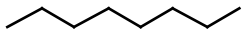
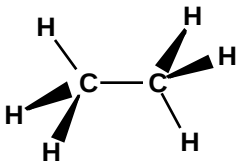
Text Related to Segment 1.03 ©2002 Claude E. Wintner

We are considering the homologous series of hydrocarbons having molecular formulae C_nH_{2n+2}. These compounds meet the requirements that (1) they have strong carbon-hydrogen and carbon-carbon (single) bonds, and (2) their carbon atoms are tetravalent and tetrahedral. We do not, at this stage, require any detailed knowledge of bonding. However, *a set of molecular models is indispensable* to comprehension of the ensuing discussion. For reference, the names of the straight chain hydrocarbons in this series through $C_{10}H_{22}$, n-decane (normal decane), are shown. The line notation introduced in the figure has each terminal and each angle represent a carbon atom saturated to tetravalence with hydrogen.

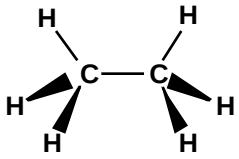
CH_4		**methane**
CH_3CH_3		**ethane**
$CH_3CH_2CH_3$		**propane**
$CH_3CH_2CH_2CH_3$		**n ("normal")-butane**
$CH_3CH_2CH_2CH_2CH_3$		**n-pentane**
$CH_3CH_2CH_2CH_2CH_2CH_3$		**n-hexane**
$CH_3CH_2CH_2CH_2CH_2CH_2CH_3$		**n-heptane**
$CH_3CH_2CH_2CH_2CH_2CH_2CH_2CH_3$		**n-octane**
$CH_3CH_2CH_2CH_2CH_2CH_2CH_2CH_2CH_3$		**n-nonane**
$CH_3CH_2CH_2CH_2CH_2CH_2CH_2CH_2CH_2CH_3$		**n-decane**

Moving on in molecular formula from methane, CH_4, to ethane, C_2H_6 ($H_3C—CH_3$), the next molecule of the series, when we examine a model, it

immediately reveals a possible complication — assuming that the plastic or metal components of the model have any relationship whatsoever to the "reality" of the molecule! In any event, the model implies the existence of an *infinite* series of structures for ethane, differing in rotational angle about the carbon-carbon bond. Two extremes, called *staggered* and *eclipsed conformations,* are shown:



staggered conformation



eclipsed conformation