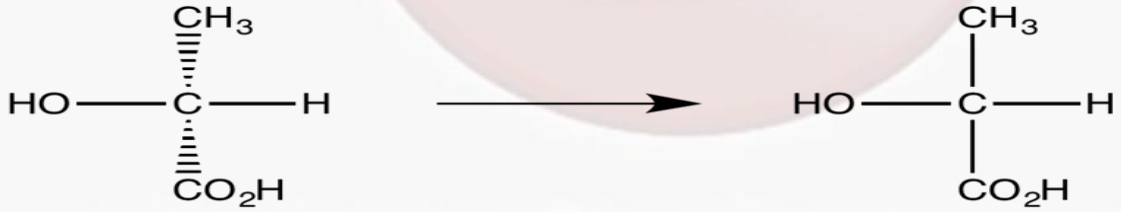
Stereo formula To Fischer Projection

Step 1.



Step 2. Push the two bonds coming out of the plane of the paper onto the plane of the paper.

Step 3. Pull the two bonds going into the plane of the paper onto the plane of the paper.



Step 4. Omit the chiral atom symbol for convenience.

Fischer Projection To Sawhorse Projection

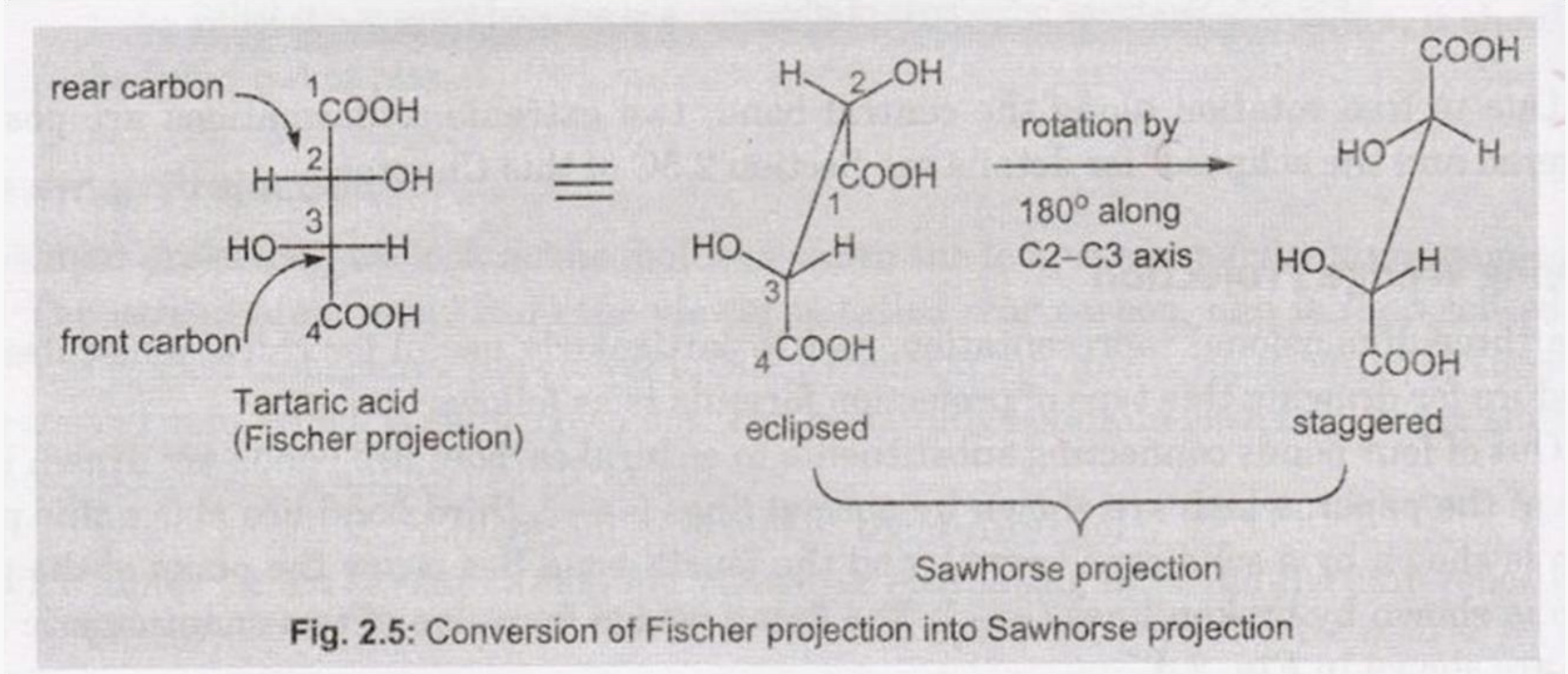


Fig. 2.5: Conversion of Fischer projection into Sawhorse projection

Sawhorse Projection To Fischer Projection

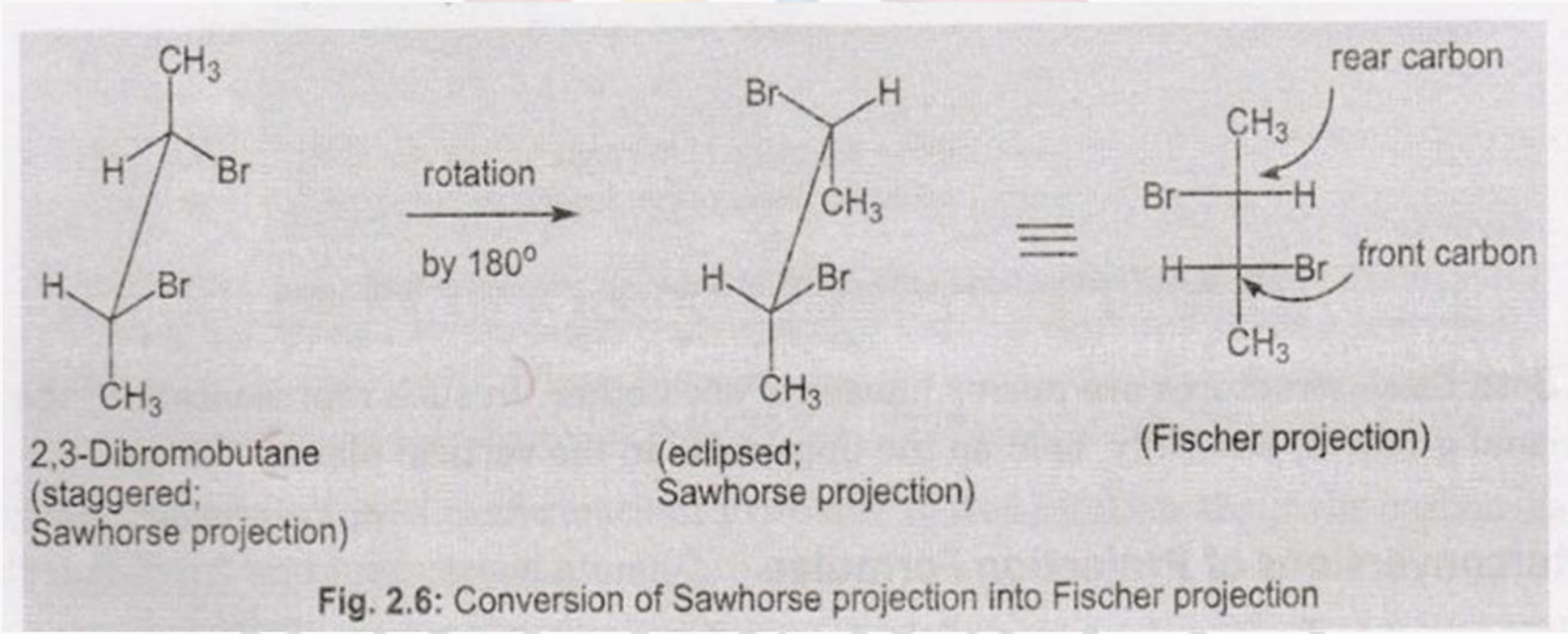


Fig. 2.6: Conversion of Sawhorse projection into Fischer projection

Sawhorse Projection to Newman Projection And then Fischer Projection

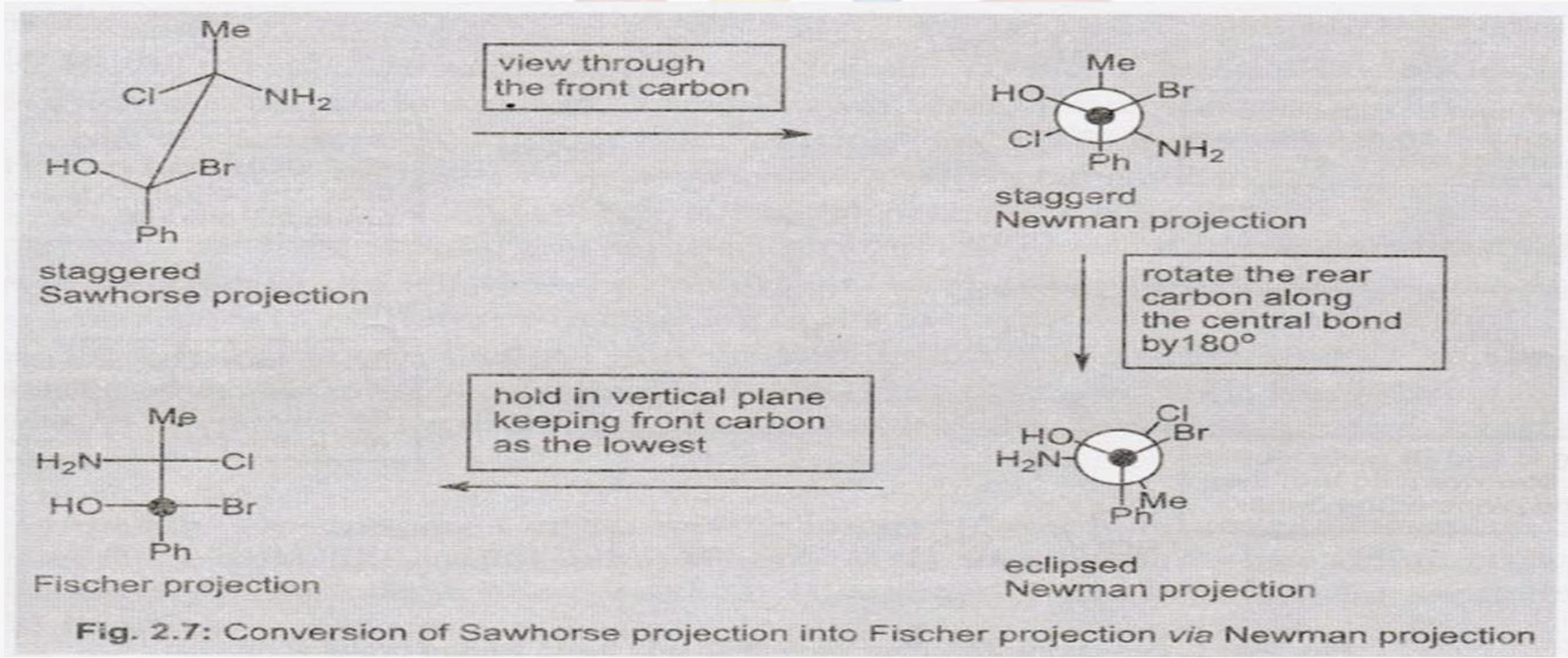


Fig. 2.7: Conversion of Sawhorse projection into Fischer projection *via* Newman projection

Fischer Projection to Newman Projection and then Sawhorse Projection

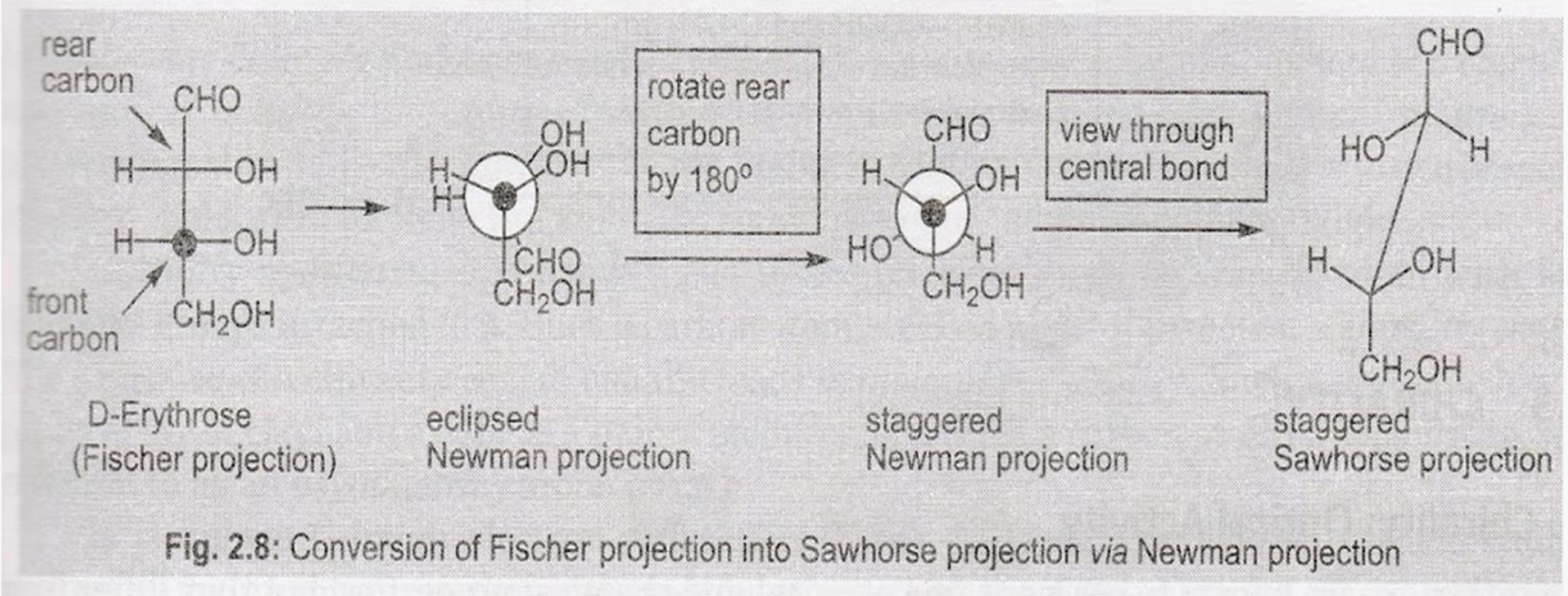


Fig. 2.8: Conversion of Fischer projection into Sawhorse projection *via* Newman projection

Thank you