Rotational Isomeric State Model

- fraction of *gauche* increases with T

- - factor 2 because 2 gauche states (g^+, g^-), only 1 trans

- $\Delta E_g \approx$ 1-2 kJ/mol
  - → at r.t. $f_g \approx 0.5$

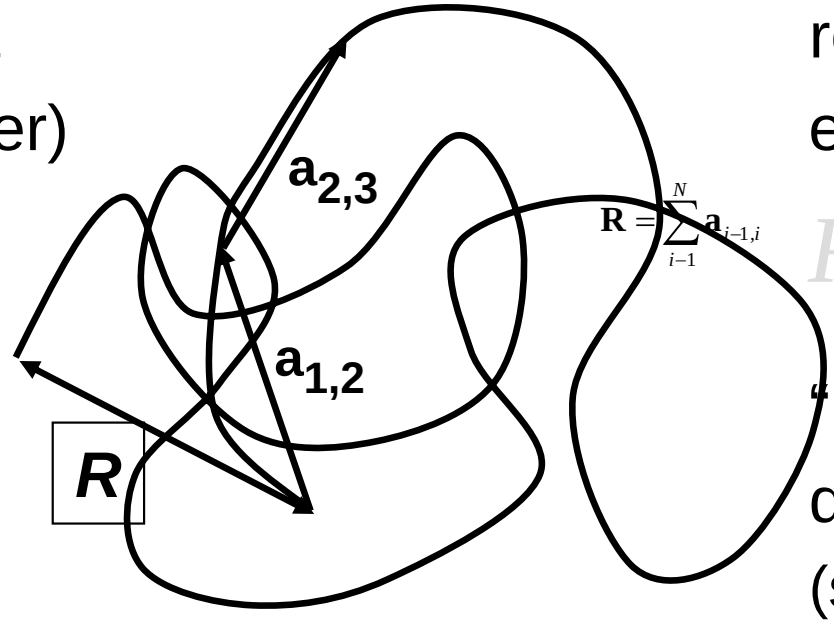
Rotational Isomeric State Model

- RIS model – an approximation
- neglects all dihedral (torsion) angles other than 180^{o} and $\pm 60^{o}$ (Flory)

Random Coil

- Polymer chain in solution, melt, or amorphous glass

segment
(monomer)



root-mean-square
end-end distance:

$$R_0 \equiv \left\langle R^2 \right\rangle^{1/2} = aN^{1/2}$$

"random walk":
distance $\propto$ no. of steps
(strictly true only for "ideal chains")

- **End-to-end distance:** $\mathbf{R} = \sum_{i-1}^{N} \mathbf{a}_{i-1,i}$

Gaussian Coil

- “ideal chain” = freely-jointed non-self-avoiding chain
  - freely jointed: any angle between a_i and a_{i+1} equally probable
  - non-self-avoiding: chain can overlap with itself
- Distribution of end-to-end distances
  - e.g. for one chain over time – Gaussian distribution

Persistence Length

- Theory of worm-like chains (Kratky and Porod)
- Persistence length is the distance along the chain at which orientational correlation with the starting segment drops to 1/e.
- Persistence length is a measure of the **rigidity** of a polymer chain