Reproduction and Variation

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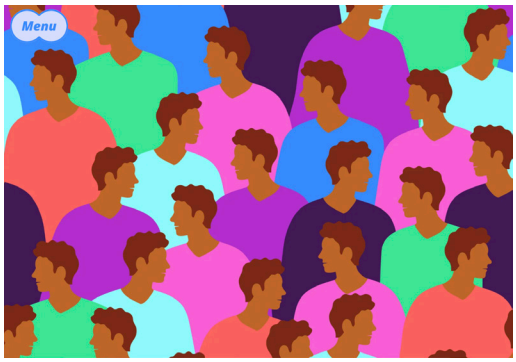
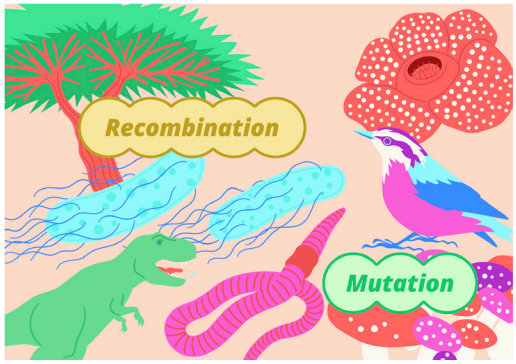


INTRODUCTION

How boring would it be if everyone were genetically identical clones? Thankfully, that's not likely to happen.

When people reproduce, there are mechanisms built in for making genetic variation. **Genetic** variation leads to **trait** variation.

That's why, aside from identical siblings, every person is genetically unique.

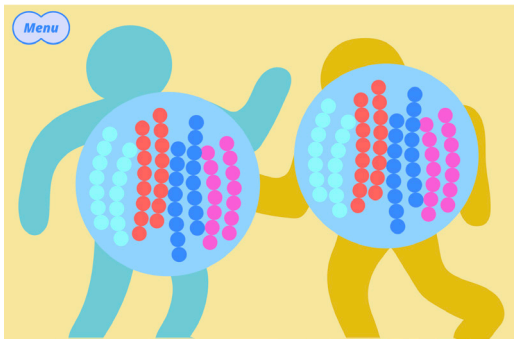


Having genetic variation is so important to a species' survival that all living things have some way of adding variation when they reproduce.

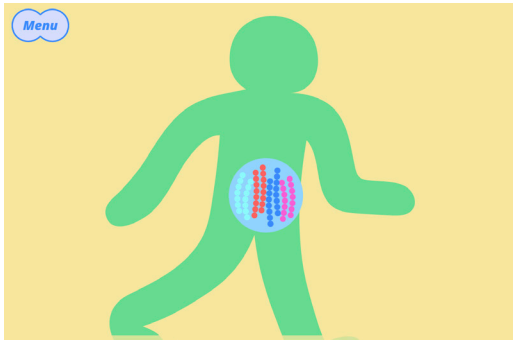
There are two ways this happens: through **recombination** and **mutation**.

And which of these two things an organism does depends on whether it reproduces alone or with a partner.

RECOMBINATION

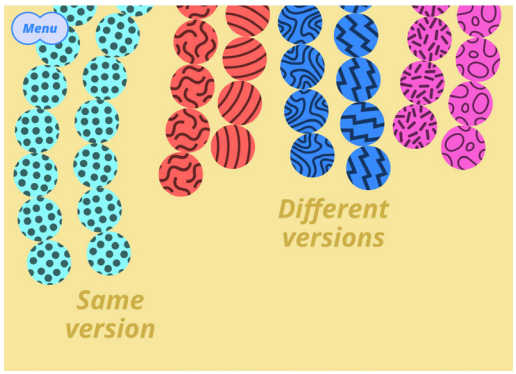


You can think of recombination as taking all the possible gene versions from **two parents...**

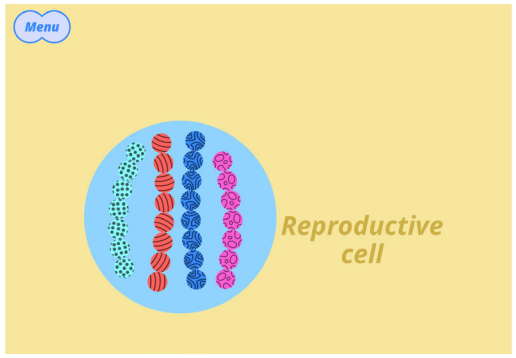


...and **randomly shuffling** them into offspring.

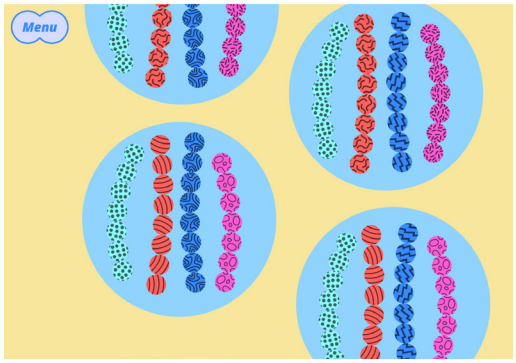
This happens during **sexual reproduction**, in living things where genes come in pairs. And it comes down to how **reproductive cells** are made.



The two genes in a pair can be the same version or different versions. Gene versions are called **alleles**.

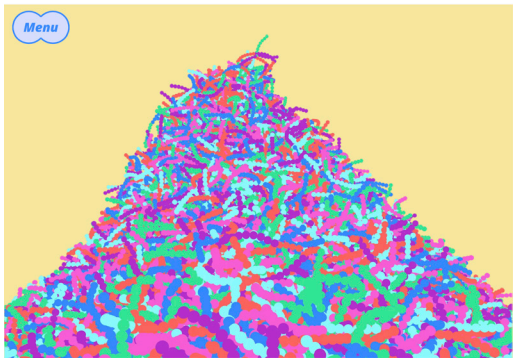


Reproductive cells get a copy of one member from each pair.



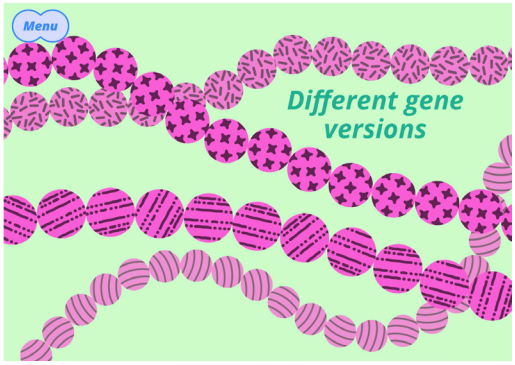
It's just as likely to be either one, like the flip of a coin. And it's a separate coin flip for each gene.

The shuffling is random, so **each reproductive cell gets a different combination of alleles**



Now imagine this times 20,000. That's about how many gene pairs there are in a person. The chance that two reproductive cells will get the exact same combination of alleles genes is basically zero.

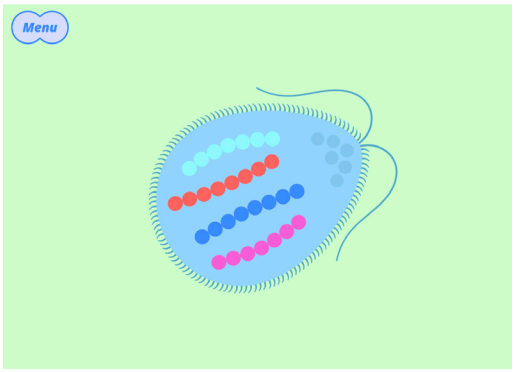
That means **no two reproductive cells are alike**. And it's why, no matter how many kids two parents have together, each one will be **genetically unique**.



MUTATION

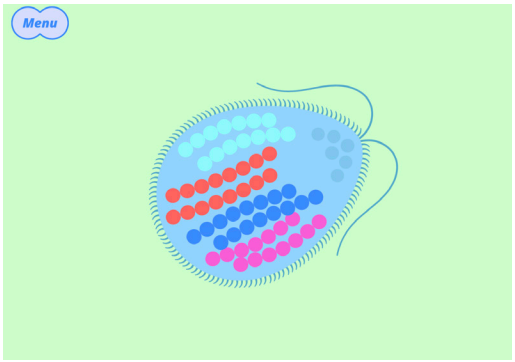
Mutation is how different gene versions – called **alleles** – come about in the first place.

Mutation is universal. It's a source of variation for **all** living things, no matter how they reproduce.

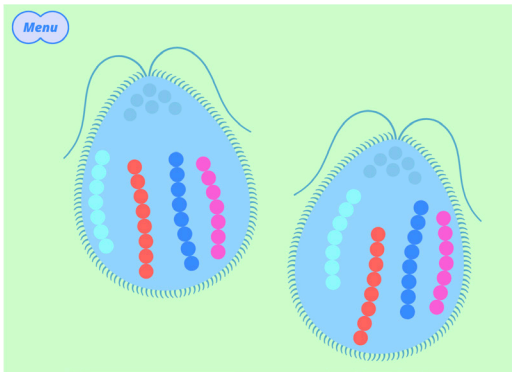


For living things that reproduce **asexually**, mutation is the main way they have for making new gene variations.

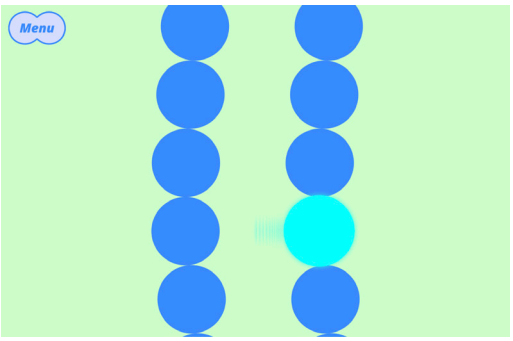
Take this creature—it's just one cell with some genes inside.



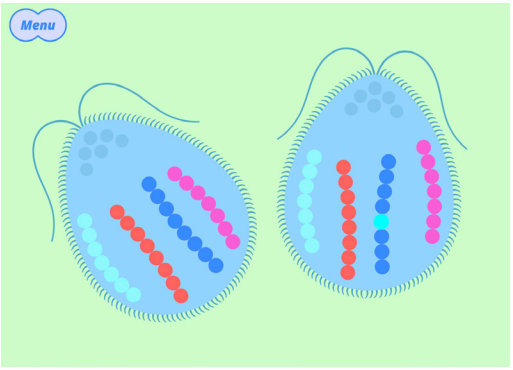
It can just straight-up copy its DNA…



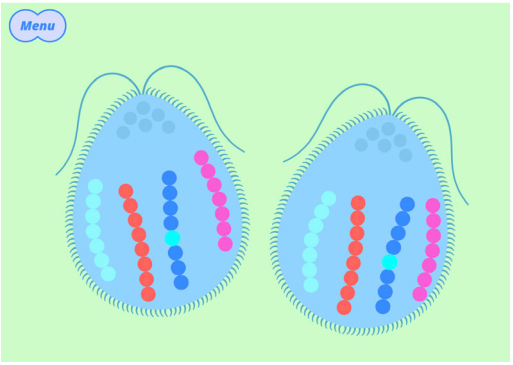
…and divide in two to make genetically identical clones.



But some of the time, as a copy is being made, a **mutation** happens. This can be as simple as one DNA building block getting mis-copied, like a typo.

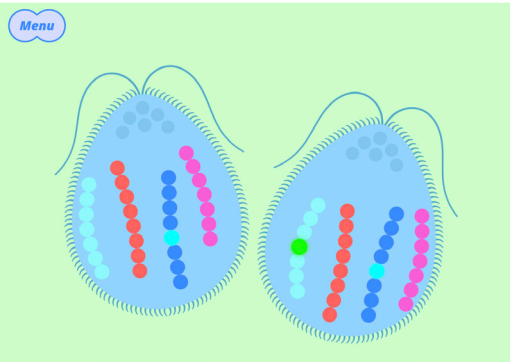


And one critter ends up with a gene difference.



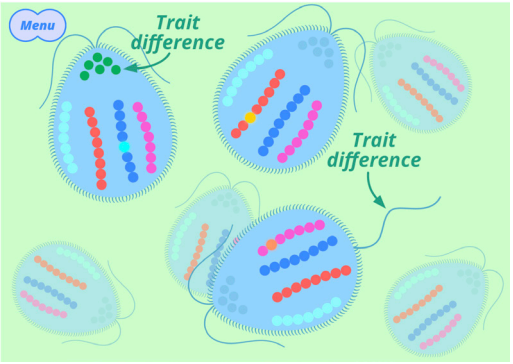
When the critters reproduce again, any differences get copied too.

Now two have the difference.



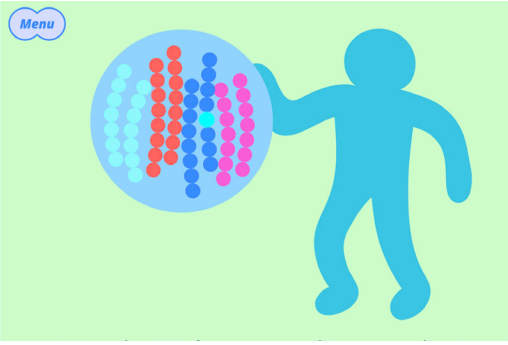
Each time a living thing copies its genes, there's a chance of mutations happening that cause new gene differences.

If those critters reproduce, their gene differences get passed down.

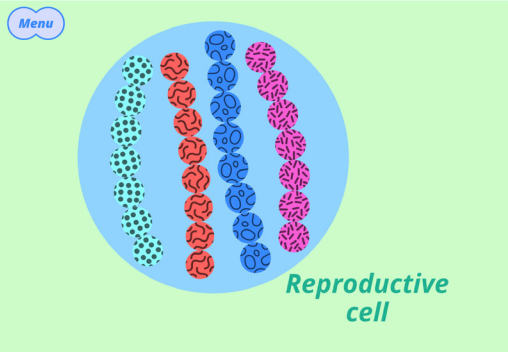


Even a small change can make a whole **new version of a gene**. And some of these will cause **trait** differences.

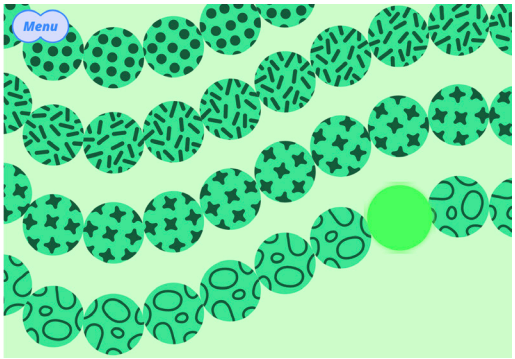
That's why, even in living things that reproduce asexually, you can end up with genetic diversity—and trait variations—across a group.



Mutation can happen any time a gene is copied—including during **sexual reproduction** as **reproductive cells** are made.



When this happens, it also makes a **new allele** that can be passed on to the next generation.



Mutation acting over many generations can produce **many alleles.**

To see the animated version, visit https://learn.genetics.utah.edu/content/change/reproductionvariation/