ANFINSEN

RIBONUCLEASE NATIVE   ACTIVE?
                             ✓
             DENATURED   ✗
             NATIVE   ✓

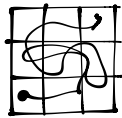PROTEIN ENCODES FOLD AND FUNCTION.

WHAT CHANGES BETWEEN U AND F?
- CHAIN BECOMES MORE ORDERED
- NEW HYDROGEN BONDS.

HOW MUCH DOES IT "COST" TO FOLD POLYPEPTIDE?

BOLTZMANN:

$$S = R \ln(W)$$
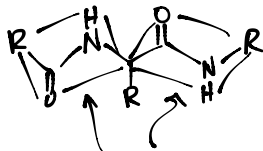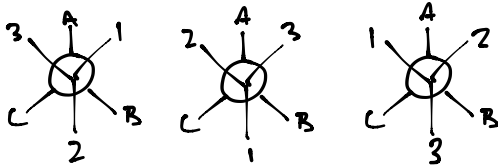
↑ ENTROPY   ↑ NUMBER OF STATES

	INITIAL	FINAL
W	1	9
S	$R \ln(1) = 0$	0.018 kJ/mol·K
TS	0	5.4 kJ/mol

THIS EXPANSION BUYS US 5.4 kJ/mol. (@ 300k)

WHAT ABOUT PROTEIN?

BOTH PLANES ROTATE
EACH CAN TAKE 3 CONFORMATIONS

- EACH PEPTIDE BOND CAN THUS HAVE 3×3=9 ANGULAR CONFIGURATION
- 12 AMINO ACID CHAIN HAS 11 BONDS ⇝ $9^{11} = 3×10^{10}$ TOTAL POSSIBILITIE

	U	F
W	$3×10^{10}$	1
S	0.2 kJ/mol K	0
TS	60 kJ/mol	0

FOLDING CHAIN COSTS 60 kJ/mol

WHERE DOES FOLDING ENERGY COME FROM?
- HYDROGEN BONDS?
- HYDROPHOBIC EFFECT?

WHY IS MINIMIZING SURFACE AREA INTERACTING WITH WATER UNFAVORABLE?

MINIMIZES DISRUPTION OF WATER STRUCTURE
DRIVEN BY <u>ENTROPY</u>. WATER FREED UP LEADS TO LARGE $\uparrow \Delta S$.