Adventures in Bioengineering: The Story of Bob the Firefly
This is Bob the firefly, here he is at home in the forest!
Bob loves to fly around the forest, he does it every day and it makes him very happy!
Bob’s favorite part about the forest is getting to fly around with his friends.

But Bob’s friends look a little bit different from Bob, even though they are all fireflies.
They look different because their genes are different than Bob’s. Genes are the building blocks of all living things, and they contain many instructions.

There are genes for the color of your eyes, the length of a dog’s fur, and all sorts of other traits.

Many genes together make a program to build our bodies.

Remember, genes don’t code for things we like and how we act - that’s our thoughts! Genes just program how we look and how our bodies work.
Bob’s friends all have genes that cause a part of their bodies to light up, but Bob has different genes, so he can’t light up.

Bob doesn’t mind this, though, because he knows that they can still play together in the forest each day.
But one night...

Hey, I can’t see Bob. Do you see him?

No, where did he go?
Bob got lost in the forest!

He was all alone, and feeling very scared.

Bob usually didn’t mind not having a light, but that night he wished that he could light up just like all of his friends, so that they could see him in the dark.
Bob spent the whole night looking for his friends but he couldn’t find them.
As the sun came up, he saw someone hiking through the forest.
Bob decided to ask her for help.

Hi! I’m lost and I can’t find my friends. Can you help me?

I don’t know how to find your friends. Can you flash your light to find them?
I’m different from other fireflies, because my body does not light up.

Hm...I am a bioengineer so I may be able to help!
What’s a bioengineer?

That’s a great question, Bob! Let me explain!
bioengineering

bio means life or living

engineering means building things to solve problems

A bioengineer is a kind of engineer who uses genes to solve problems. For example, we can bioengineer germs that create medicine to keep people healthy!
Remember how we have genes inside of our bodies? Bioengineers can change those genes to solve problems by borrowing helpful genes from other living things.
The way I bioengineer genes is by using CRISPEE. CRISPEE is a tool that allows me to remove or add genes from a living thing. Can you think of a way that we can use CRISPEE to help you find your friends?
Maybe you can give me the gene to light up, just like my friends!

Bob was a little nervous. Although he wanted to find his friends, he had always liked being a little different from everyone else.
That’s a great idea Bob! CRISPEE uses special genes that come from one creature and are used in another creature to do useful things.

There are lots of different genes! There are genes that tell living things to turn colors, to stay warm when it’s cold out, to grow big and small, and even to smell like a banana!
Some genes cause bioluminescence, which means light that is inside living things.

bioluminescence

bio
means life or living

lumin
means light
Pam created a gene program that would light Bob up with a beautiful cyan light. Bob has now been successfully bioengineered to light up! Bob was excited, because even though he could now light up like his friends, he was still different because of his unique bioengineered light.
Looking good, Bob! Now your friends will be able to find you, and you’ll never get lost again!

I can’t wait to see them again! Thank you, Pam!
Bob flew out of the lab flashing his new cyan light. His friends found him immediately!

Look, Bob’s back!

And look at his light!
Bob and his friends played together every day and every night, and he never got lost again!
The End
Glossary

**Bioengineer**: a kind of engineer who uses genes to solve problems.

**Biology**: Biology is the study of living things. Biologists try to understand the natural world and the things that live in it. These things include plants, animals, and tiny living things like cells and bacteria.

**Bioluminescence**: A word for the natural light that some animals can make to glow in the dark.

**CRISPEE**: a tool that allows bioengineers to remove or add genes from a living thing.

**Firefly**: a small flying beetle that can make glowing light on a part of its body.
Glossary

Gene: Genes determine what traits are passed down from a mother and father to their child. Eye color, height, and hair color are some examples of the traits that are controlled by genes. Genes exist inside the cells that make up living things.

Gene program: a list of gene instructions that tells a living thing what to do. Just like a computer program, a gene program requires many instructions in a specific order to work.

Laboratory: a space where biologists, bioengineers, and other scientists can investigate things.

Program: a list of instructions that tells something what to do.