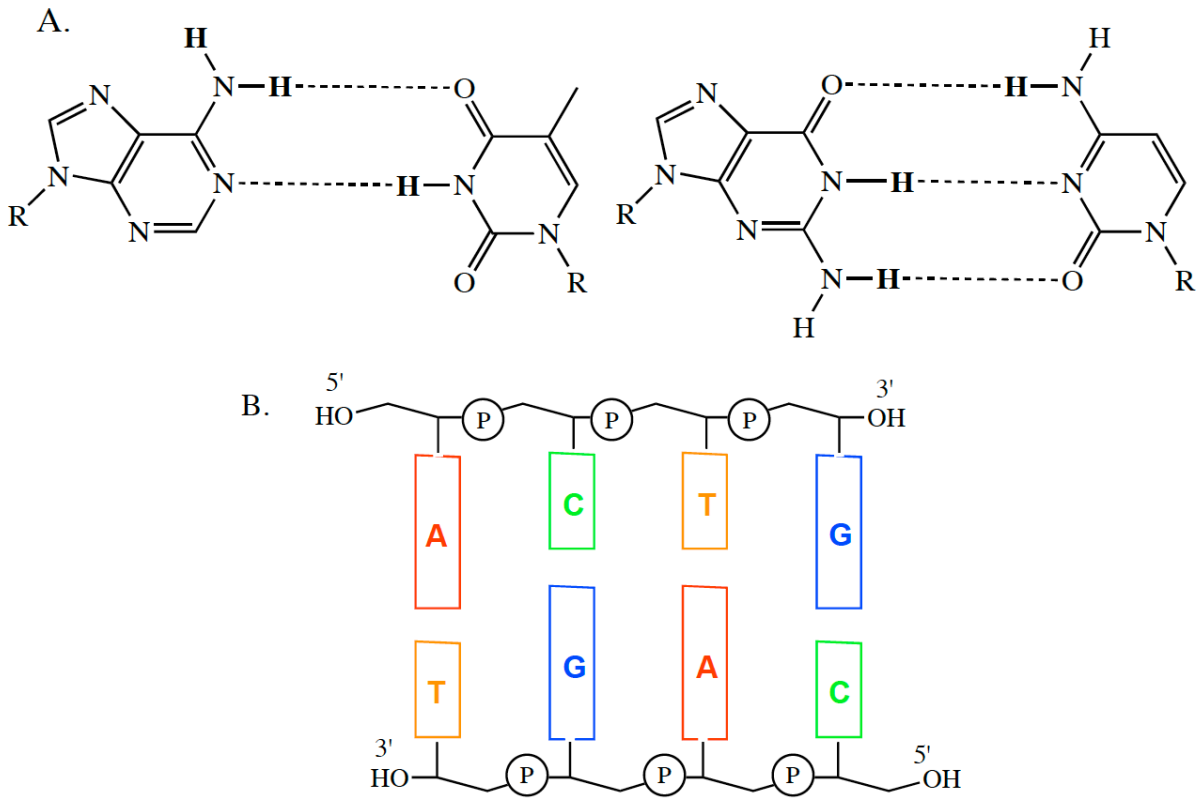
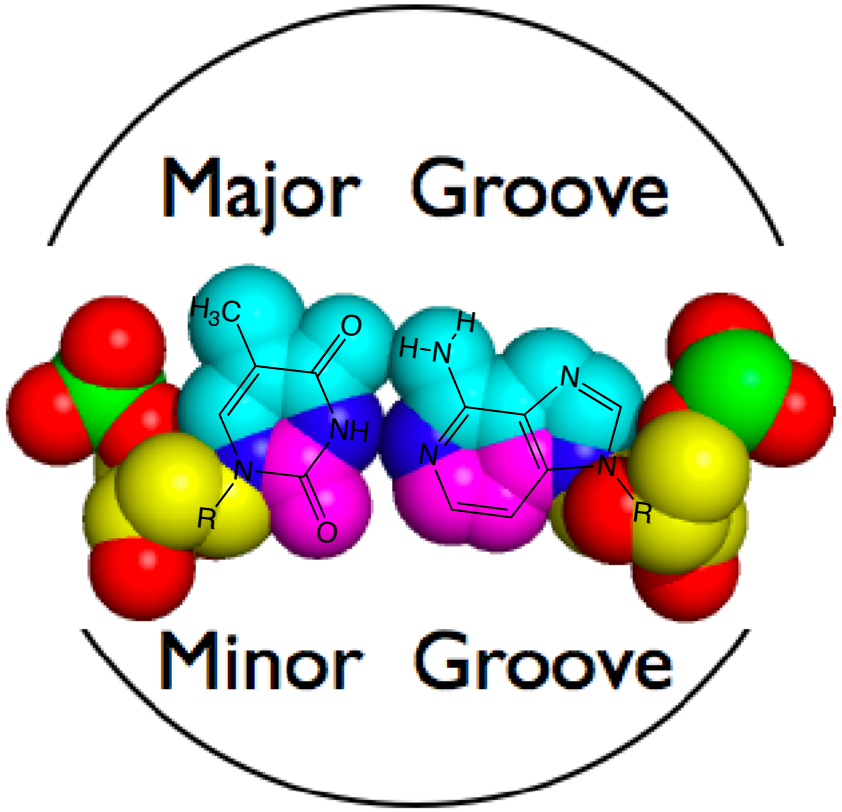
Watson-Crick Base Pairing

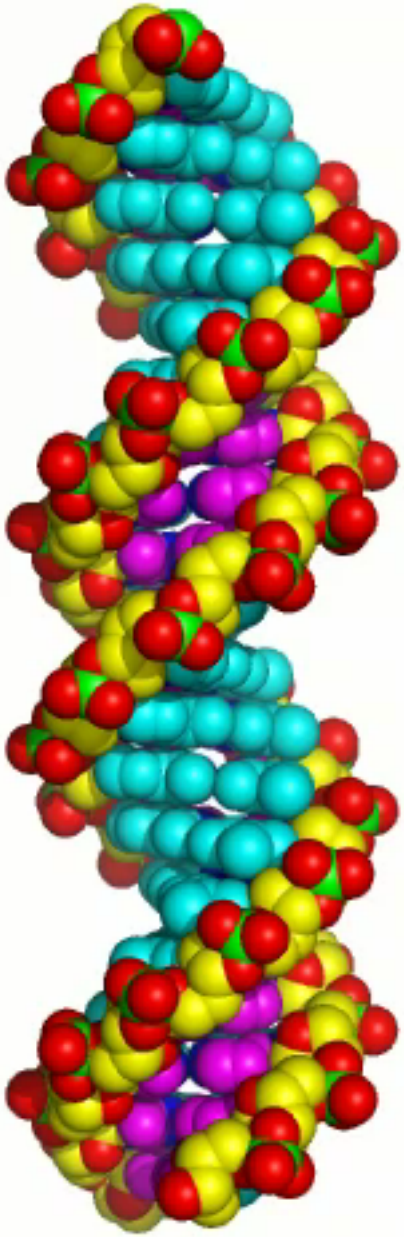


DNA Duplex



Minor Groove

Major Groove



Stability and Sequence

Table N. 2. Table[a] of thermodynamic data for contributions made by base pair doublets in duplex melting. Each sequence can be seen as two dinucleotides that complement each other. For example, AT/TA is 5'-AT-3'/3'-TA-5'.

	ΔH_{melt} (kcal/mol)	ΔS_{melt} (cal/molK)	ΔG_{melt} (kcal/mol)
AT/TA	7.2	20.4	1.1
TA/AT	7.2	21.3	0.9
CT/GA	7.8	21	1.5
AA/TT	7.9	22.2	1.3
GG/CC	8	19.9	2.1
GA/CT	8.2	22.2	1.6
GT/CA	8.4	22.4	1.7
CA/GT	8.5	22.7	1.7
GC/CG	9.8	24.4	2.5
CG/GC	10.6	27.2	2.5

[a]. SantaLucia (1998) *Proc. Natl. Acad. Sci. USA* **95**, 1460-5.

Direct Measurements of Base Stacking Interactions in DNA by Single-Molecule Atomic-Force Spectroscopy

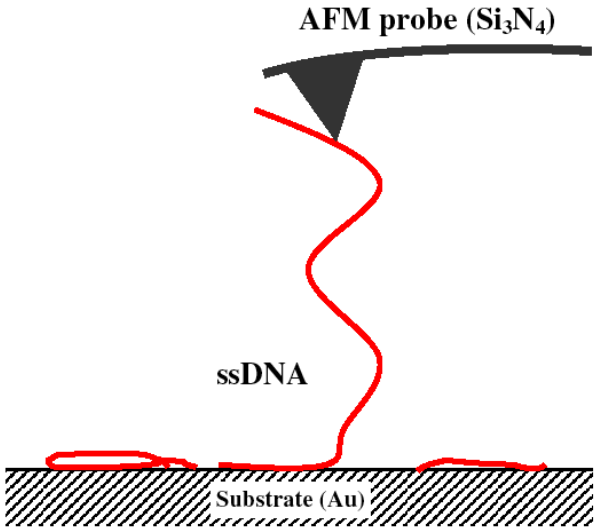


FIG. 1 (color online). Schematic of single-molecule atomic-force microscopy measurements of ssDNA molecules (the figure is not to scale).

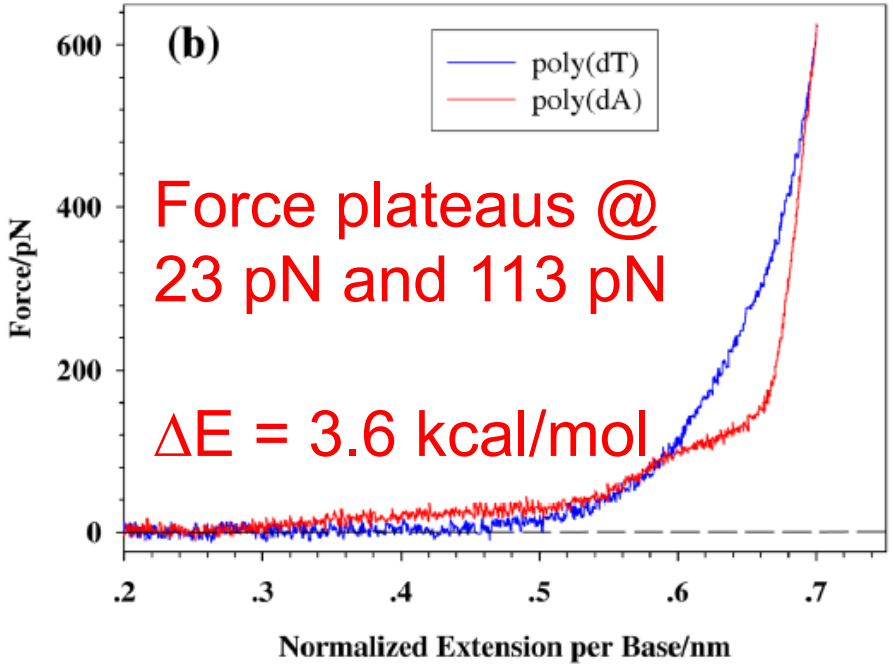
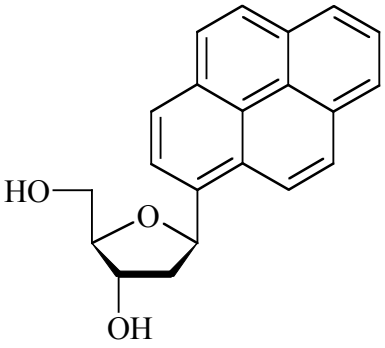
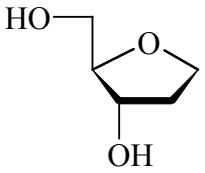


FIG. 3 (color online). (a) three typical force-extension measurement curves for poly(dT), (b) comparison between poly(dA) and poly(dT) on a normalized extension basis. We assume that at a force of 600 pN, ssDNA is fully stretched, and the distance between two neighboring phosphates is 0.7 nm.

Base Stacking and Stability



P



ϕ

Duplex	**T_m (°C)**	**ΔG_{melt} ($^{kcal}/_{mol}$)**
5′ CTTTTC**T**TTCTT 3′ GAAAAG**A**AAGAA	43.2	12.6
5′ CTTTTCϕTTCTT 3′ GAAAAGAAAGAA	22.0	7.0
5′ CTTTTCϕTTCTT 3′ GAAAAG**P**AAGAA	41.6	12.1

Matray and Kool (1998) *JACS* 120, 6191

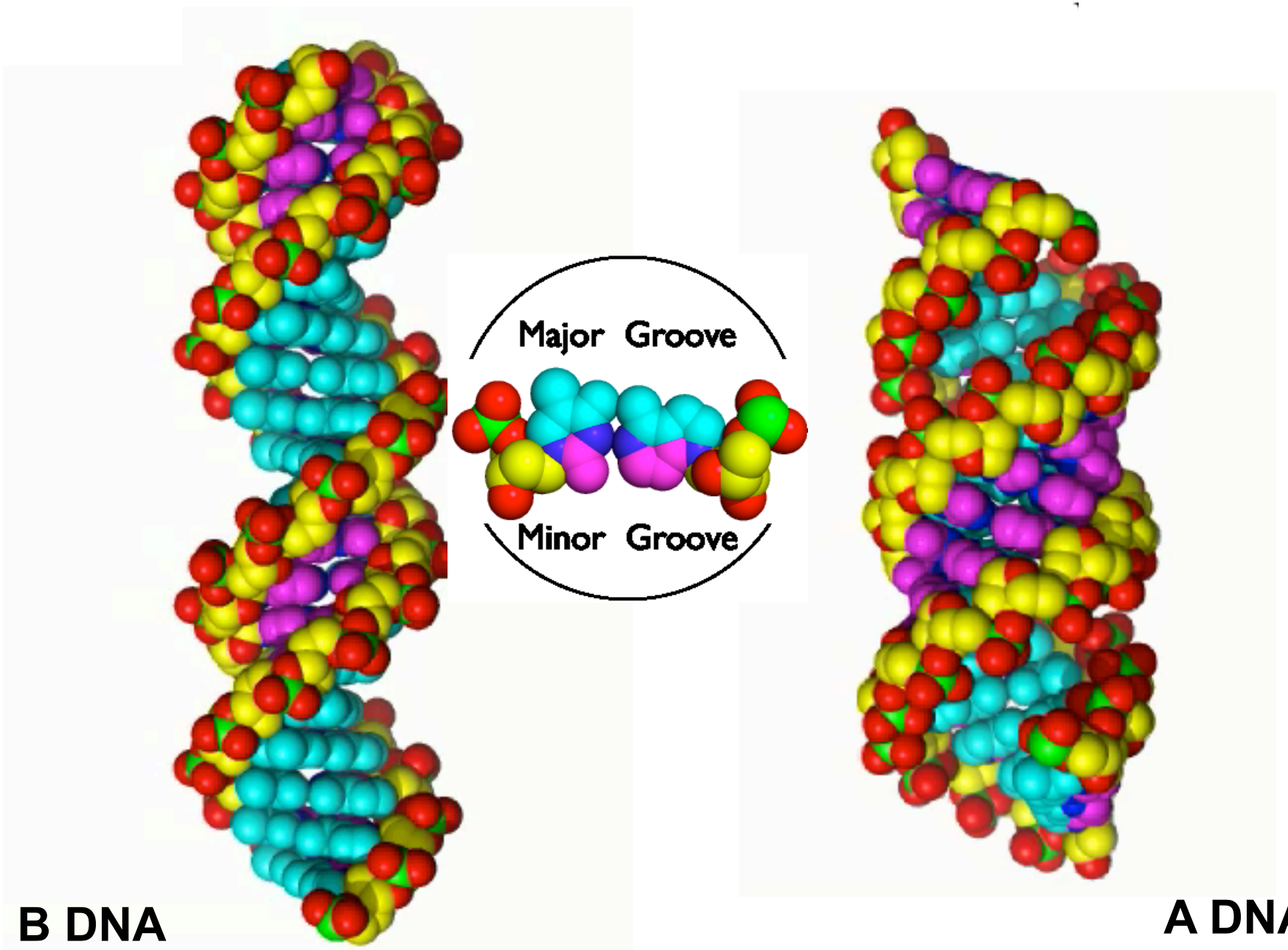
The Overhang Experiment

5′- XCGCGCG

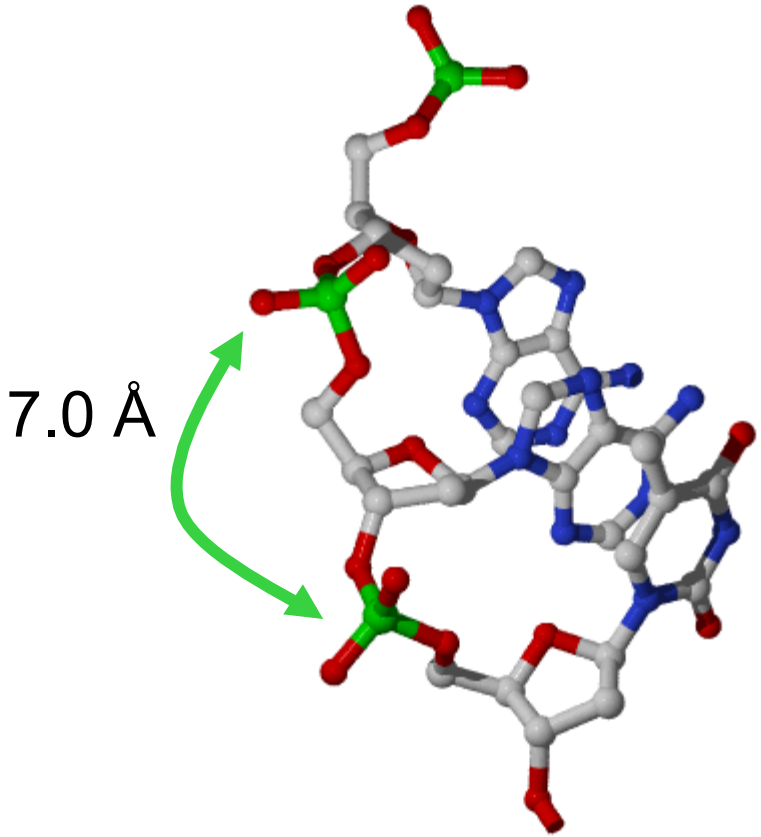
GCGCGCX — 5′

X	T_m (°C)	ΔH_{melt} (kcal/mol)	ΔS_{melt} (cal/molK)	$\Delta\Delta G_{melt}$ (kcal/mol)
None	41.7	45.9	122	-
Thymine	48.1	47.9	125	1.1
Cytosine	46.2	50.4	133	1.0
Adenine	51.6	54.7	144	2.0
Guanine	51.5	43.3	109	1.3
Benzene	48.3	51.4	135	1.4

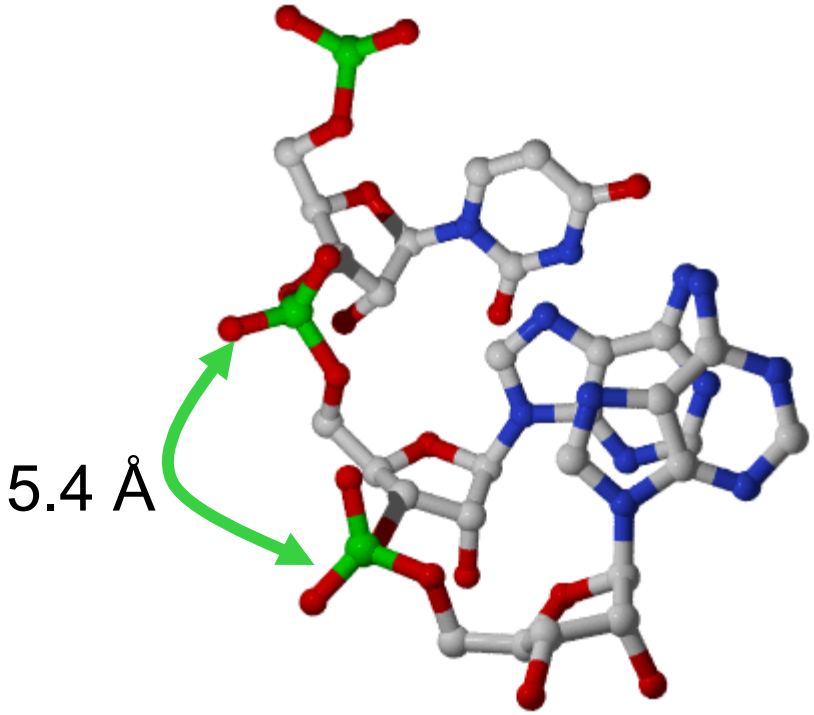
J. Am. Chem. Soc. 1996, 118, 8182-8183.


Major Groove
Minor Groove
B DNA
A DNA

Phosphate Separation

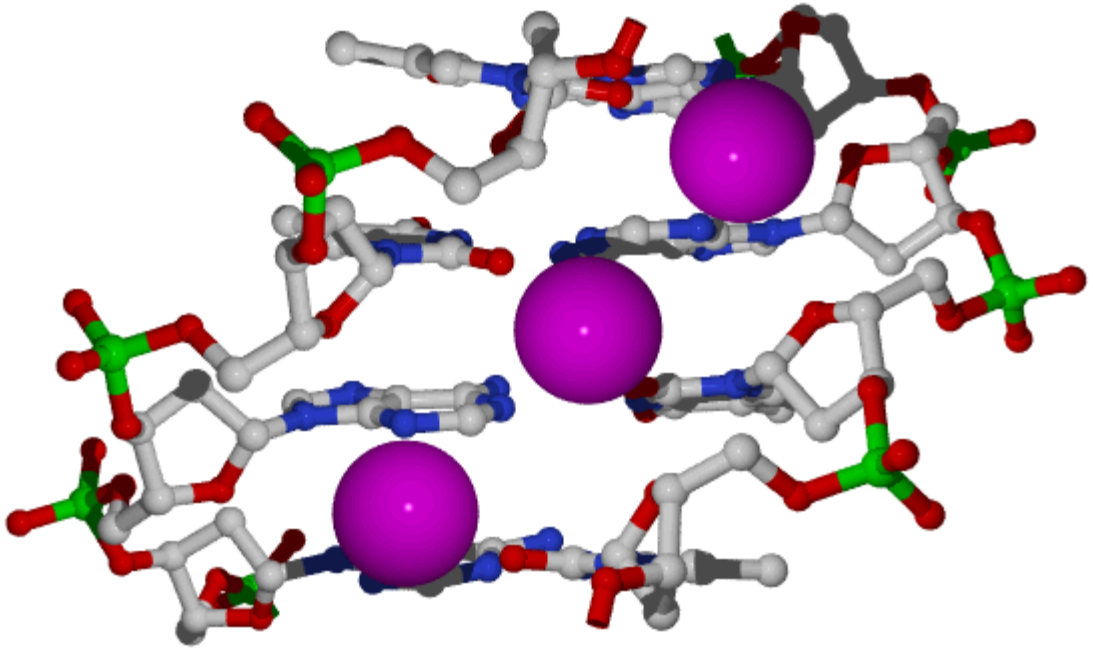


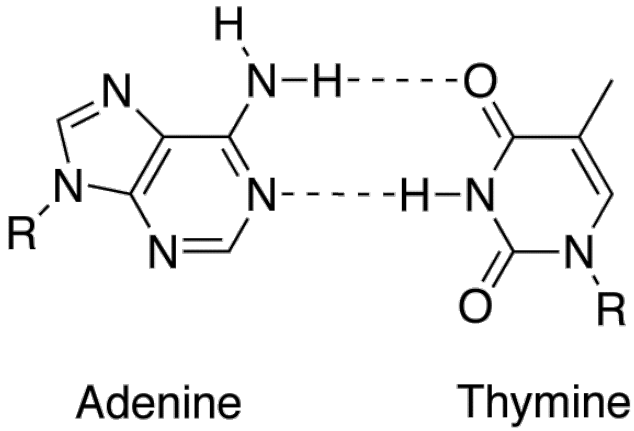
B-conformation



A-conformation

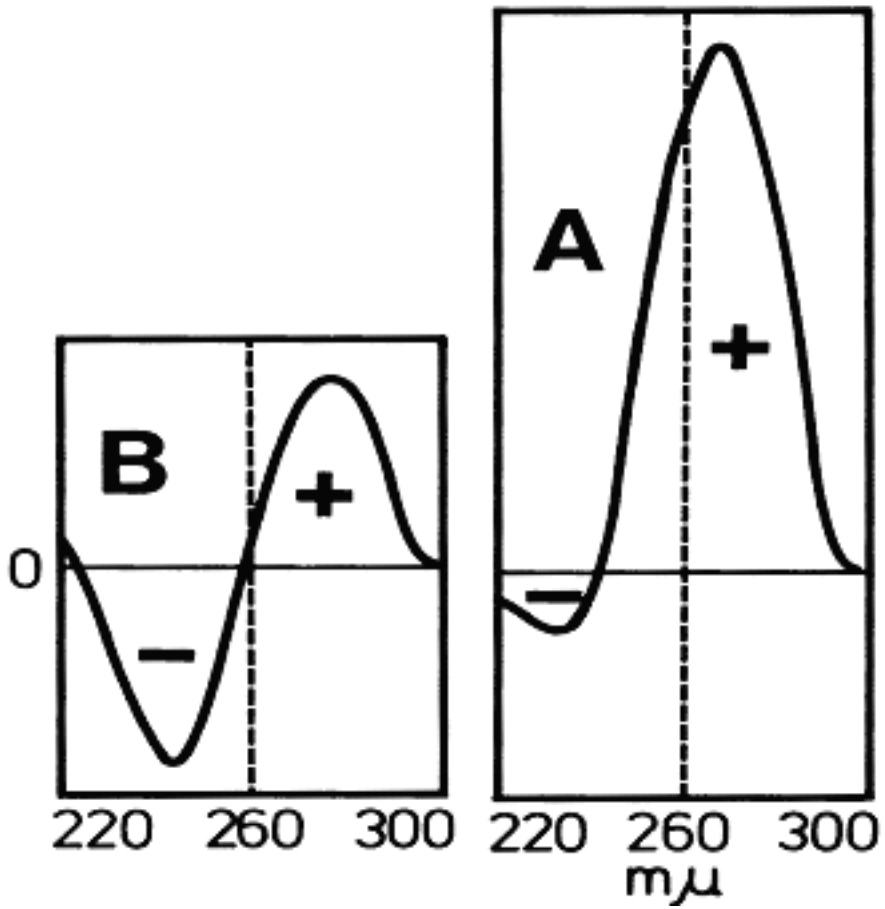
Spine of Hydration in AT rich DNA





Adenine Thymine

CD Spectra of DNA



Proc. Natl. Acad. Sci. USA
Vol. 92, pp. 6464–6468, July 1995
Biophysics

An A-DNA triplet code: Thermodynamic rules for predicting A- and B-DNA

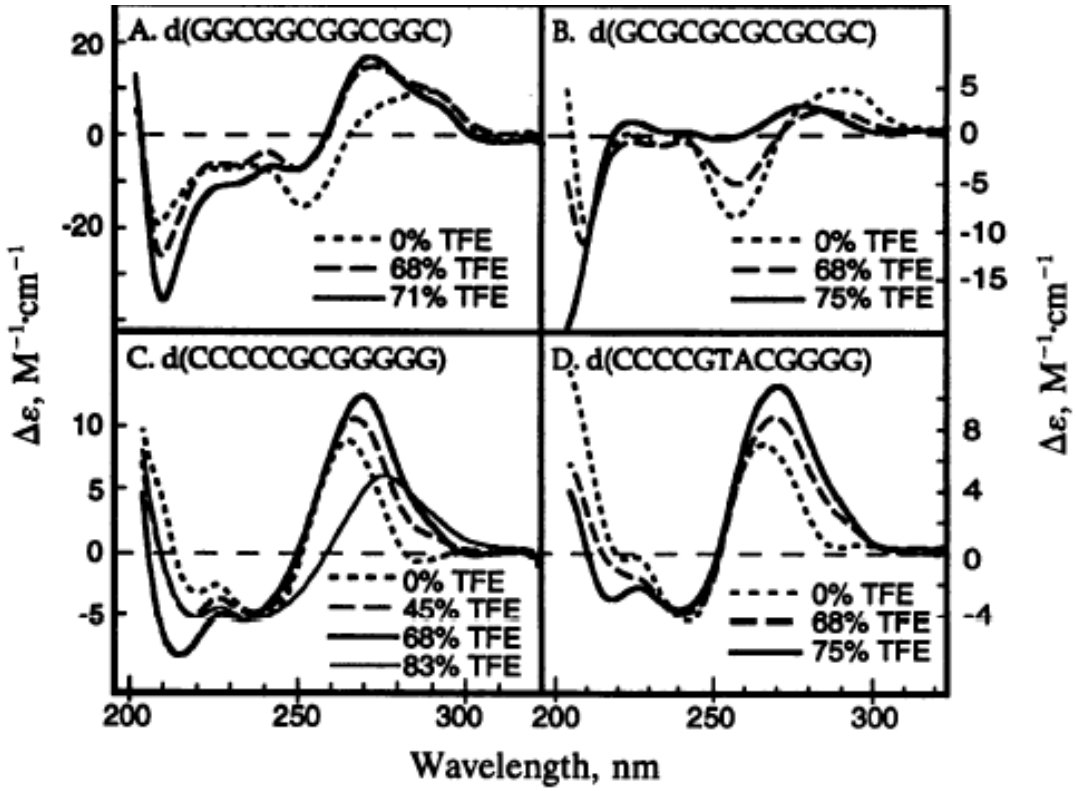
(DNA structure/structure prediction/crystallography/circular dichroism/spectroscopy)

BETH BASHAM, GARY P. SCHROTH, AND P. SHING HO*

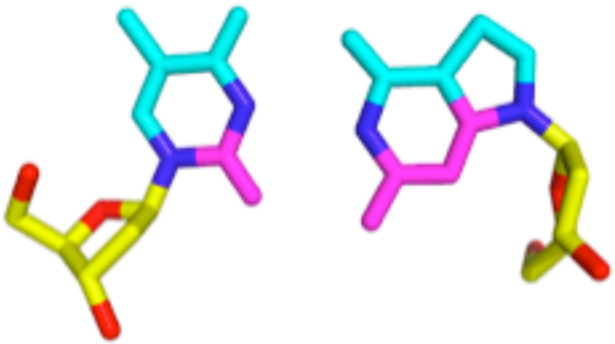
Table 5. Conformations of dodecanucleotides in aqueous solution (0% TFE) and in high concentrations of TFE (concentrations shown in parentheses)

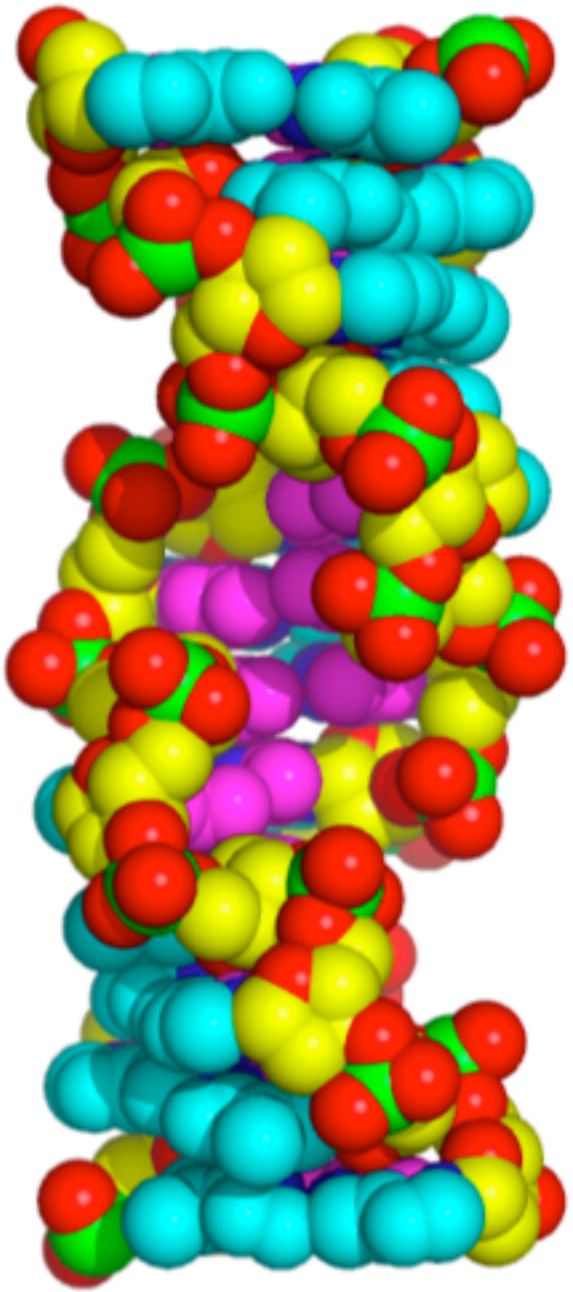
Sequence	APE	DNA conformation		
		Predicted	0% TFE	High TFE
d(GGCGGCGGCGGC)	0.10	B	B	A (71%)
d(GCGCGCGCGCGC)	0.71	B	B	Z (75%)
d(CCCCCGCGGGGG)	−0.15	A	A-like	A (68%)
d(CCCCGTACGGGG)	−0.03	A	A-like	A (75%)

APE=A-DNA Propensity
Related to $\Delta G_{solvation}$(B➔A)

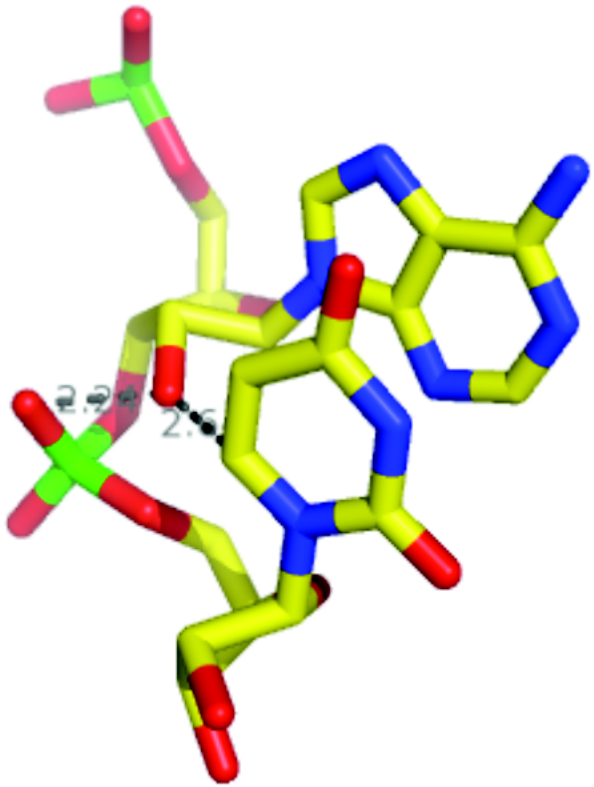


Z DNA

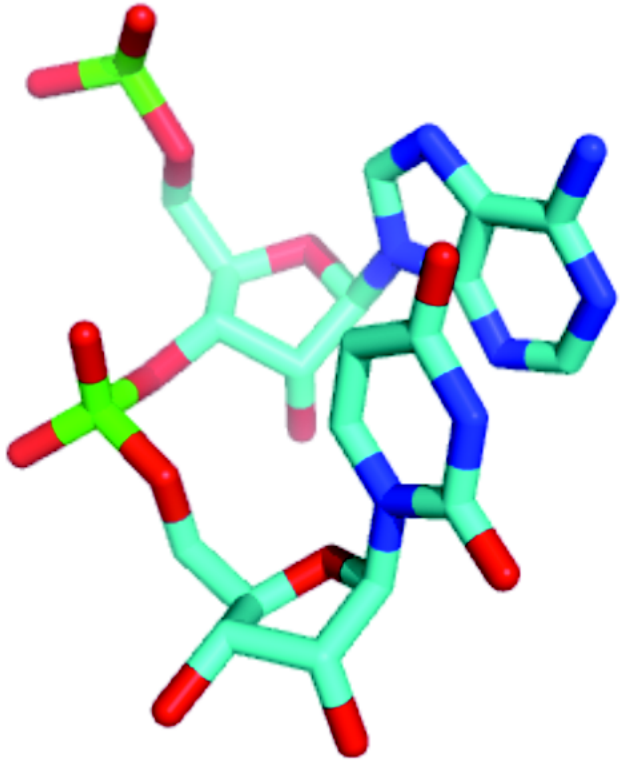




RNA is Always in A Conformation



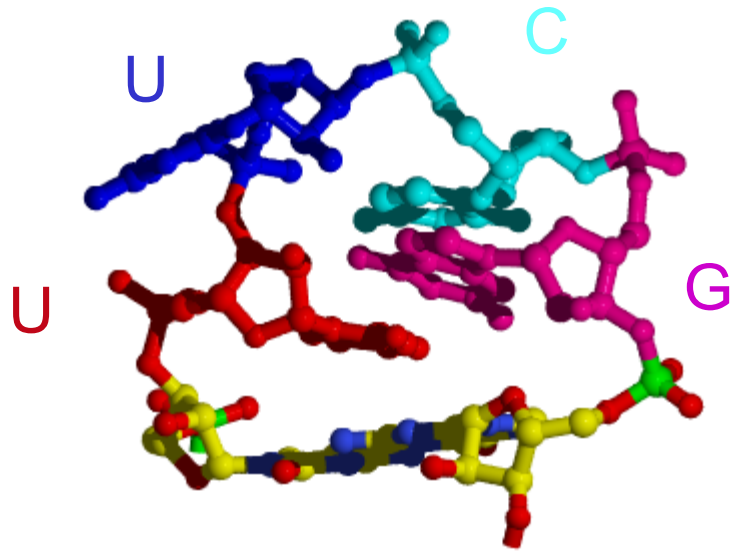
B-RNA

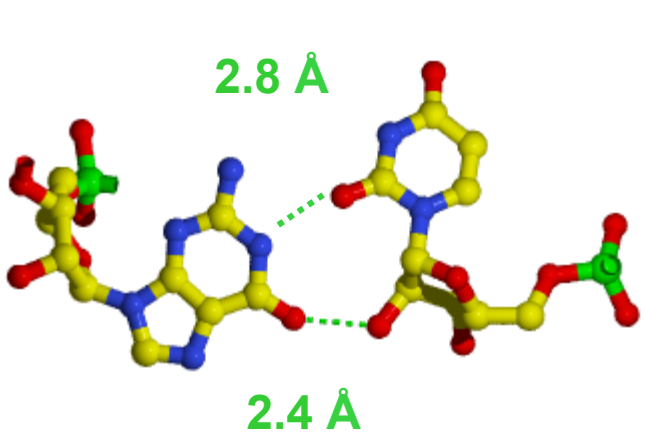


A-RNA

UUCG Tetraloop

Loop	T_m (˚C)	ΔH˚ ($^{kcal}/_{mol}$)	ΔG˚ ($^{kcal}/_{mol}$)
G(UUCG)C	60.1	-48.6	-3.4
G(UUUG)C	51.1	-39.2	-1.7
G(UUUU)C	51.5	-38.2	-1.7
G(CUCG)C	62.4	-47.5	-3.6
deoxy - G(TTCG)C	44.7	-31.2	-1.4





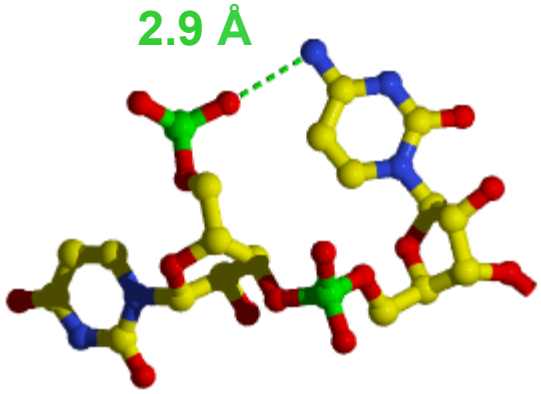
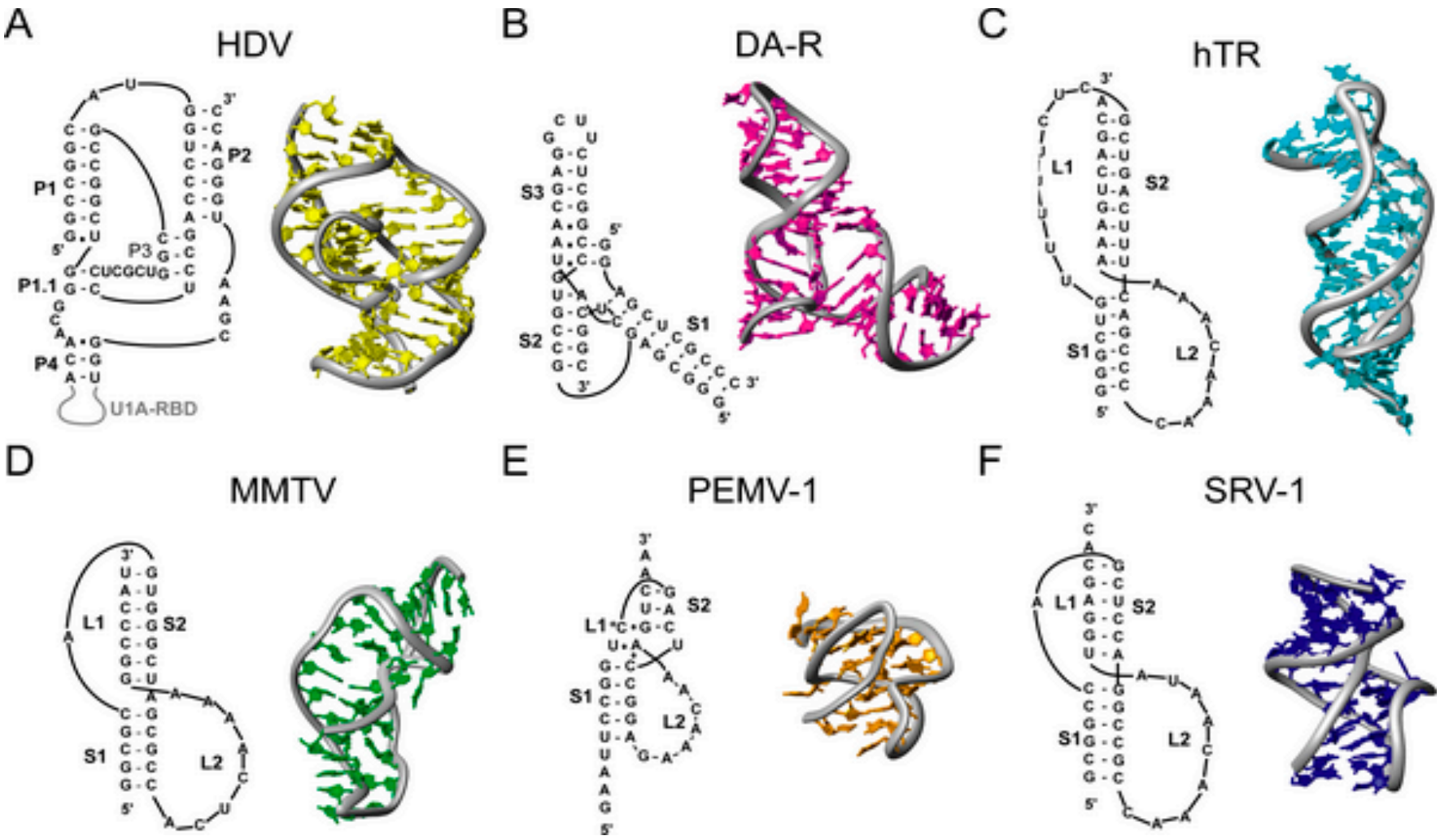


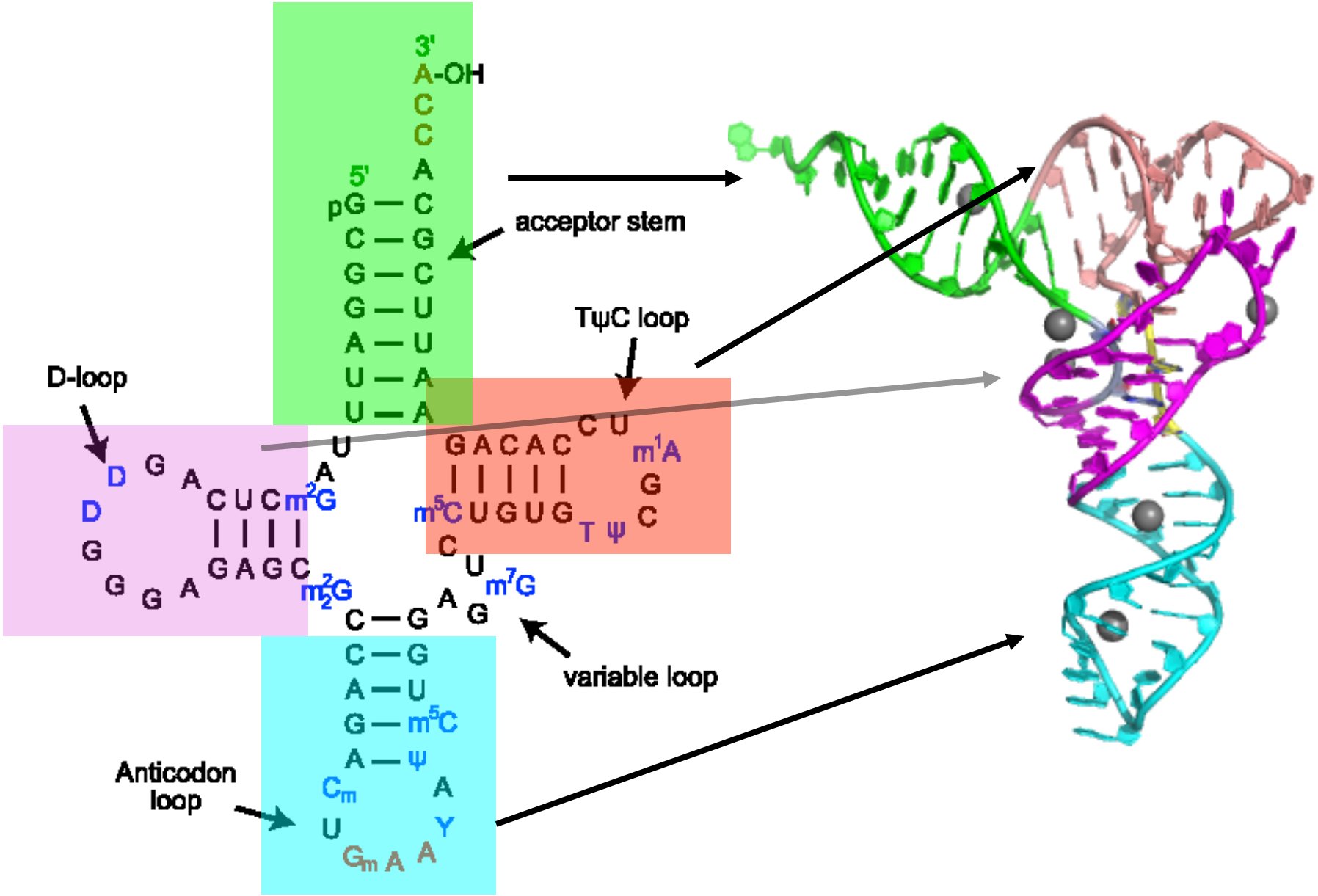
Figure 2. Sequences and Structures of RNA Pseudoknots



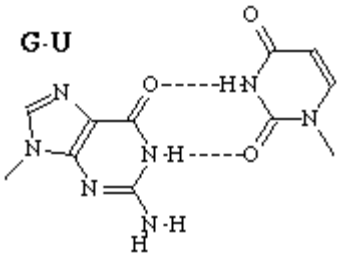
Staple DW, Butcher SE (2005) Pseudoknots: RNA Structures with Diverse Functions. PLoS Biol 3(6): e213. doi:10.1371/journal.pbio.0030213

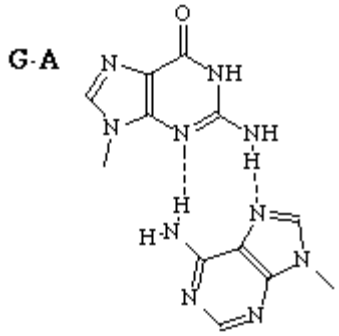
http://www.plosbiology.org/article/info:doi/10.1371/journal.pbio.0030213

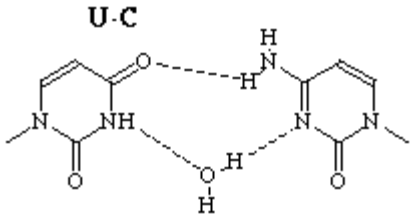
tRNA Structure

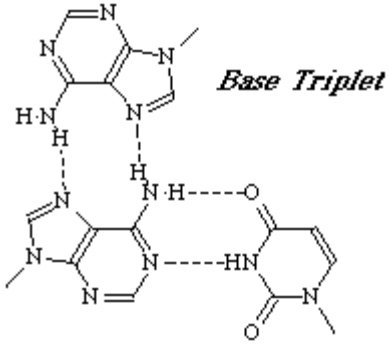


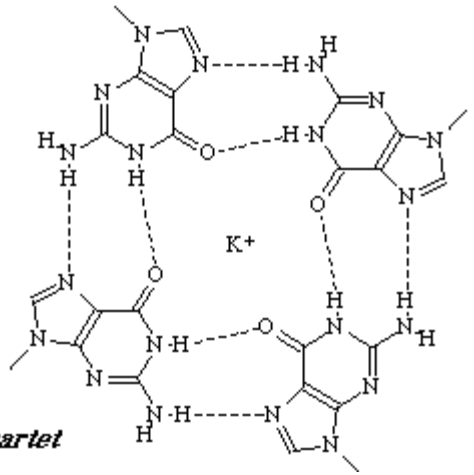
Non Watson-Crick Base Pairs



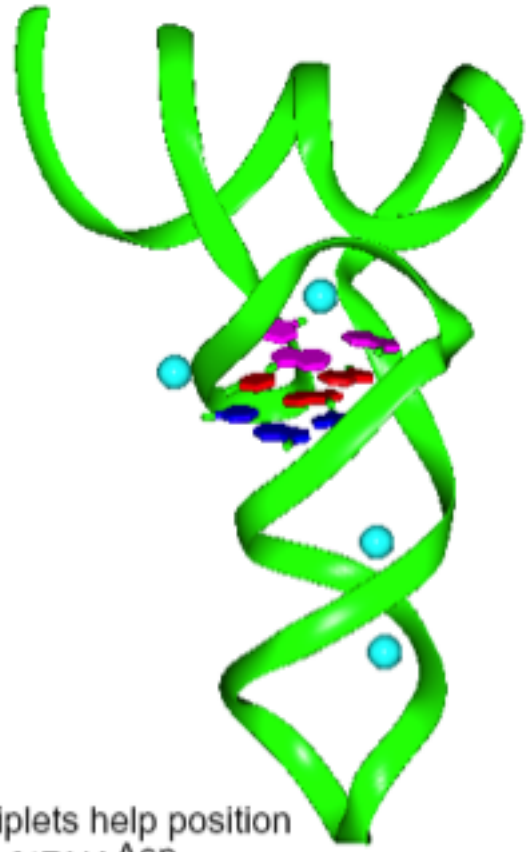




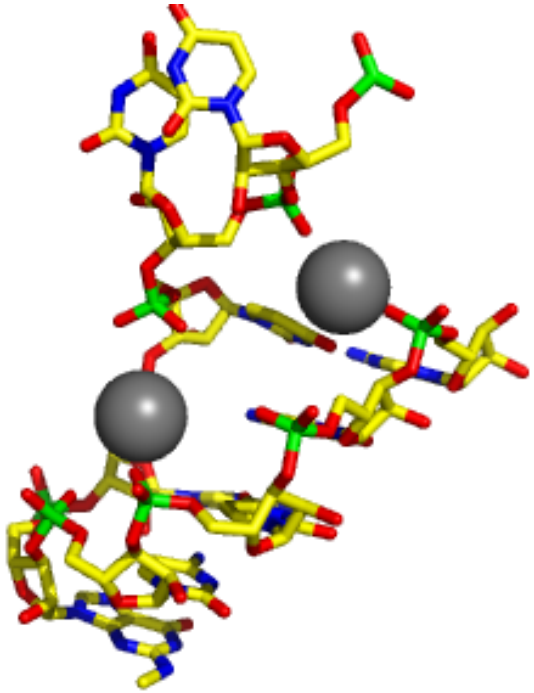




Tertiary Structure in RNA



Base triplets help position D arm of $tRNA^{Asp}$.



Mg^{2+} stabilizes dense phosphates