What is dna and how does it work?

Science, Genetics

Alright, let me help you start off with the facts, DNA stands for Deoxyribonucleic Acid. Sound like a mouthful? Don't worry you'll get used to it. Anyway, from reading the title you can suggest that DNA is pretty important, it's what everything living on the planet is made out of, from a tiny piece of bacteria, to the tallest tree in the world. Cells are a little bit bigger, but not that much bigger, they're still invisible to the naked eye. Alright, that's enough introduction for now, let's get into some Deoxyribonucleic Acid!

DNA is really important, from back in the billions of years ago without much life when the most lively thing on earth were bacteria, they were made out of DNA. Those bacteria were just Prokaryotic cells, but we'll get into that later. You can think of DNA like some code on a computer program, it's what makes it, without it, you've got nothing. It makes up the organism, tells it how to make more of itself, and displays what it can and cannot do.

DNA is made out of a sneeze called ATCG which stands for Adenine, Thymine, Cytosine, and Guanine. ATCG in DNA are called nucleotides. Its structure is a double helix, it looks like a spiral staircase almost, or a spiral ladder. Adenine is connected through a bond made out of hydrogen atoms to Thymine, and only Thymine. The same goes for Cytosine and Guanine. These four substances can be arranged into almost anything, from a virus to the Chromosome of a Cell.

DNA is you in a sense. It makes up everything you are, everything down to the smallest construct of you. Even down to the tiniest of red blood cells, there's DNA there too. Fun fact, one of the only things able to reach down far

enough to break those hydrogen bonds I talked about earlier is called RNA; Which is what we're about to get down into right now!

There are many types of RNA. Think of RNA like half of a DNA strand. Instead of DNA being Deoxyribonucleic Acid, RNA is just Ribonucleic Acid, no more of that Deoxy stuff, it sounds like a detergent. Anyway we'll be going over just 3 types of RNA, mRNA, rRNA and tRNA.

Just a quick fact before we get into RNA, RNA contains AUCG. RNA is Adenine, Uracil , Cytosine, and Guanine, all the same holds true for the bonding. Cytosine still binds to Guanine and Guanine only, but Adenine only bonds to Uracil now! mRna is messenger RNA. No, not that messenger app on your phone, mRNA is what copies half of the DNA strand information and sends off the DNA sequence information down to the tRNA, which is the next step in this whole DNA reproduction!

The tRNA is what transfers that information down to the next stage rRNA. rRNA is the ribosomal or receiver RNA. It receives the rRNA and just builds that other half of the DNA and just rinse and repeat after that. All of this is happening inside you right now constantly until you die.

Alright! Let's get into genes! Not those pants you're wearing, we're talking about genetic genes. And as such let's talk about a person for a moment. His name was Gregor Mendel, He was born in 1822 and died in 1884. But let's talk about what happened in between those points. Gregor mendel is referred to the father of genetics. A long time ago he had an experiment with pea plants.

He took a pink pea plant, and a white pea plant, and cross breed them, meaning he took a seed from one and pollen from another and put them together. After all the seeds grew up, he got 100% pink pea plants and 0% white ones. " How could this be?" he thought. He performed the experiment again and he got 75% pink and 25% white ones. This is due to Dominant and Recessive Genes. A dominant gene, in this case was the pink leaf.

The recessive gene was the white one. Let's say the white petals were ww chromosomes and the pink ones were PP. Remember how I said DNA could display what is could or could not do? well the chromosomes are just that. Only ww could make up white, but PP and Pw could make up pink. Cross breeding would get you 16 different results. And to how reproduction works you only pass down one of those chromosomes.

So all of them came out pink if you do the math, that's the only possible combination being Pw. But cross breeding those two again gave him another 16 results, but this time, it wasn't PP vs ww, it was Pw vs Pw. And as such, the results were 4 white and 12 pink, because you only have 1/4th chance of getting a ww. And the others were either Pw or PP. And that's how recessive and dominant genes work.

Now. Let's talk about something called Cells, I know you've heard of them, reader. Cells are made up of a membrane bound nucleus, lots of ribosomes, mitochondria, the Golgi apparatus and the soft and hard endoplasmic reticulum and a little bit of cytoplasm for filling.

Let's start off with the center of a cell, the nucleus. The nucleus is the heart of the cell, however the nucleus is like a casing for the nucleolus, like the brain of the cell. The nucleolus is surrounded by chromosomes, which are in every cell, and those chromosomes look like a giant, but still tiny X. Farther out from the nucleus, we have the Endoplasmic reticulum (ER) right outside. The ER is useful in modifying and transporting proteins.

Some of the time they stay put in the ER and sometimes they go out onto the Golgi apparatus! The Golgi apparatus is like the boxing part of the factory, it packages the proteins into lipids and vesicles. A lipid is what that makes up the cell membrane, like the outside shell. A vesicle is this bubble that actually leaves the cell and releases the proteins to other cells in the area. This is constantly happening inside your body as you are reading this. As you probably learned in biology some day that the mitochondria are the powerhouse of the cell.

Something else that is really cool is that mitochondria have their own DNA that is specific to them, not shared throughout the cell. However mitochondrial DNA is highly susceptible to mutations because it does not have robust DNA. Inside the mitochondria is adenosine triphosphate or you can just call it ATP for short. ATP is energy for cells, it can transfer energy, and is sometimes referred to as the currency of the cells.

Another thing they do is that they generate heat and help with signaling activities, and mediate cell growth and death. The number of mitochondria in the cell varies, like say in the liver, there are sometimes hundreds of

mitochondria for energy to break down foods.. Now, we are going to talk about Plant Cells.

Actually, before we go and talk about Plant cells, let's talk about the difference between them. Plant cells are very similar to Animal cells, but Plant cells have Cell Walls, and Chloroplasts. That's pretty much it actually. Most of the rest is the same.

You all know that plants perform photosynthesis, turning light energy intofood, or ATP. But how do they do it? Well it starts was down in the cells with something called chloroplasts. This is something that animal cells do NOT have. Inside a chloroplast is many of these little green disks called thylakoids. These thylakoids contain chlorophyll, that's where the magic happens. If you didn't know, chlorophyll is green, and that is the major role in what makes most leaves and most plants green! That's why Big trees have so many leaves. They need so much food, so they need a wide area to capture sunlight,.

Alright, let's get into some history. Plant and animal cells are called Eukaryotes and I'm about to talk about something much older. Prokaryotes are 2 billion years older than Eukaryotes. Fun fact: Eukaryotes came from Prokaryotes. Prokaryotes are very simple, they only have a singular but long strand of DNA that just floats inside the cell. Prokaryotes are just bacteria, that's the domain they belong to.

The story on how Prokaryotes become Eukaryotes is that one day a Prokaryote swallows another bacterium, and the relationship works nicely.

That other bacterium is called mitochondria. so when the cell reproduced through binary fission it split half of the mitochondria, and then the cycle repeated and other things were engulfed and then evolution came and then suddenly you have a Eukaryote after 2 billion years.

But now, let's talk about our final category, Viruses. Everybody has heard of them and been infected by them, but what are they? As you may have guessed there are many different types of viruses. This is Called biological diversity. If there were only one virus in the world, we would become immune and the virus would die off without hosts. Viruses can only survive if they have host cells, and all viruses want to do is spread as far and wide as possible.