

# Genomics: A Mapping Analogy

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One goal of genomics is to sequence and map all the genes of an organism. Having a map allows you to see where a gene is on a chromosome, to know its position relative to other genes, and to see how big or small it is. Humans assign a name to genes to make it easier for humans to talk about the genes.

Questions to consider:

1. What makes a good map?
2. What makes a good map better?



## Analogy Puzzle:

Take a UW campus map (one showing buildings and with an index). Ask the participants to put their right index finger on the Genetics/Biotechnology Center building. And also ask them to be prepared to describe all the stuff they need to know in order to put their finger on the right spot.

### What do they need to know?

They need to know:

1. Spoken English.
2. How the sounds for *Genetics/Biotechnology Center* are written.
3. That words in English are written using an alphabet.
4. That the English alphabet has 26 letters.
5. The shapes of the 26 letters.
6. The order of the 26 letters.
7. That the alphabetical order is used as an organizing tool.
8. That the tool is an index, a list of words in alphabetical order.
9. The words are followed by coordinates (in this case, E7).
10. The 10 digits of the Arabic numerals and their shapes and their orders.
11. That E7 represents a coordinate system in two axes (Cartesian).
12. That E7 can be found at the intersection of the E column and the 7 row.
13. That the Biotechnology Center is just one of many buildings in the E7 box.
14. That the Biotechnology Center is the building with number 49.

Next, ask the participants to find the Botany building.

They'll look under the index, but they won't find it. That's because the Botany Department is housed in a building called Birge Hall.

The index is organized by name of the building, and not by function. (Sometimes the building name tells its function, but often it does not.)

With this map, can you know the name and location of all the buildings on campus?

With this map, can you know the function of all the buildings on campus?

Is it possible to know the names and locations of all the buildings without knowing their functions?

Likewise, is it possible to know the names and locations of all the genes of an organism without knowing their function?

In making a map, whether of a campus or of a genome, the mapmaker gets to consider what data to show (and what data not to show), how to show it, and how to organize it and index it so that the map reader can use it to navigate and to make new connections.

Functional genomics is the part of genomics that seeks to figure out the functions of all the genes. Sometimes researchers can get hints as to the possible function of a gene by comparing its sequence to other similar genes of known function. Other times researchers can get hints as to the possible functions by figuring out under what conditions a gene is expressed. However, the function is not directly knowable by sequencing or mapping or knowing the expression pattern; a gene's functions have to be directly tested by methods other than sequencing or mapping.

BioTrek: The Outreach Program of the Biotechnology Center of the University of Wisconsin-Madison and of UW-Extension.

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