Stereochemistry of Chlorination
monochlorination products from Cl₂/heat

\[ \text{R-2-bromobutane} \xrightarrow{C4} \text{R-3-bromo-1-chlorobutane} \]

\[ \text{C1} \xrightarrow{} \text{S-2-bromo-1-chlorobutane} \]

In reactions occurring away from the stereocenter
- the relative configuration of the center is retained
- the CIP priority may be different or the same

\[ \text{C2} \xrightarrow{} \text{R, 50\%} + \text{S, 50\%} \]

\( \text{(rac)-2-bromo-2-chlorobutane} \)

reaction at the stereocenter provides an achiral intermediate
- enantiomeric prods form from enantiomeric TSs
- reaction on either side is equal in energy
- a racemate results
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\[ \text{C}2 \]

\begin{align*}
R-2\text{-bromobutane} & \quad \rightarrow \quad C2 \\
2R,3R, 25\% & \quad + \quad 2R,3S, 75\% \\
& \quad \text{2-bromo-3-chlorobutane}
\end{align*}

diastereomeric products arise from diastereomeric TSs
• diastereomers are different in energy
• TSs leading to diastereomers may be different in energy

This is a **stereoselective reaction**
• one stereoisomer is produced in excess over another
• in this reaction, the stereoselectivity is low, \( \Delta \Delta G^\ddagger < 0.5 \text{ kcal/mol} \)