"МИС-РТ"-2021 Сборник №78-1-1 http://ikar.udm.ru/mis-rt.htm

Water may participate in the formation of proton wires in DNA grooves

Publications: dnaresonance.org

Presented by Elena Naumova and Max Rempel max@dnaresonance.org

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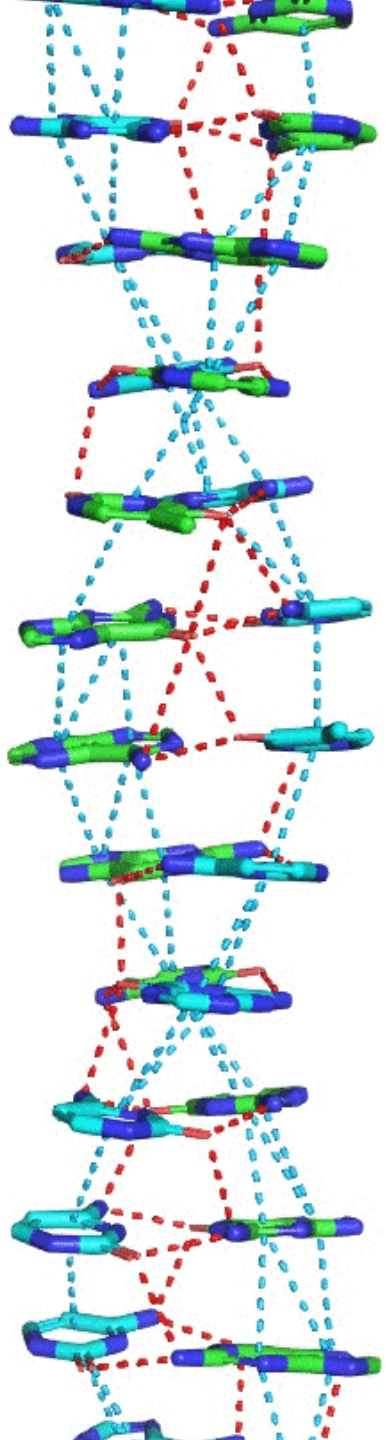
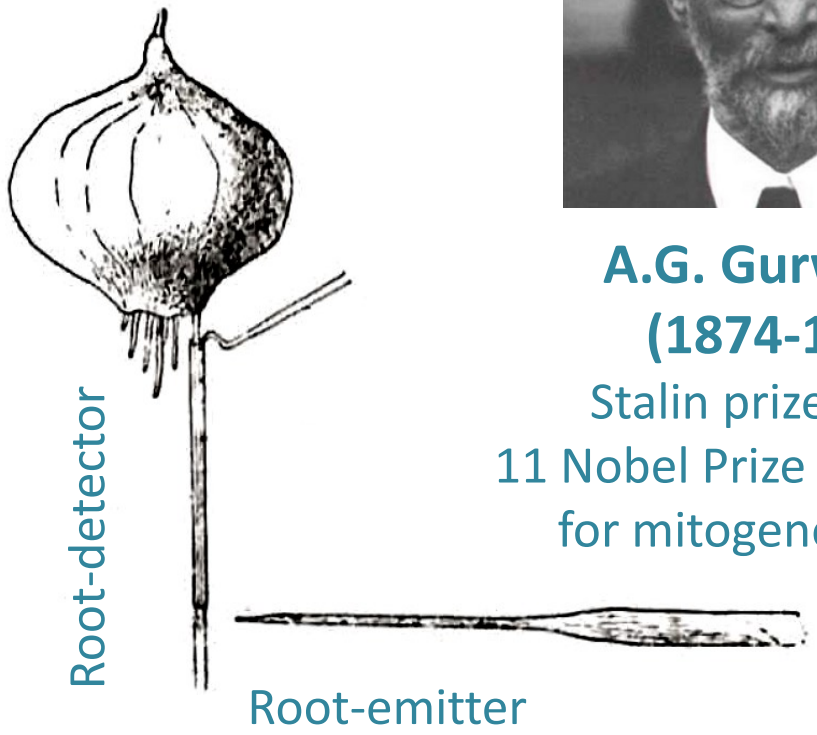
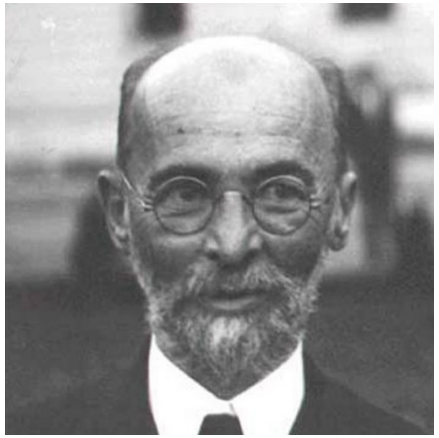


Morphogenetic field and electromagnetic signaling

Gurwitsch's onion experiment



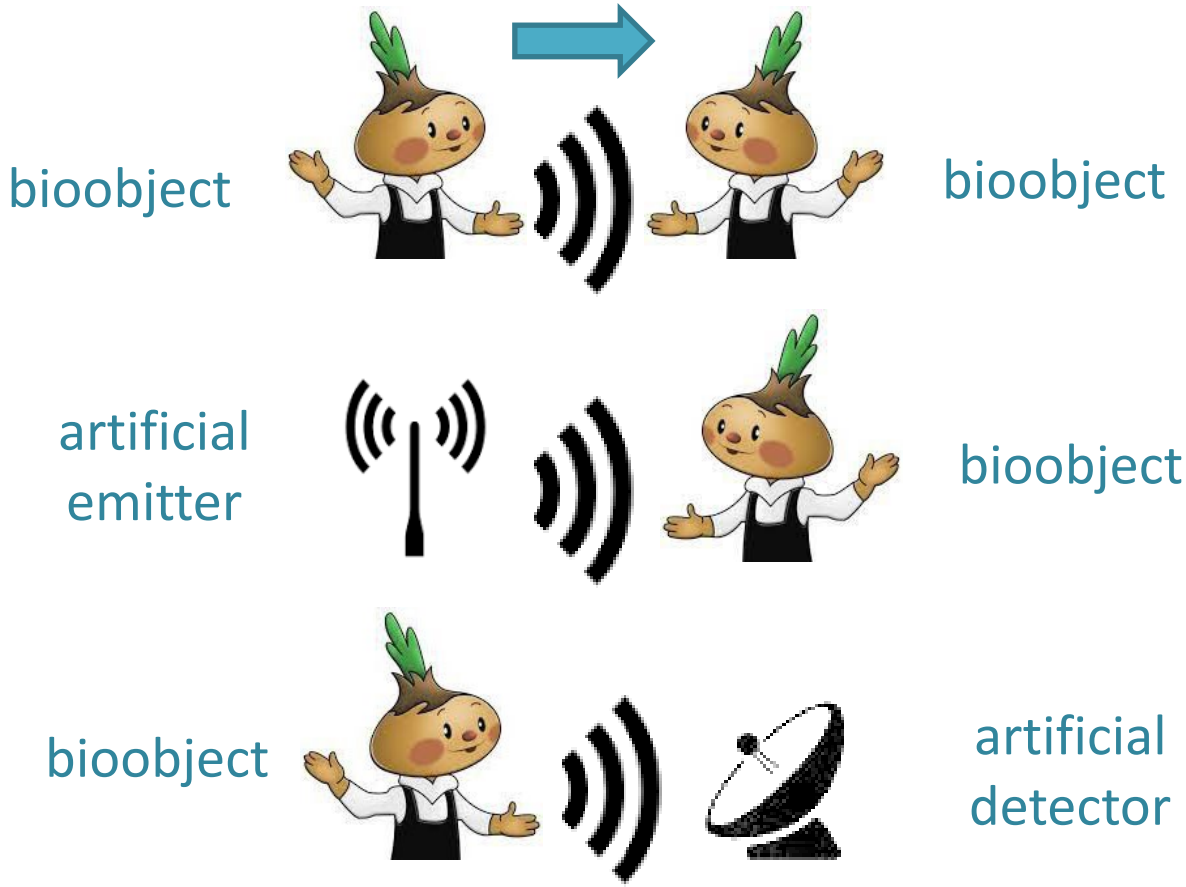


A.G. Gurwitsch (1874-1954)

Stalin prize (1941),
11 Nobel Prize nominations
for mitogenetic effect

Morphogenetic field concept: 1912
Mitogenetic effect: stimulation of mitoses by UV-emission from growing tissue, 1923

Experiments :

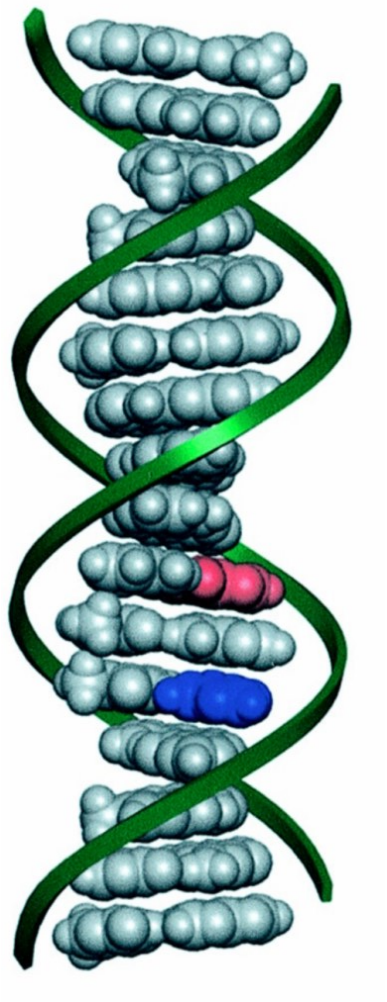


What could be a transmitter and a receiver in an alive object?

DNA as a source and target of electromagnetic signaling

Based on the observed effects A.G. Gurwitsch hypothesized "the existence of some sort of the equivalent of chromosomes after their complete optical fading during interkinesis" (Gurwitsch, 1944)

Dr. Richard Alan Miller, coauthor, in 1972 proposed that DNA creates morphogenetic field



Why DNA?

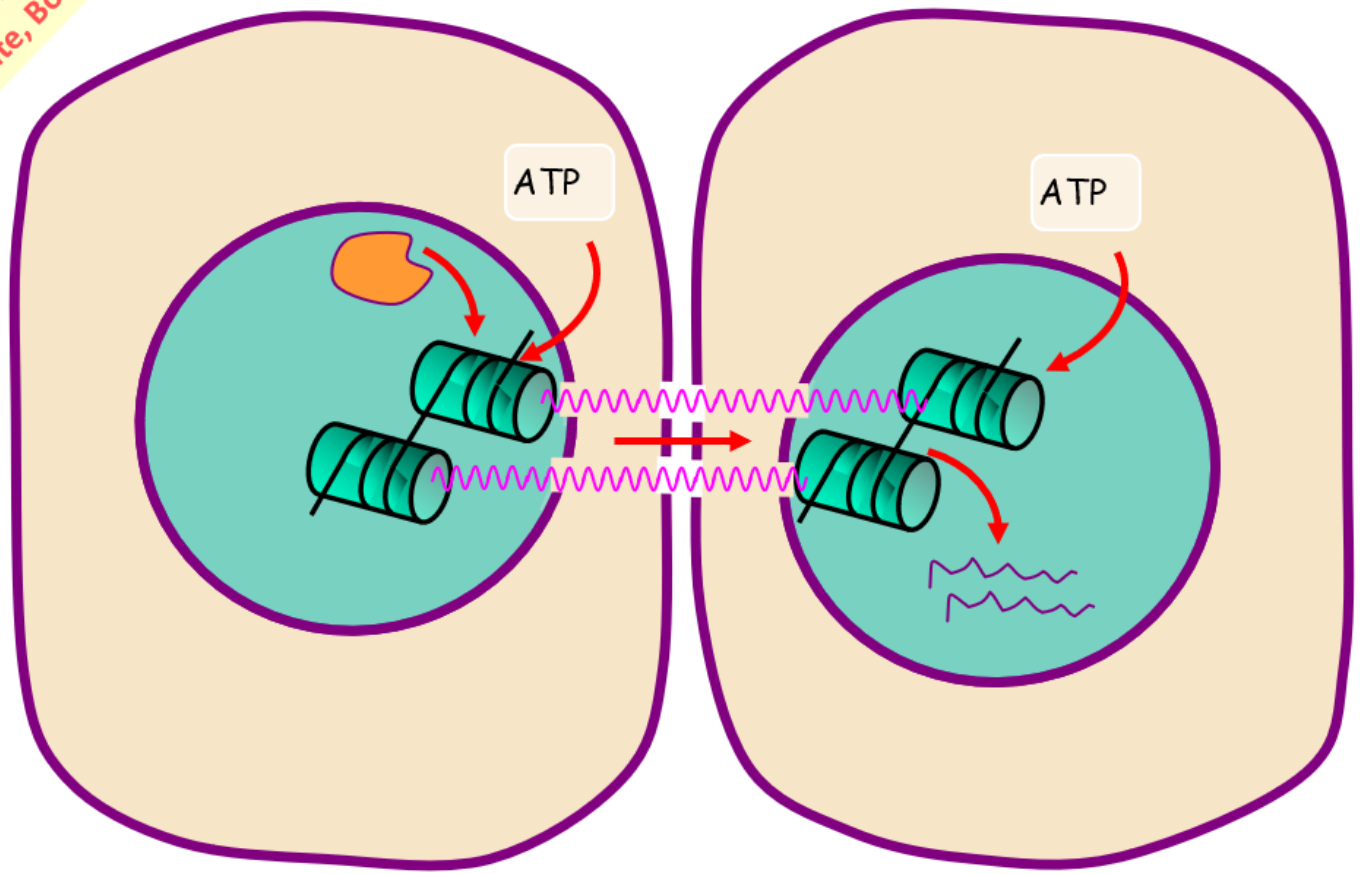
- DNA is the most stable and conservative macromolecule
- DNA determines all the basic processes in the cell
- DNA is reproduced with incredible precision
- DNA comprises a substantial amount of the body

Which DNA substructures oscillate? What is the mechanism of oscillation?

A Slide from 2003 talk in Forsyth Institute, Boston

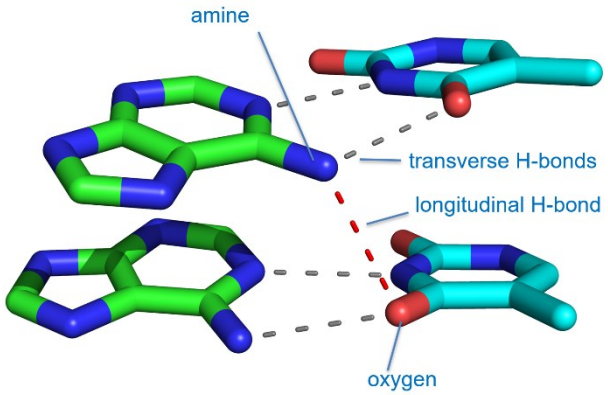
chromatin structures may transmit and receive electric signals

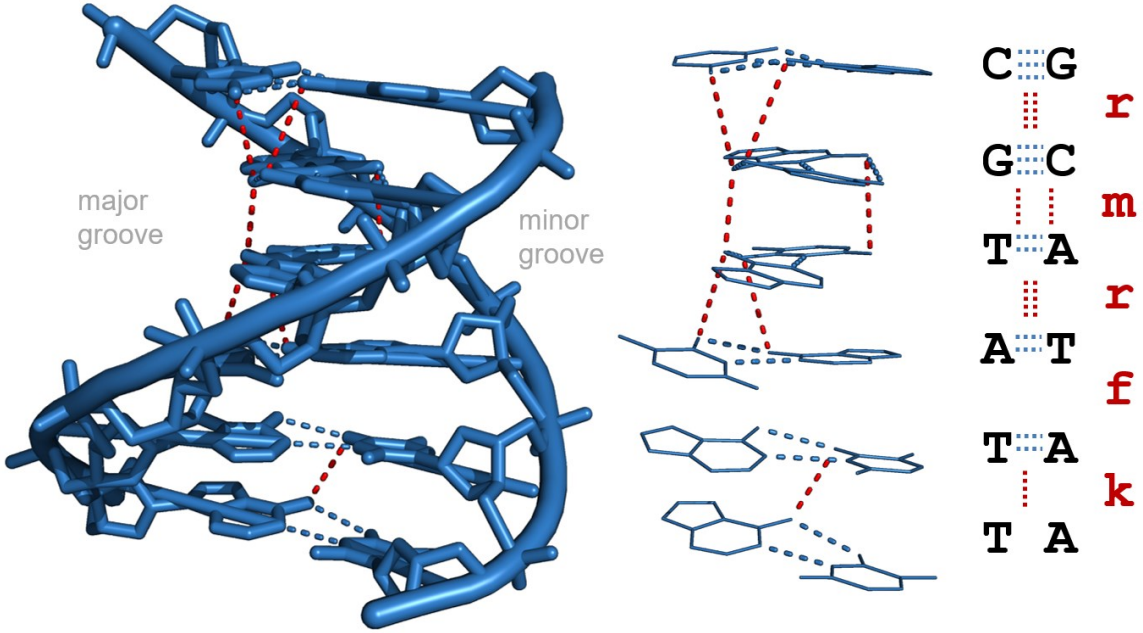
Max Rempel 2003



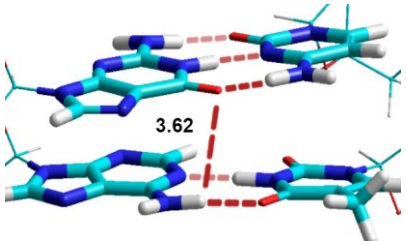
DNA RESONANCE

Longitudinal hydrogen bonds

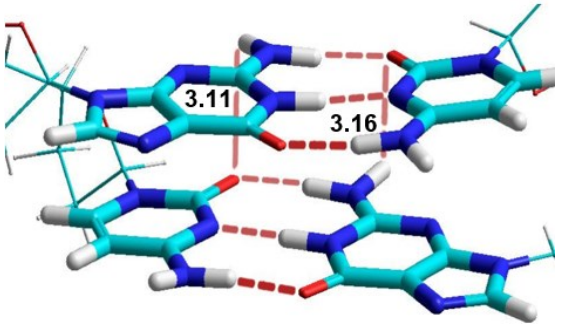




Dinucleotides have different longitudinal hydrogen bonds



GA



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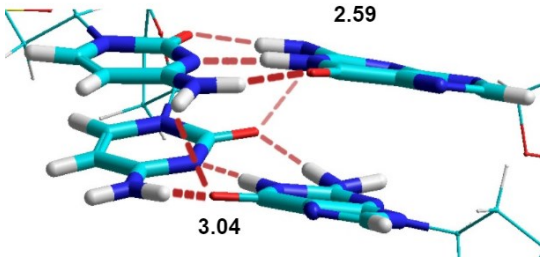
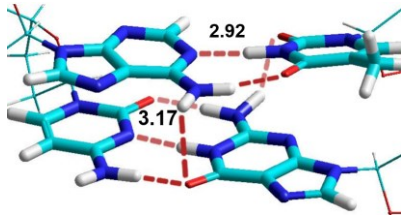
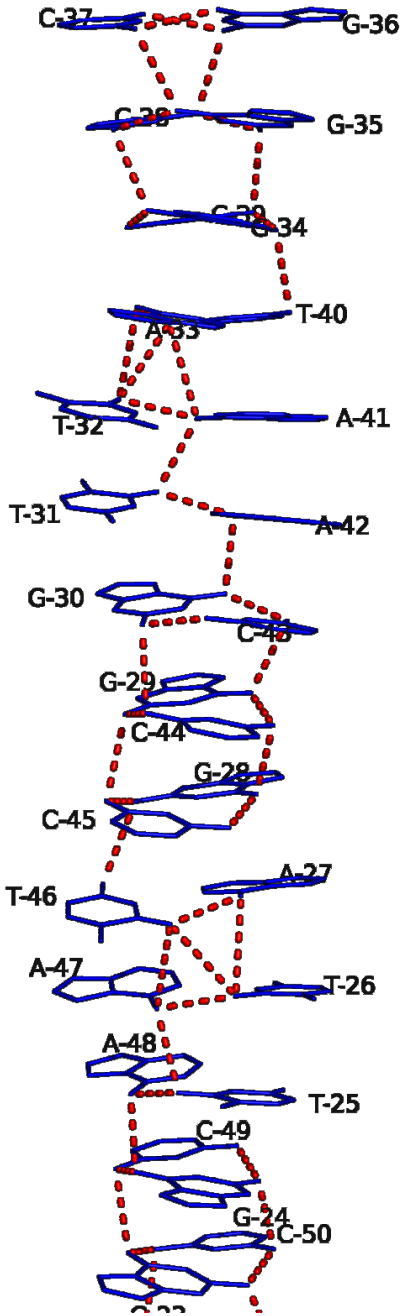


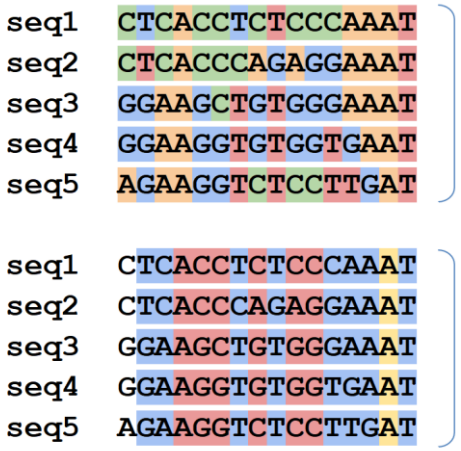
CC

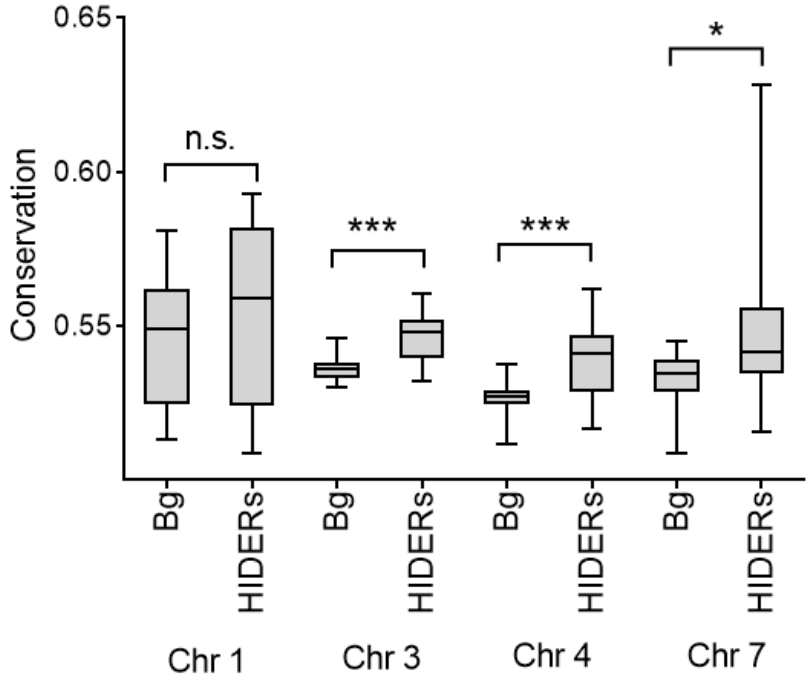


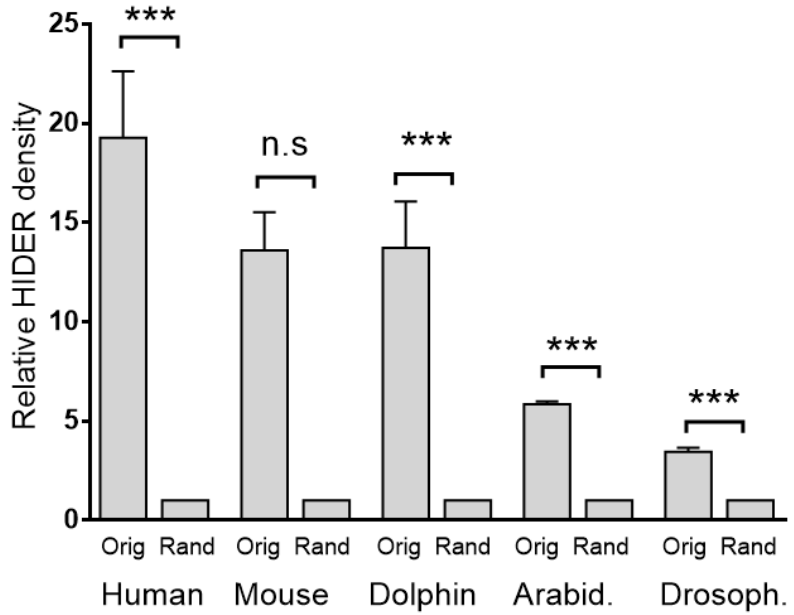
AC



Repetitive patterns of proton wires are enriched by evolution in all tested species







Repetitive patterns of proton wires are enriched in conserved regions

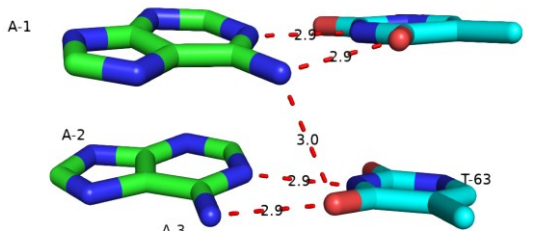
Rempel 2020 PMID: 32712047

Comparison of different methods of prediction

How flexible is B-form?

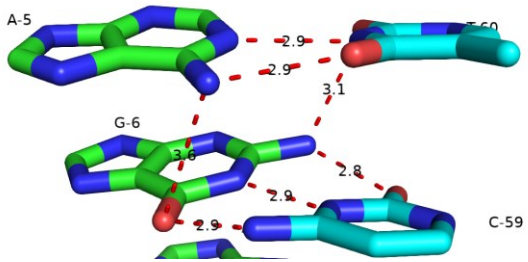
AA

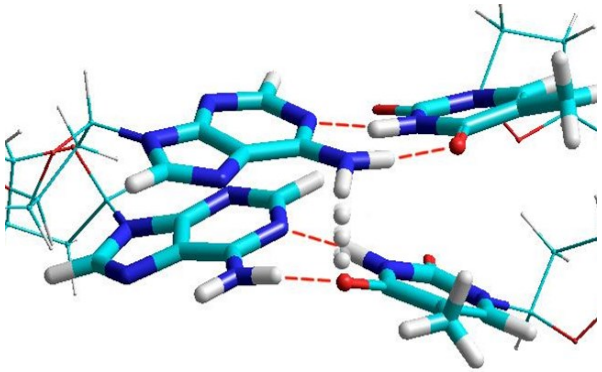
AG



stereometric

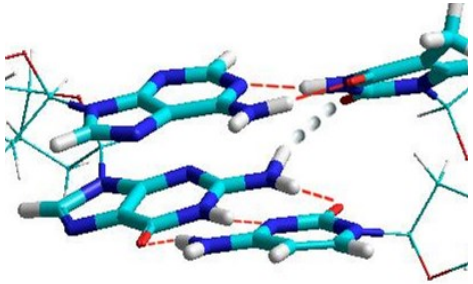
by distance

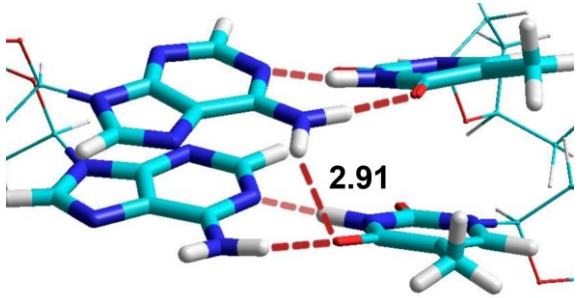




quantum chemical

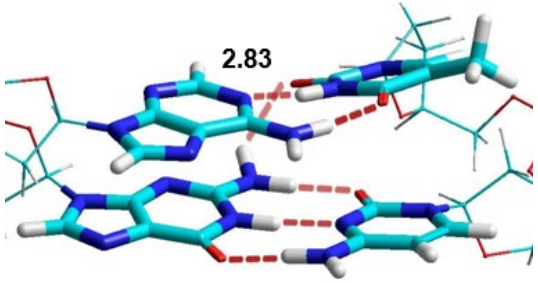
flexible model





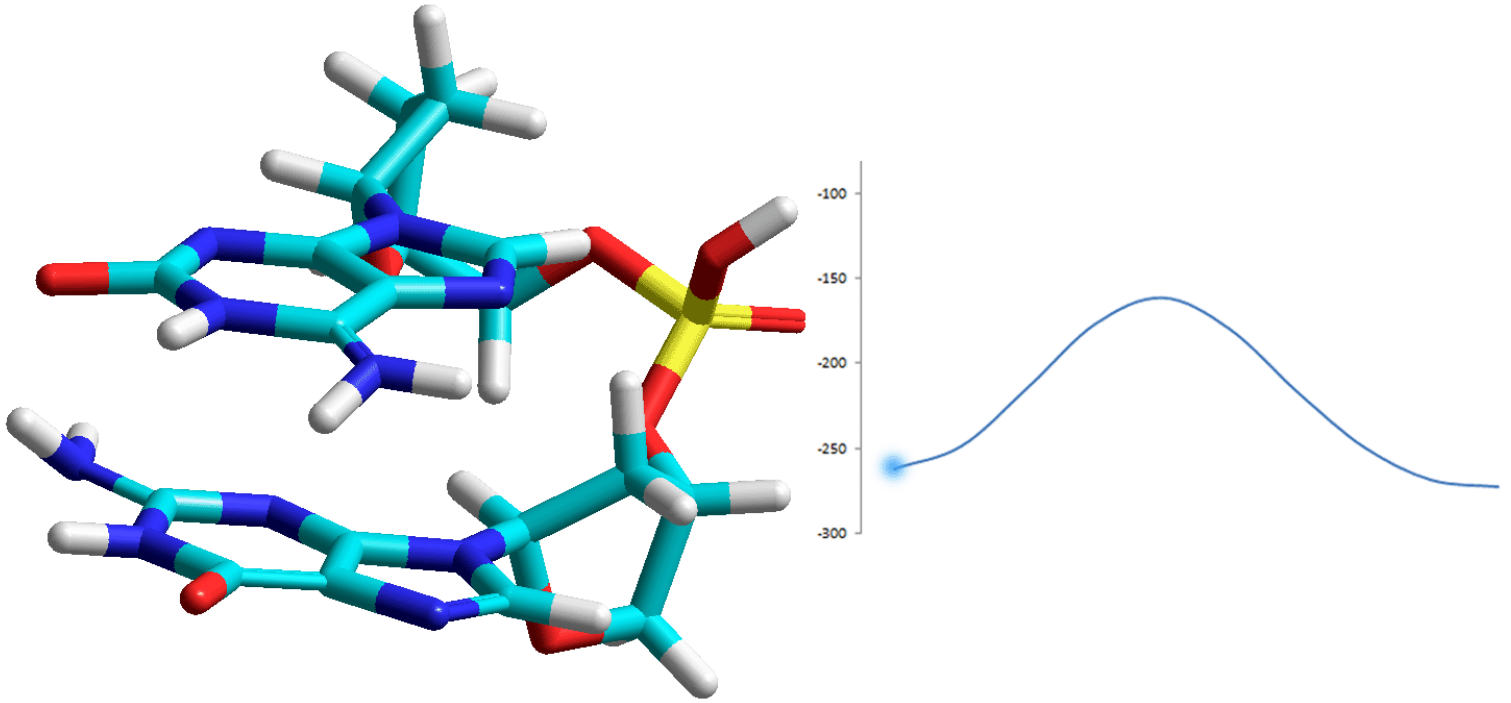
quantum chemical

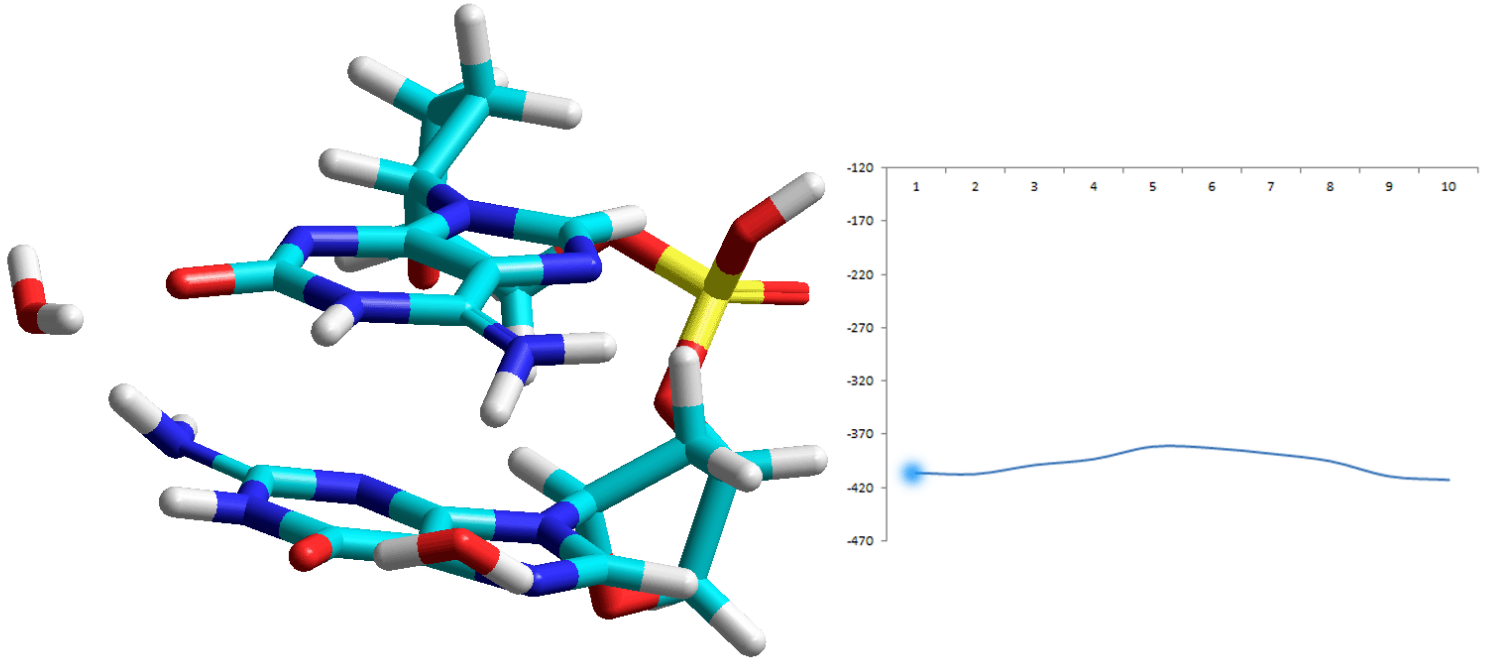
B form



complete agreement

partial agreement





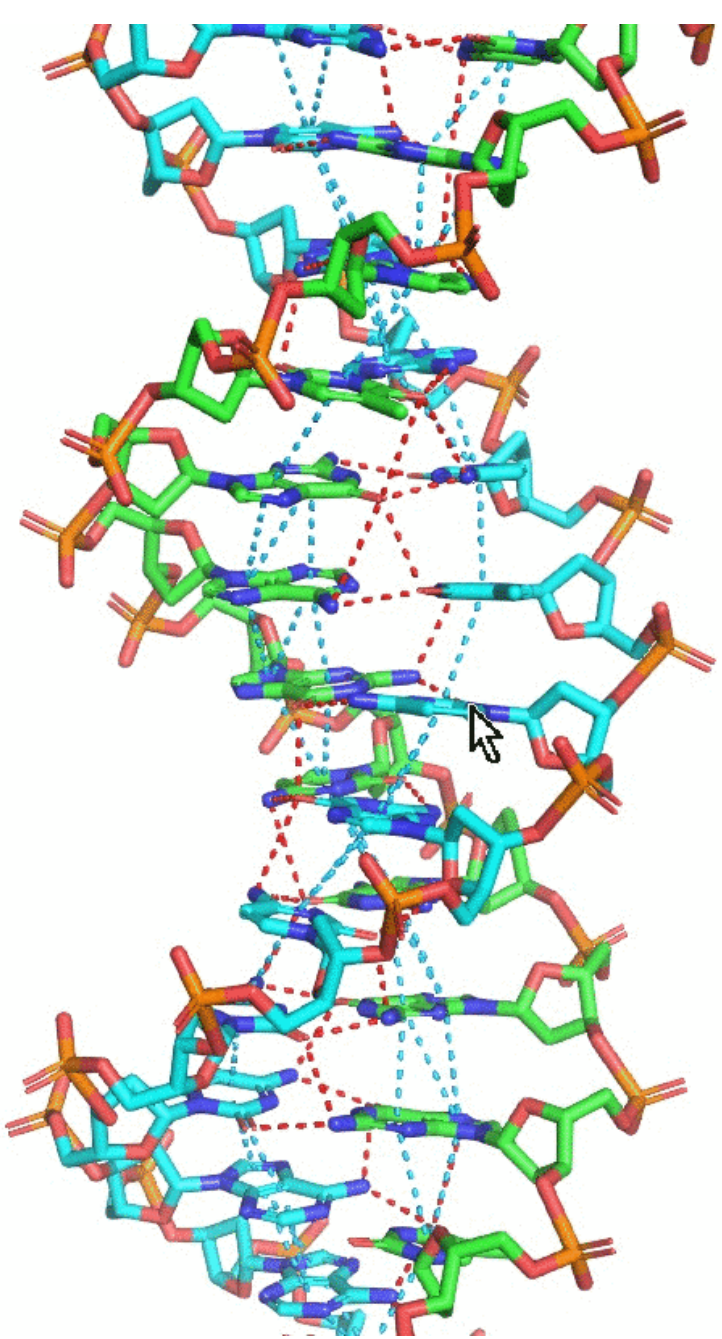
Does water mediate longitudinal proton jumping in DNA?

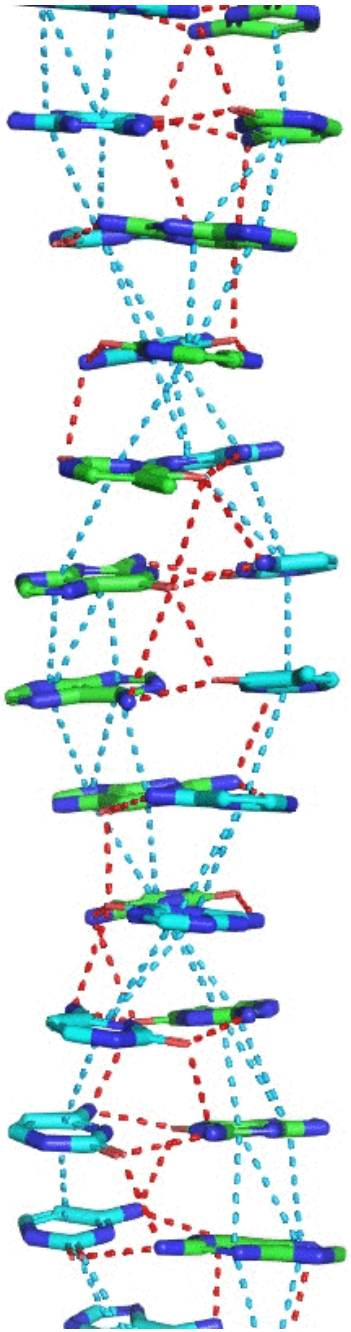
Method: Komarov, Samchenko. "Bi-Stability... Genomic DNA." *Russian Physics Journal* 63.8 (2020)

3.7A cutoff
for h-bonds

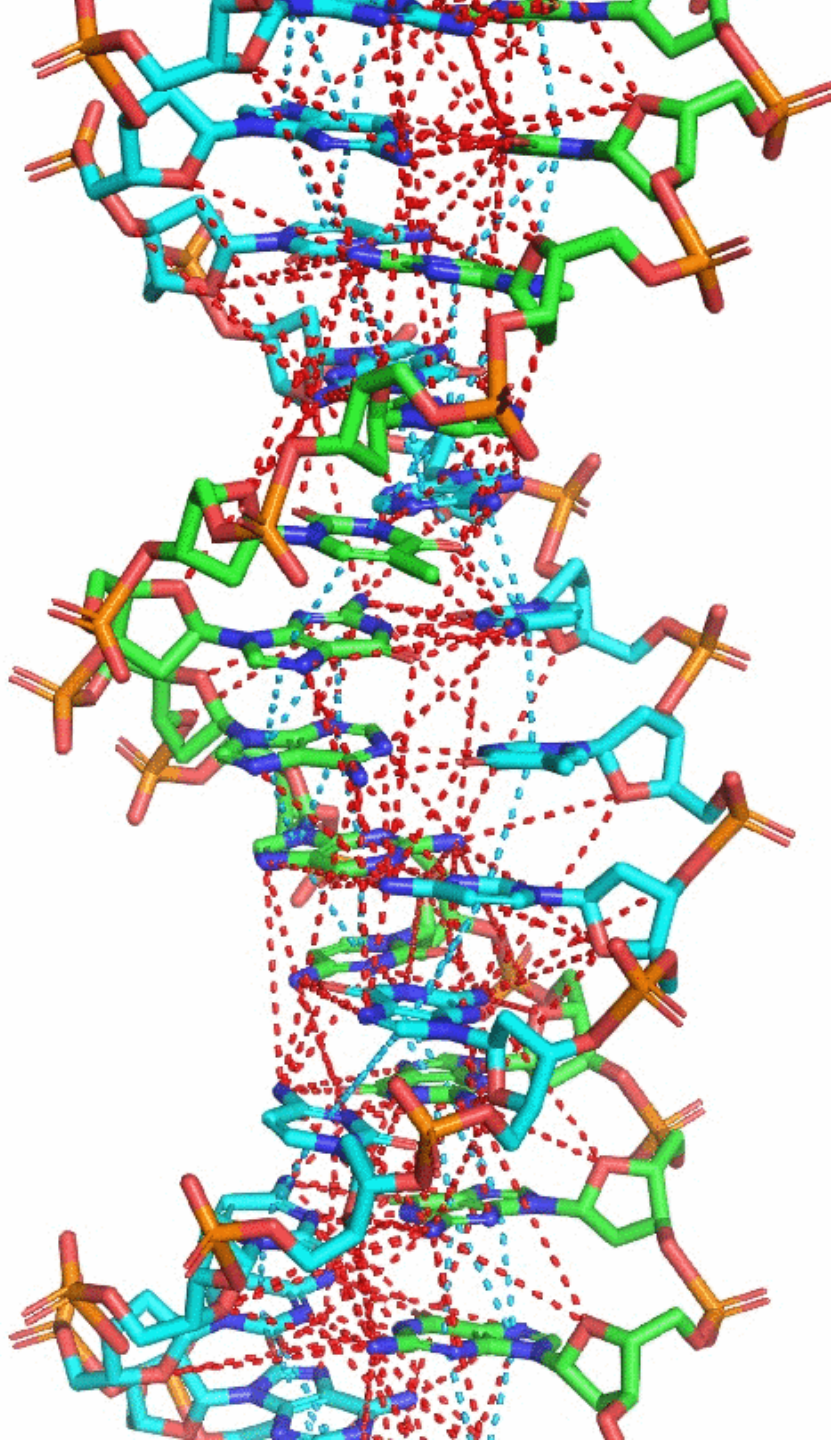
electron wires

proton wires





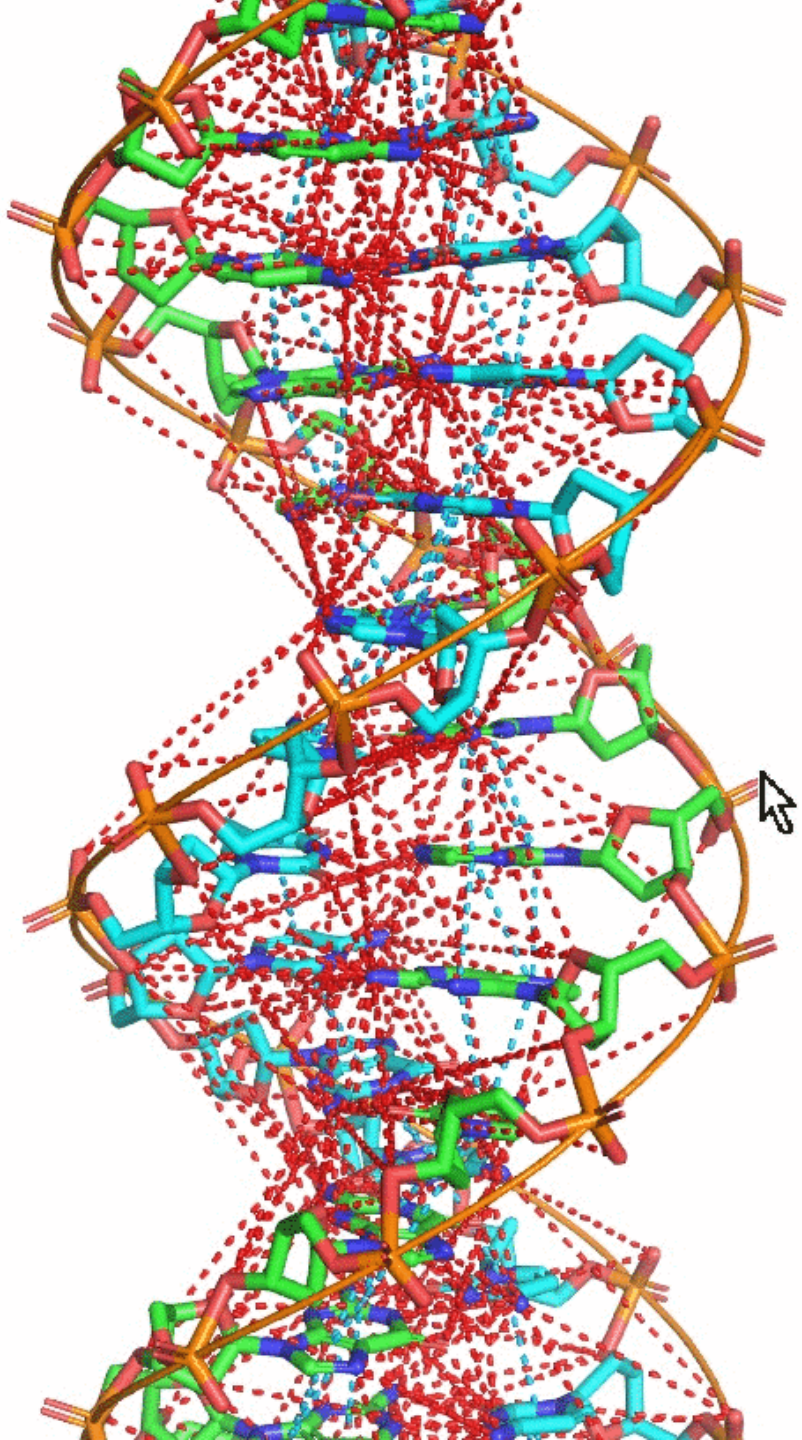
7.5A cutoff
for proton wires



electron wires

proton wires

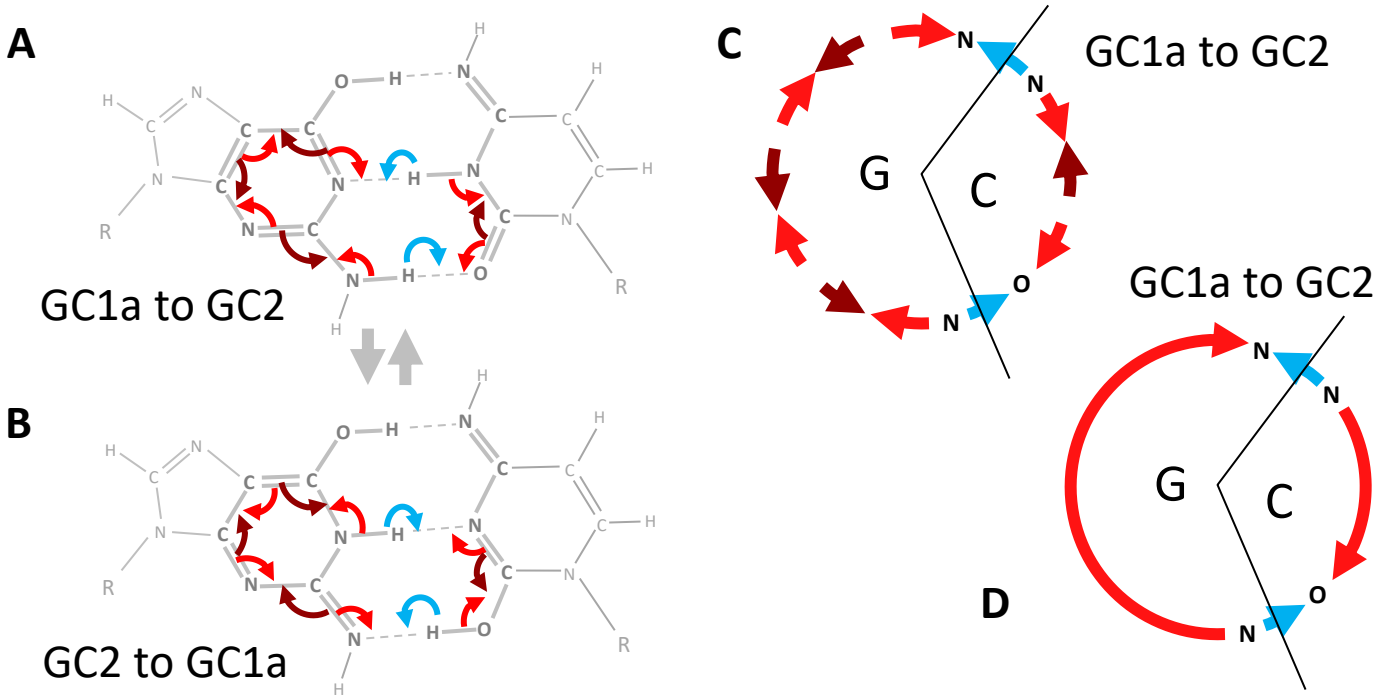
10A cutoff
for proton wires



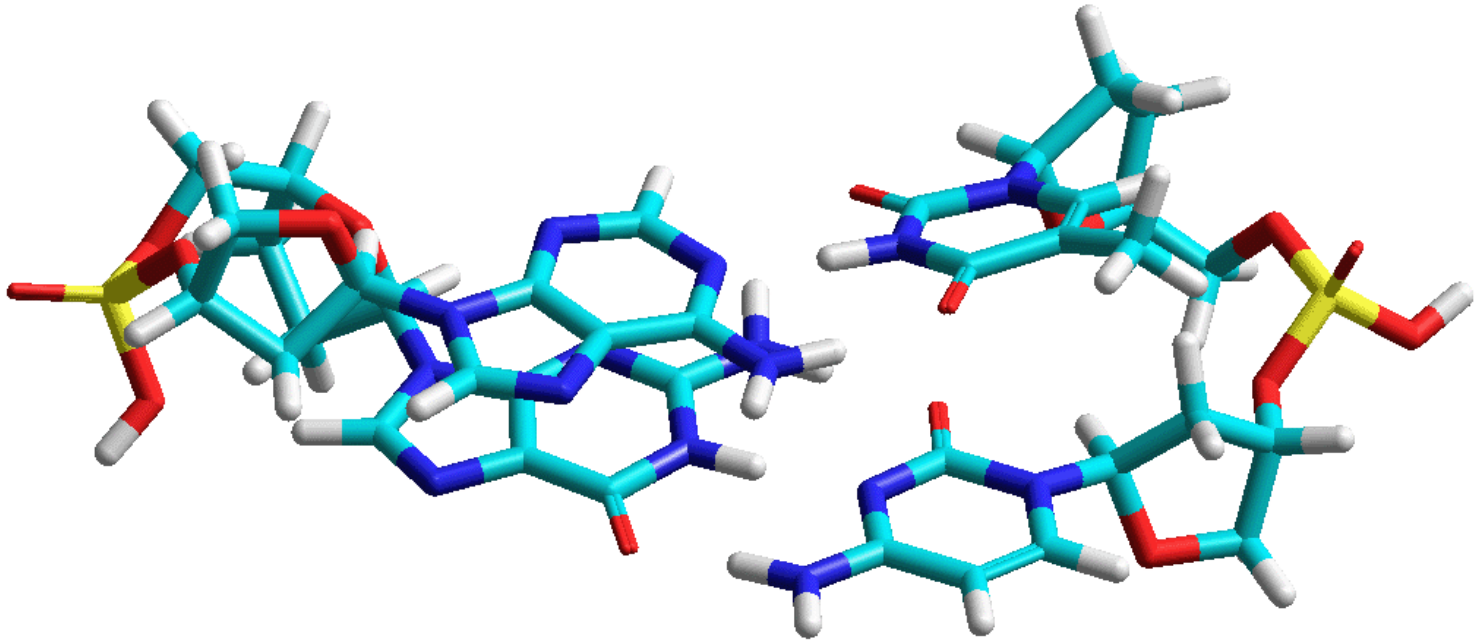
electron wires

proton wires

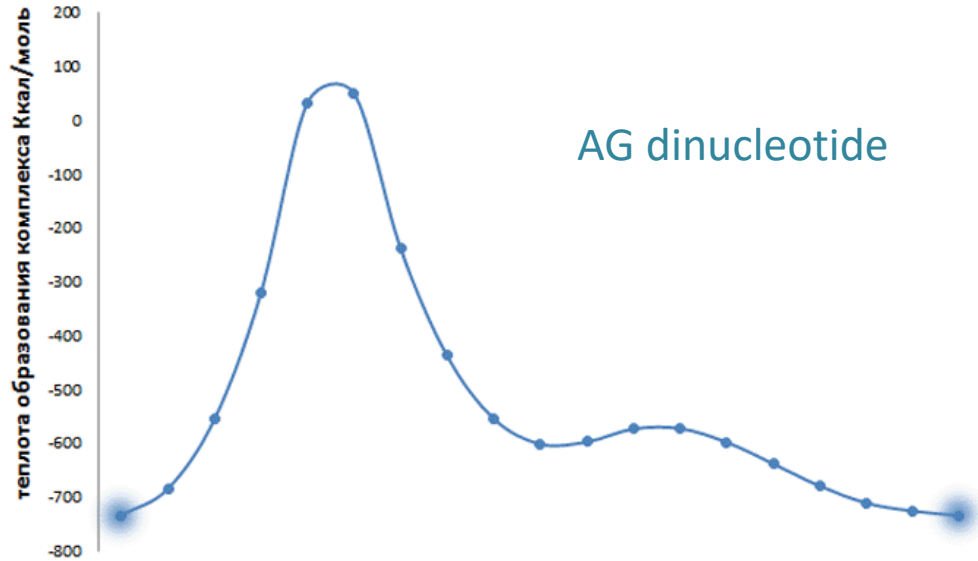
Oscillations of protons in tautomers and the requirement of neutrality



Proton jumps obey neutrality requirement



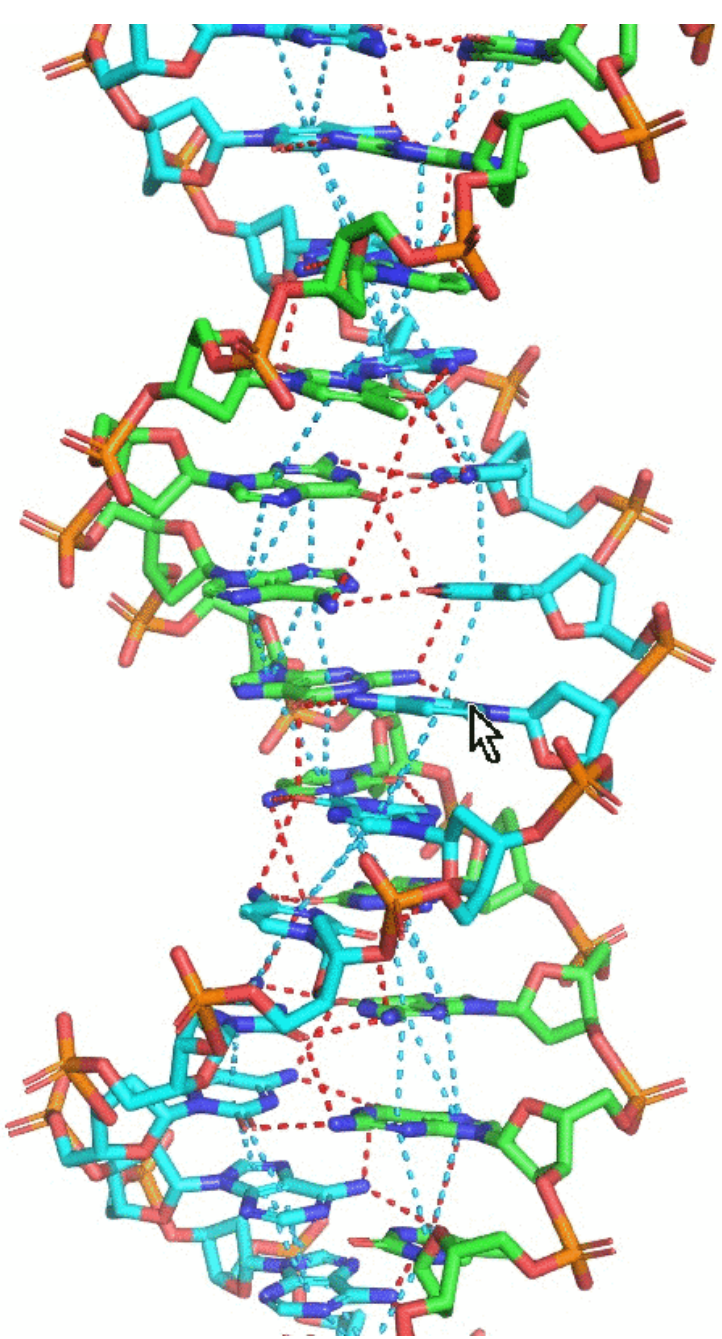
Tautomer transition energy

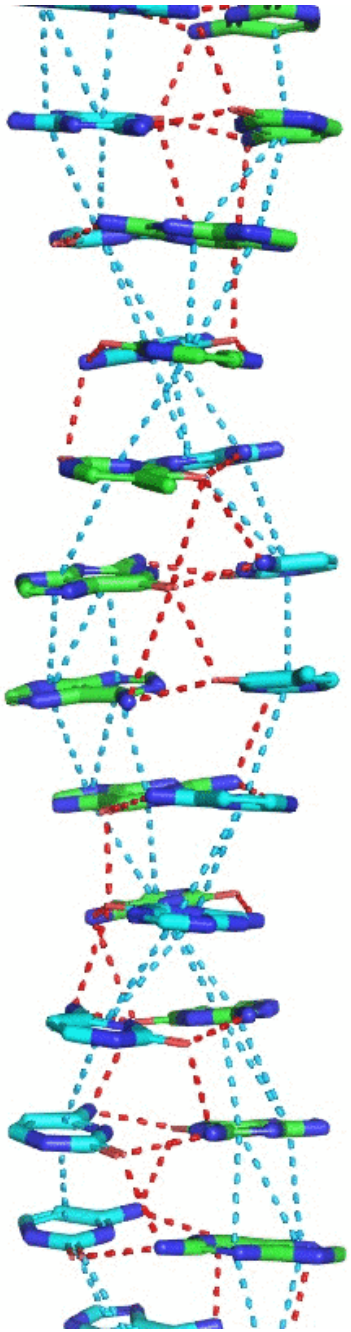


3.7A cutoff
for h-bonds

electron wires

proton wires





Spectroscopic experimens in progress

We synthesized a series of DNA samples with varied predicted proton chains.

Same composition – varied chain lengths.

>F01w 1 wire 141 bp ea

GGGTTAGGGTTAGGGTTAGGGTTAGGGTTAGGG

TTAGGGTTAGGGTTAGGGTTAGGGTTAGGGTTAGGG

TTAGGGTTAGGGTTAGGGTTAGGGTTAGGGTTAGGG

TTAGGGTTAGGGTTAGGGTTAGGGTTAGGGTTAGGG

>F05w 24 wires, 6 bp ea

GGGATTGGGATTGGGATTGGGATTGGGATTGGG

ATT GGGATTGGGATTGGGATTGGGATTGGGATTGGG

ATT GGGATTGGGATTGGGATTGGGATTGGGATTGGG

ATT GGGATTGGGATTGGGATTGGGATTGGGATTGGG

Spectroscopic measurements

Will the spectrum changes reflect predicted proton chain lengths?

Looking for collaborators

Acknowledgements

Ivan Savelev
Elena Naumova
Anton Klimov
Alex Samchenko
Alex Voronka
Elena Erdyneyeva
Nellie Zyryanova
Nikolai Kondratyev
Eugenia Kananykhina
[Vadim Guschin]
Konstantin Kupriyanov
Irina Garanina
Ancha Baranova
Evgenia Kananykhina
Alexei Tovmash
Lev Shishkin
Liliya Yulmetova

Collaborators:

Richard Alan Miller
Glen Rein
Anna Byalik
Alexandre Vetcher

dnaresonance.org

Contact:

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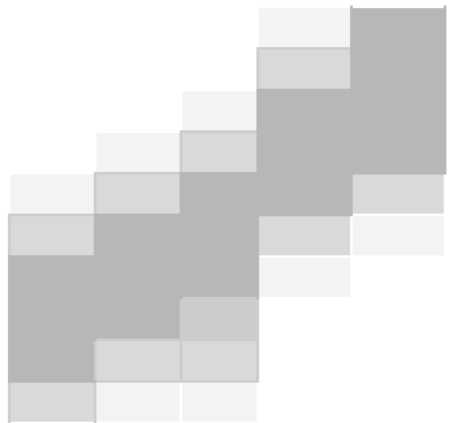
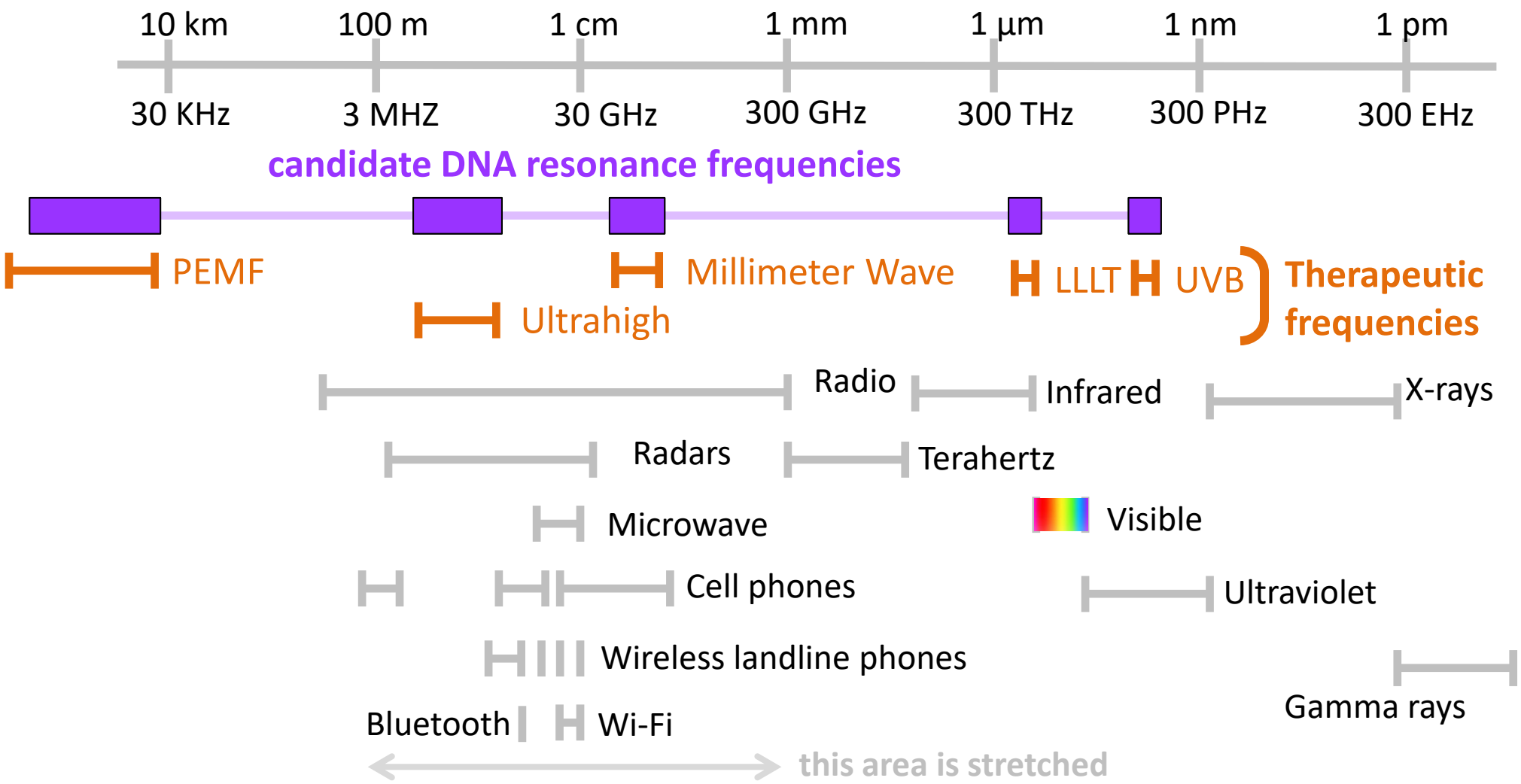
Table [Wavelengths]: A very approximate prediction of resonance wavelengths of genomic repeats

Repeat unit length		Periodic	Type	wavelength	PEMF	UHF	MWT	LLLT	UVB
				light	37km	0.3m	7mm	800nm	300nm
				sound	186m	1.5um	30nm	4nm	1.5nm
1 bp	0.3 nm	y	simple						
2 bp	0.7 nm	y	simple						
3 bp	1.0 nm	y	simple						
4 bp	1.3 nm	y	simple						
6 bp	2.0 nm	y	telomeric						
171 bp	57 nm	y	centromeric						
260 bp	86 nm	n	MIR						
300 bp	100 nm	n	Alu						
1000 bp	332 nm	n	Mariner						
6000 bp	1992 nm	n	LINE1						



(UHF - ultra high frequency, MWT - millimeter wave therapy)


10 km
100 m
1 cm
1 mm
1 µm
1 nm
1 pm
30 KHz
3 MHZ
30 GHz
300 GHz
300 THz
300 PHz
300 EHz
candidate DNA resonance frequencies
PEMF
Millimeter Wave
LLLT
UVB
Therapeutic frequencies
Ultrahigh
Radio
Infrared
X-rays
Radars
Terahertz
Microwave
Visible
Cell phones
Ultraviolet
Wireless landline phones
Gamma rays
Bluetooth
Wi-Fi
this area is stretched

Quantum chemical modeling methods

Designed B-DNA using Winmopac 7.21

MOPAC – molecular orbital modeling program

- Method UHF PM6-DH2X
  - is widely used for modeling macromolecules
  - good agreement with spectrometry and crystallography
  - does half-empirical computation = Ab initio + emprirical
  - does Schrödinger equation computation
- we computed transition energies for tautomeric transitions

Komarov, Samchenko. "Bi-Stability... Genomic DNA." *Russian Physics Journal* 63.8 (2020)