

Careers in Science

Genomics: Studying Genomes

Genomics is a branch of biology that analyzes the DNA sequence of specific organisms and compares it to other organisms with the hope of gaining information about a gene's particular function. Scientists in this field might study the DNA code of an organism, the length of genes, and numbers of genes, or the locations of genes on chromosomes. They are particularly interested in any similarities and differences in the genome of various organisms.

A career in genomics requires a strong background in molecular biology but also a solid foundation in math and statistics. Genomicists often use computers to aid in the analysis and presentation of vast amounts of data. This use of computer databases to organize and analyze biological data is called bioinformatics. A sharp eye for detail and an underlying curiosity about the world are also essential characteristics in this and other fields of science.

One area of genomics called gene mapping got its start with the mapping of a simple virus in 1977. To date, scientists have mapped the genome of hundreds of animals, including mice, frogs, and chimpanzees. Our own genome was sequenced as part of the Human Genome Project completed in 2003.

Plants also have been studied using gene sequencing. Watermelons, sugar beets, rice, and wheat have all had their genomes mapped. Scientists today often use techniques called next-generation sequencing, which are higher-yielding methods than previous techniques, resulting in millions of copies of DNA in a short period. A small flowering plant called *Arabidopsis*, a type of mustard plant, was the first plant to have its genome sequenced in 2000. *Arabidopsis* is still used today as a model organism for research into the processes of all flowering plants. Genomicists and plant biologists are working together to research variant alleles of *Arabidopsis* to improve understanding of other plants, including those used for food. Because the DNA sequence of *Arabidopsis* is already known, scientists can use this information and compare it to other plants. Research on rice and corn genomes is aimed at producing crop varieties that produce higher yields, are less susceptible to disease, or can grow in drought conditions.

FIGURE 16: The field of genomics attempts to understand our genetic code better in order to find out how genes affect our traits, our health, and even our future.



The study of animal genomes gives researchers in many fields of research incredibly valuable information about how our own genes might function and what happens when they do not function properly. Plant genome sequencing provides scientists with information on how to grow crops that are more productive. The insights gained from the field of genomics will undoubtedly have far-reaching effects on industries, such as pharmaceutical research, health care, and agriculture.



Language Arts Connection

Write a brief report answering these questions.

- Do you think you would enjoy a career as a genomicist? Why or why not?
- Which organism would you like to study the DNA of, and why?
- Why do you think studying the genome of other animals might provide valuable information?
- Why might scientists be interested in the genomes of plants?
- In what ways do you think the field of genomics has improved our lives?
- How might changes in technology change the way we study the genomes of organisms?

**DISCUSSION: SEQUENCING
YOUR OWN GENOME**

**EVALUATING CLAIMS: EYE COLOR
AND OUR ANCESTORS**

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