Contemporary Genetics


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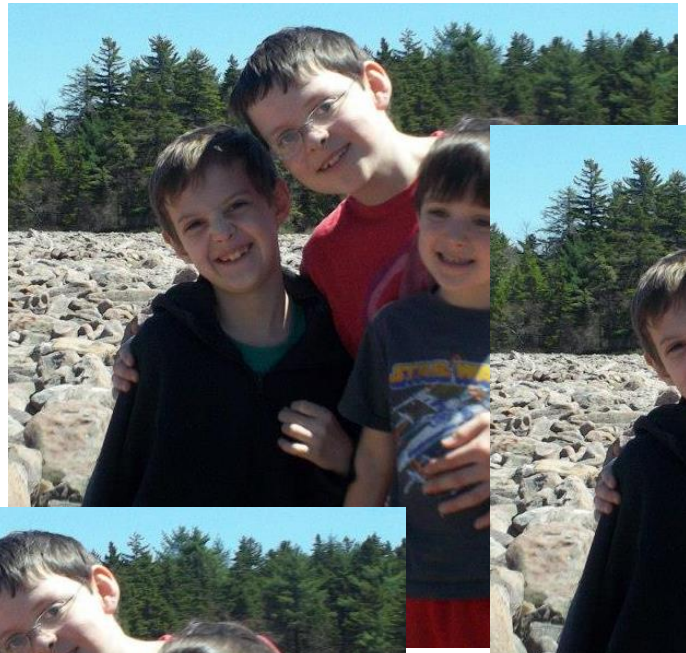
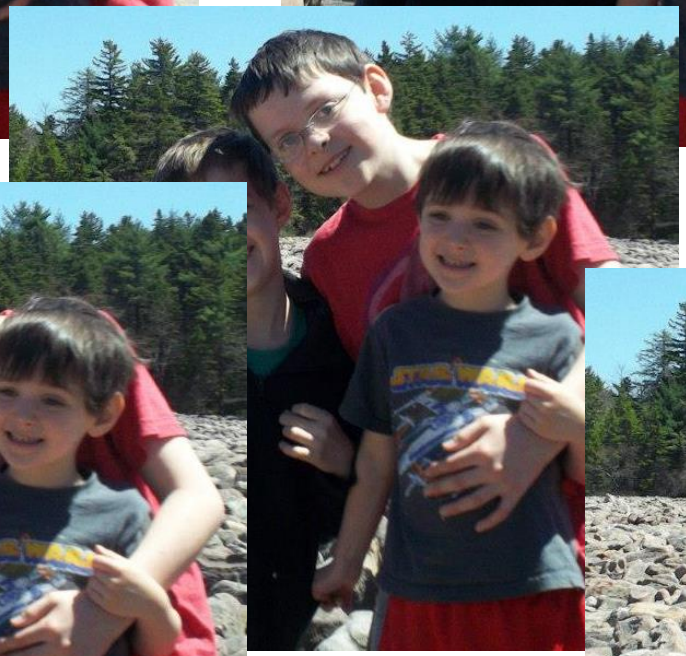
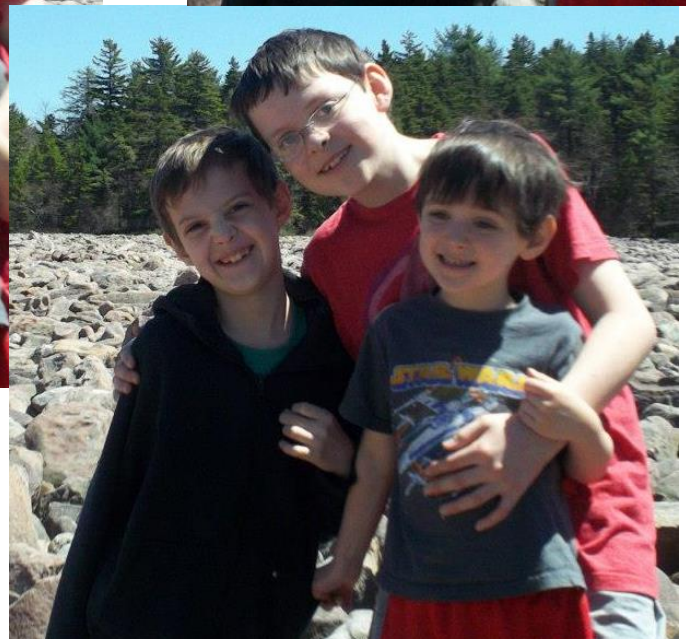







SCIENCE
CAN TELL YOU HOW TO CLONE A TYRANNOSAURUS REX
HUMANITIES
CAN TELL YOU WHY THIS MIGHT BE A BAD IDEA

equipment, and to Dr. G. E. R. Deacon and the captain and officers of R.R.S. *Discovery II* for their part in making the observations.

[1] Young, F. B., Gerrard, H., and Jevons, W., *Phil. Mag.*, **40**, 149 (1920).
[2] Longuet-Higgins, M. S., *Mon. Not. Roy. Astro. Soc., Geophys. Supp.*, **5**, 285 (1949).
[3] Von Arx, W. S., Woods Hole Papers in Phys. Oceanog. Meteor., **11** (3) (1950).
[4] Ekman, V. W., *Arkiv. Mat. Astron. Fysik. (Stockholm)*, **2** (11) (1905).

MOLECULAR STRUCTURE OF NUCLEIC ACIDS

A Structure for Deoxyribose Nucleic Acid

WE wish to suggest a structure for the salt of deoxyribose nucleic acid (D.N.A.). This structure has novel features which are of considerable biological interest.

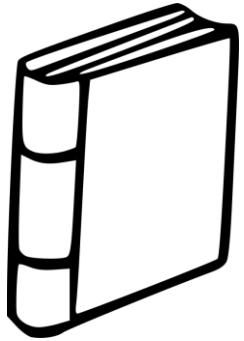
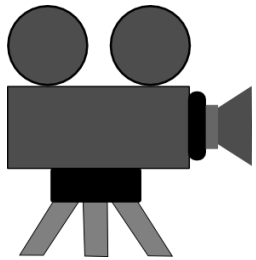
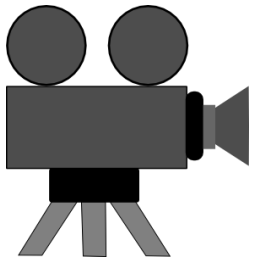
A structure for nucleic acid has already been proposed by Pauling and Corey[1]. They kindly made their manuscript available to us in advance of publication. Their model consists of three inter-twined chains, with the phosphates near the fibre

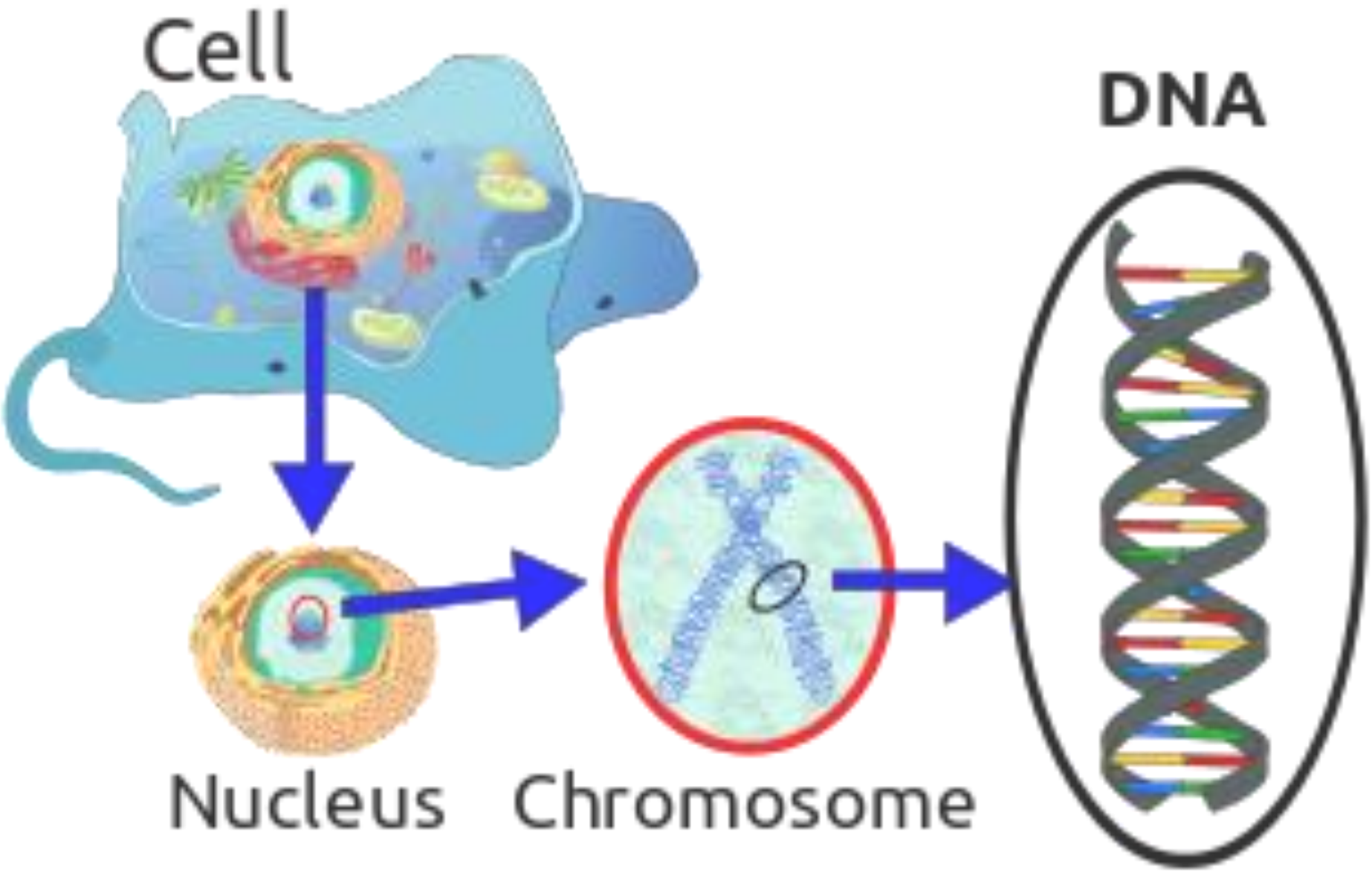
is a residue on each chain every 3·4 A. in the *z*-direction. We have assumed an angle of 36° between adjacent residues in the same chain, so that the structure repeats after 10 residues on each chain, that is, after 34 A. The distance of a phosphorus atom from the fibre axis is 10 A. As the phosphates are on the outside, cations have easy access to them.

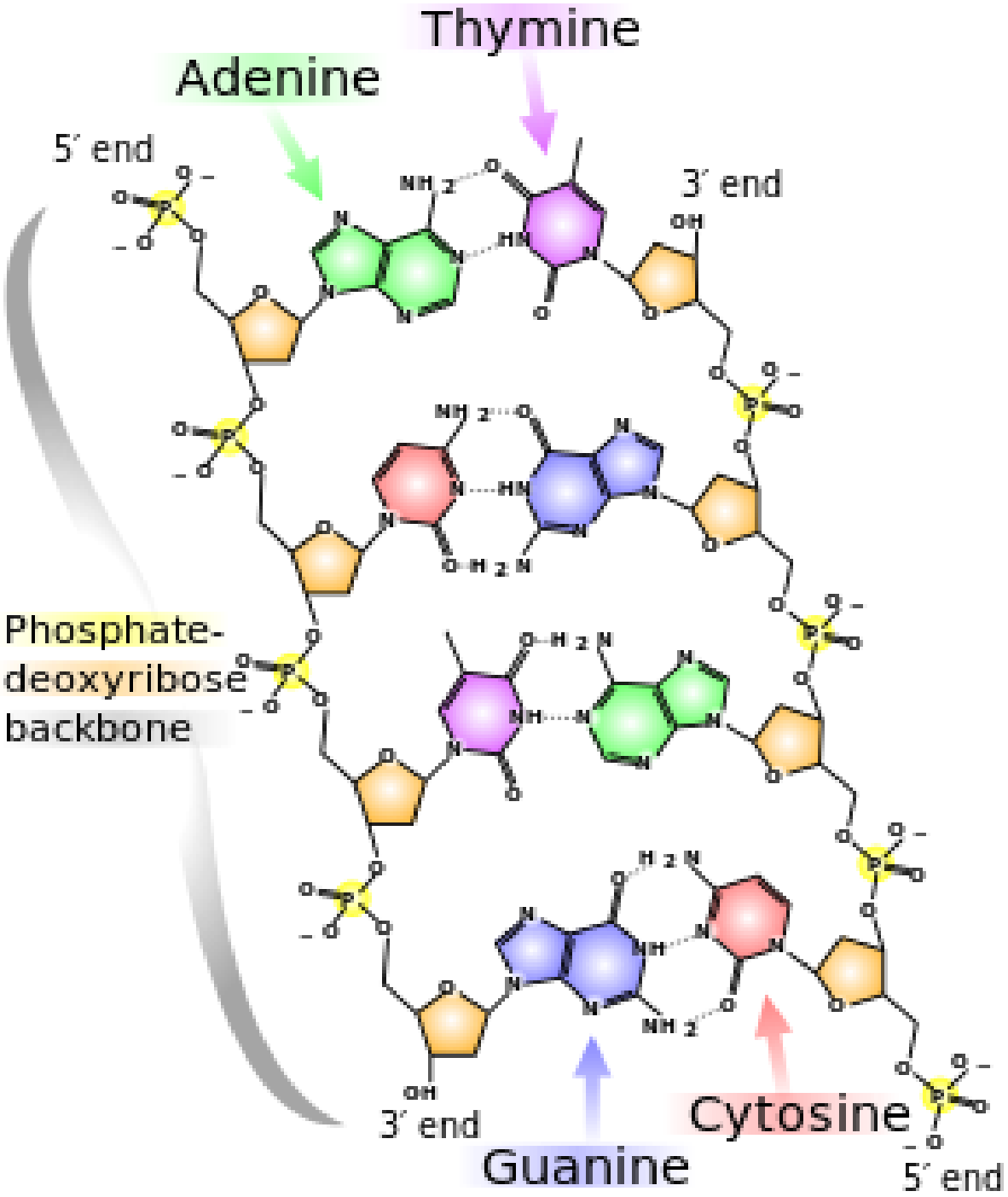
The structure is an open one, and its water content is rather high. At lower water contents we would expect the bases to tilt so that the structure could become more compact.

The novel feature of the structure is the manner in which the two chains are held together by the purine and pyrimidine bases. The planes of the bases are perpendicular to the fibre axis. They are joined together in pairs, a single base from one chain being hydrogen-bonded to a single base from the other chain, so that the two lie side by side with identical *z*-co-ordinates. One of the pair must be a purine and the other a pyrimidine for bonding to occur. The hydrogen bonds are made as follows : purine position 1 to pyrimidine position 1 ; purine position 6 to pyrimidine position 6.

If it is assumed that the bases only occur in the structure in the most plausible tautomeric forms (that is, with the keto rather than the enol con-


Cell
DNA
Nucleus
Chromosome


Thymine
Adenine
5′ end
3′ end
Phosphate-
deoxyribose
backbone
3′ end
Cytosine
Guanine
5′ end

Worksheet: Structure of DNA

1. DNA can be found in what organelles?
   Nucleus, Mitochondria, and Chloroplast

2. What scientists contributed to our knowledge of DNA and what did they do?
   - Miescher – there is stuff inside the nucleus
   - Levine – chemical composition of DNA
   - Chargoff – Ratio of adenine, cytosine, guanine, and thymine
   - Griffith – Bacterial transformation; Something carries genetic code
   - Avery, MacLeod & McCarthy – DNA causes bacterial transformation
   - Hershey & Chase – DNA carries genetic code
   - Pauling – Proposed triple helix (incorrect)
   - Watson and Crick – Proposed double helix (correct but couldn't support their idea)
   - Franklin – X-ray crystallography showed structure of DNA
   - Wilkins – "stole" Franklin's work and shared it with Watson and Crick

Worksheet: Structure of DNA

3. What is the shape of DNA?
    - Double Helix (Ladder twisted)

4. What three parts make up a single nucleotide:
    - Nitrogenous Base
    - Pentose Sugar
    - Phosphate Group

5. What are the sides of the DNA ladder made of?
    - Sugar (deoxyribose)

6. What sugar is found in DNA?
    - Deoxyribose

Worksheet: Structure of DNA

7. What are the 4 bases that make up the rungs of the DNA ladder?
   - Adenine
   - Thymine
   - Guanine
   - Cytosine

8. How do the bases bond together?
   - Adenine and Thymine
   - Guanine and Cytosine

Patterns of Inheritance
Vocabulary

Phenotype - Expressed trait of an organism (physical feature)

Genotype – Genetic make-up of an organism (letters we use to describe someone's genetic make-up)

Dominant – Allele that determine the phenotype (always shown as a capital letter)

Recessive – Allele that has no noticeable affect on the phenotype (always shown as a lowercase letter)

Homozygous – Two identical alleles for a gene

Homozygous Dominant i.e. RR

Homozygous Recessive i.e. rr

Heterozygous – Two different alleles for a gene

Rr