UNIVERSITY OF NEBRASKA AT OMAHA

COLLEGE OF INFORMATION SCIENCE & TECHNOLOGY

AT HOME
SEQUENCE ASSEMBLY

presented by

codecrush

Welcome

Materials

- Scissors
- Internet connection to our group
- The sequence assembly papers given to everyone, cut into pieces along the lines as instructed. Keep each set of papers separate!

Instructions

Print the materials in color, or print them in black and white and draw over the lines in the appropriate (red, blue, green) ink.

Activity Overview

A **genome** is all of a living thing's genetic material. It is the entire set of hereditary instructions for building, running, and maintaining an organism, and passing life on to the next generation. The whole shebang. In most living things, the genome is made of a chemical called **DNA**, and it is stored in the nucleus of every cell in the organism.

The genome contains **genes**, which are packaged in **chromosomes** and affect specific characteristics of the organism. The word " genome " was coined in about 1930, even though scientists didn't know then what the genome was made of. They only knew that the genome was important enough, whatever it was, to have a name. In short, the genome is divided into chromosomes, chromosomes contain genes, and genes are made of DNA.

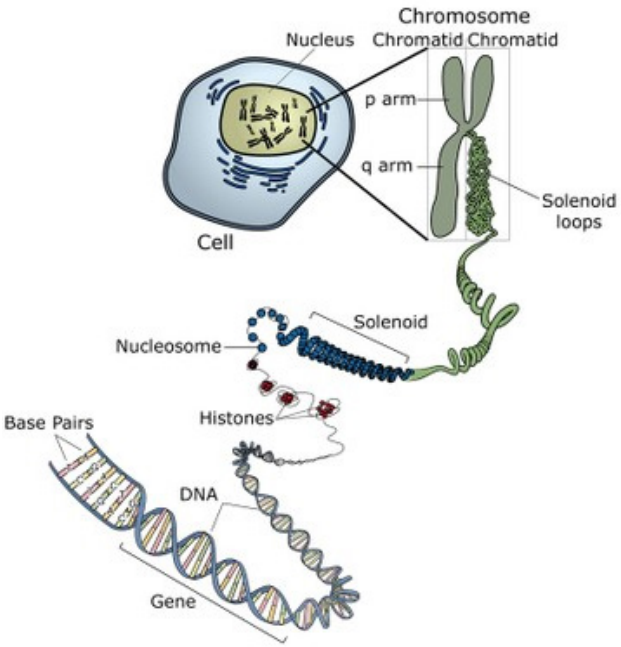

Image adapted from: National Human Genome Research Institute.

DNA stands for **deoxyribonucleic acid** and is one of the two types of nucleic acid in cells. We're made up of many, many cells that we can't see and each cell has a job. Some cluster of cells make up our muscles, some make up our bones—and all together they make our bodies! But how does each cell know what to do? That's where DNA comes in. It tells the cells what to do.

DNA is like the boss of the company. It gives cells instructions that it passes down in the form of "codons," which is a three-block code. These codes are made from a string of four different letters which have best friends they favor and prefer to hold hands with. A likes T and G likes C and when put together they become instructions for the cells. Scientists can read DNA by putting it through a machine called a sequencer, which reads the DNA out to it letter by letter.

Imagine if you were reading the story of the Tortoise and the Hare. The first sentence of this story is:

A Hare was making fun of the Tortoise one day for being so slow.

You and I can read that sentence with our eyes from left to right, usually with words at a time. A sequencer has to measure the chemical properties of each letter to read the story. So a sequencer calls out one letter at a time. A sequencer would read the story of the Tortoise and the Hare like this, one letter at a time:

A

H

a

r

e

w

a

s

m

a

....

And so on. Because DNA is so fragile, it often falls apart after you read one sentence. This means we have to read the DNA one line at a time:

1. A Hare was making fun of the Tortoise one day for being so slow.
2. “Do you ever get anywhere?” he asked with a mocking laugh.
3. “Yes,” replied the Tortoise, “and I get there sooner than you think.”
4. “I’ll run you a race and prove it.”

But when the sentences come out of the sequencer, they are out of order:

1. “Yes,” replied the Tortoise, “and I get there sooner than you think.”
2. A Hare was making fun of the Tortoise one day for being so slow.
3. “I’ll run you a race and prove it.”
4. “Do you ever get anywhere?” he asked with a mocking laugh.

It is our job as bioinformaticians to put these sentences back in order - this is called “assembly”. In our sequence assembly activity, we will explore how scientists put the sentences of DNA back in order to read a genome.

Step 1
Print the materials in color, or print them in black and white and draw over the lines in the appropriate (red, blue, green) ink.

Step 2
Cut on solid lines.

ribed into RNA that gets tra	scribed into RNA that gets t
gets translated into protein	into protein.
transcribed into RNA that ge	is transcribed into RNA that
RNA that gets translated int	NA that gets translated into
is transcribed into RNA that	DNA is transcrib
ets translated into protein.	DNA is transcribed into RNA
DNA is tr	transcribed into RNA that ge

Step 3
Print the materials in color, or print them in black and white and draw over the lines in the appropriate (red, blue, green) ink.

Step 4
Cut on solid lines.

e Human Genome is over 3,000	0 base pairs of nucleotides
ides in length.	an Genome is over 3,000,000,
,000,000 base pairs of nucle	s of nucleotides in length.
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man Genome is over 3,000,000	000,000,000 base pairs of nu
airs of nucleotides in lengt	The Human Geno
over 3,000,000,000 base pair	ome is over 3,000,000,000 ba

Step 5
Print the materials in color, or print them in black and white and draw over the lines in the appropriate (red, blue, green) ink.

Step 6
Cut on solid lines.

50 percent of its dna with	uman genome shares 50 percen
he human genome shares 50 pe	genome of a banana
nana	ares 50 percent of its dna w
cent of its dna with the gen	the human genome shares 50 p
an genome shares 50 percent	the human
n genome shares 50 percent o	e human genome shares 50 per
enome shares 50 percent of i	na with the genome of a bana

Step 7
Print the materials in color, or print them in black and white and draw over the lines in the appropriate (red, blue, green) ink.

Step 8
Cut on solid lines

woodchuck chuck if a woodchu	w much wood would a woodchuc
chuck if a woodchuck could c	ould a woodchuck chuck if a
wood would a woodchuck chuck	chuck chuck if a woodchuck c
if a woodchuck could chuck w	d would a woodchuck chuck if
how much wood would a woodch	uck if a woodchuck could chu
woodchuck could chuck wood	odchuck chuck if a woodchuck
a woodchuck chuck if a woodc	ch wood would a woodchuck ch

Reflections

What did you learn?

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