Length Of A Human DNA Molecule

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Bibliographic Entry	Result (w/surrounding text)	Standardized Result
Mitchel, Campbell Reece. **Biology Concept and Connections**. California, 1997.	"At actual size, a human cell's DNA totals about 3 meters in length."	3.0 m
McGraw Hill Encyclopedia of Science and Technology. New York: McGraw Hill, 1997.	"If stretched out, would form very thin thread, about 6 feet (2 meters) long."	2.0 m
Matthews, Harry R. **DNA Structure Prerequisite Information**. 1997.	"The length is (length of 1 bp)(number of bp per cell) which is $(0.34\ nm)(6 \times 10^9)$"	2.0 m
Leltninger, Albert L. **Biochemistry**. New York: Worth, 1975.	"Chromosome 13 contains a DNA molecule about 3.2 cm long."	1.5 m
"Cell." **The World Book Encyclopedia**. Chicago: Field Enterprises, 1996.	"On the average, a single human chromosome consists of DNA molecule that is about 2 inches long."	2.3 m

The chromosomes in the nucleus of a cell contain all the information a cell needs to carry on its life processes. They are made up of a complex chemical (a nucleic acid) called deoxyribonucleic acid, or DNA for short. Scientist's decoding of the chemical structure of DNA has led to a simple conceptual understanding of genetic processes. DNA is the hereditary material of all cells. It is a double-stranded helical macromolecule consisting of nucleotide monomers with deoxyribose sugar and the nitrogenous bases adenine (A), cytosine (C), guanine (G), and thymine (T). In the chromosomes of a cell, DNA occurs as fine, spirally coiled threads that in turn coils around another, like a twisted ladder.

The DNA molecule is threaded so fine that it is only possible to see it under high powerful electron microscopes. To get a sense of exactly how long an uncoiled DNA molecule is compared to a typical cell, a cell is magnified 1000 times. At this scale, the total length of all the DNA in the cell's nucleus would be 3 km -- the equivalent distance of the Lincoln Memorial to the capital in Washington, DC.

The human genome comprises the information contained in one set of human chromosomes which themselves contain about 3 billion base pairs (bp) of DNA in 46 chromosomes (22 autosome pairs + 2 sex chromosomes). The total length of DNA present in one adult human is calculated by the multiplication of

(length of 1 bp)(number of bp per cell)(number of cells in the body)

$(0.34 \times 10^{-9}\ m)(6 \times 10^9)(10^{13})$

2.0×10^{13} meters

That is the equivalent of nearly 70 trips from the earth to the sun and back.

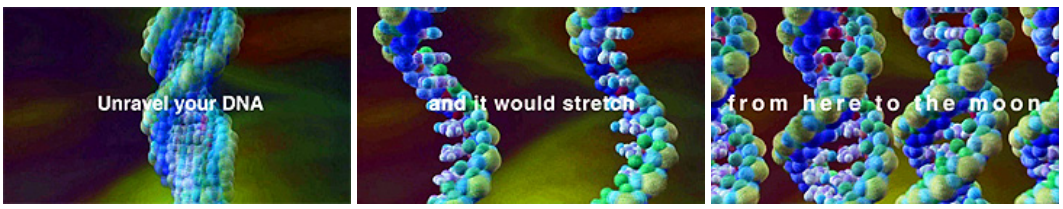
2.0×10^{13} meters = 133.691627 astronomical units

133.691627/2 = 66.8458135 round trips to the sun

On the average, a single human chromosome consists of DNA Molecule that is almost 5 centimeters.

Steven Chen -- 1998

Bibliographic Entry	Result (w/surrounding text)	Standardized Result
WNET-DT 13.1, 5:00 PM 10 May 2006.	"Unravel your DNA and it would stretch from here to the moon"	3.85×10^8 m



Editor's Supplement -- 2006

External links to this page:

- BioINFORMatic: DNA Packaging, Casey Sears, 2009
- US Patent 7,234,414, Mastitis detection, Rodney Wayne Claycomb & David Simon Whyte, 2007
- US Patent Application 12/377,404, Method of electrically detecting a biological analyte molecule, Zhiqiang Gao, et al, 2010

The Physics Factbook
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