



Even though Alex hated riding in school buses, he was excited about this particular field trip. His class was visiting Retro-Gen, a science company experimenting with the DNA of extinct species. Their company hoped to bring some of those species back into existence one day. Alex's science teacher, Mr. Grant, shared stories about Watson & Crick, the first scientists to describe the ladder-like structure of DNA in 1953. Using licorice sticks, toothpicks, and mini-marshmallows, students built models of the twisted molecule. They learned that, in most organisms, the DNA resides in a cell structure called the nucleus. Instructions coded in the DNA allow the nucleus to control the cell's activities. As Alex's interest in genetics grew, he researched the topic more extensively. He loved watching documentaries and reading about DNA online. In fact, there was only one other person in class who was more interested in genetics than he was. That was his friend, Sashi.

Arriving at Retro-Gen, Alex was astonished by the size of the building complex. The class followed Mr. Grant inside. They were greeted by the receptionist, whose name tag said "Ellie". She led them into a futuristic looking laboratory.

Alex examined every detail in the entire lab as his eyes darted here and there. He saw specialized computer equipment, centrifuges, banks of test-tubes, and large microscopes that dwarfed the ones in his classroom. Working somewhere like this after graduating from college would be a dream of any DNA enthusiast.

Ellie said, "This is one of our many genetics laboratories. Here, scientists work to repair and reconstruct incomplete DNA sequences. If we ever want to bring ancient, extinct species back into our world, we have to perfect this process." Alex's hand shot up. "Yes, a question?" she asked, pointing toward him.

"Has RetroGen ever tried to reconstruct dinosaur DNA?" he asked.

"Uh, no, of course not," she said, somewhat nervously. "DNA breaks down over time. There's no way to recover it from animals that lived millions of years ago, despite what you might have seen in movies." To Alex, her voice sounded like she was reciting a prepared statement. "At Retro-Gen," she continued, "we focus on more recently extinct animals, such as the woolly mammoth and dodo bird."

Sashi had the next question. "Is there any way that geneticists could take the modern genetic sequence of a species closely related to dinosaurs, such as a species of bird, and undo the changes that have occurred to it over time? It would be like backtracking to a previous state."

"That's a very interesting idea," Ellie said with a smile. She looked up to Mr. Grant and said, "You certainly have some very intelligent students!" She was definitely acting odd, Alex thought.

Before Mr. Grant could respond, the back door to the laboratory opened. An older man with glasses and a balding head proudly marched into the room. He wore a lab coat and carried a tablet computer. Glad to change the topic of conversation, Ellie began to

introduce the new arrival. “Ah, he’s right on time. This is Dr. Arjun Suri, one of our lead geneticists. I’ll let him take it from here.”

Dr. Suri approached the group with a wide, friendly grin. “Good afternoon! I’m so glad you could join us here at Retro-Gen. I’m going to show you a little bit about what we do here.” He turned over the tablet to show an image on the screen. It displayed a collection of X-shaped and rod-shaped structures. “Does anyone recognize what these are?”

“Those are chromosomes!” Sashi answered enthusiastically.

“That’s correct!” he answered. “Chromosomes are how DNA is organized. Each chromosome contains sections called genes. Dr. Suri tapped on one of the chromosomes. The image expanded to fill the screen and lines divided it into hundreds of sections. “Here are all the genes on this chromosome. But, let us look closer.” He tapped on one of the sections of the chromosome. “This gene is composed of DNA and carries a code – a sequence of letters – that functions as a set of instructions. Of course, the code is not really made of letters. It’s made of molecules called nucleotides. We just use letters to represent them.”

“What molecules are found in DNA?” Alex asked.

“They are guanine, cytosine, adenine, and thymine, which we represent with G, C, A, and T. If you get a distinct sequence of these letters or nucleotides, it is called a gene. Genes work together to determine traits, or characteristics, like the color of the eyes or the size of the ears.” Dr. Suri pulled on one of his own rather large ears and laughed along with the kids. “Now, if you want to see some of the equipment we use to try to recreate the DNA code of extinct species, please follow me.”

The doctor led the class through the lab and into a hallway with more labs on either side. As they walked, Dr. Suri talked about how Retro-Gen started. However, Alex wasn’t really paying attention to him. Instead, he glanced through the windows of the labs they passed, trying to catch other scientists at work.

Alex felt a nudge at his side as they neared the next corner. He turned to see Sashi peering into one of the labs. Several scientists had their heads down as they peered into microscope viewfinders. Others were attempting to decipher images on large screens. On one screen, Alex recognized an image of a cell, the smallest part of an organism that was considered still alive. “What do you think they are doing?” Sashi asked curiously.

“I have no idea, but I hope they’re creating dinosaurs, like you said,” Alex remarked. They watched for a few more seconds and then decided to return to their class. However, as they made the turn in the hallway, they found it empty. The class was gone! Sashi began to panic.

“It’s okay,” Alex reassured her. “They couldn’t have gone far.”

The curious pair continued their search. They looked through door windows for signs of their group. After taking several more turns, they felt hopelessly lost. Just then, Alex spotted a unique door – one without a window – titled *Paleontology Department – Restricted Access*. “Look!” Alex said to Sashi. “If they aren’t trying to create dinosaurs, why do they have a Paleontology Department?”

He took Sashi's mischievous grin as an affirmative signal. Together, they carefully pushed open the door and walked into an empty lab. With a closer examination, they found test tubes labeled with the species of dinosaurs: triceratops, stegosaurus, and compsognathus, among others. "I was right," Sashi said. "They are trying to make dinosaurs."

Alex's attention then turned toward a table in the middle of the room. It was covered with a transparent dome. Peering at the table, he saw six large eggs. "Look, Sashi!" Alex whispered loudly. "They've done it. They've been able to produce viable dinosaur offspring!" he said, referring to the babies in the dome.

"They must have gone chromosome by chromosome and decoded the entire genome of a modern-day species," Sashi speculated. "Then, they modified the genes to code for the traits a dinosaur had, thereby genetically engineering them!"

Just then, one of the eggs twitched. "It's hatching!" Sashi squealed in excitement. Alex held his breath as they watched the egg jerk and tremble, and then finally... crack! A nose poked out of the fissure. It widened, and the egg split in two as the new organism worked its way out.

Once the offspring was fully free of the egg, Sashi immediately knew its identity. "A compy!" she said, using the easier-to-pronounce nickname of the compsognathus. "It even has feathers," Sashi added. Paleontologists now theorized that many dinosaurs had been covered in feathers. "I can't believe I'm actually looking at a dinosaur!"

Wide-eyed, they stared at the compy.....until an announcement on the intercom interrupted this awesome moment. *"Attention all employees! Two students from the field trip have gone missing. Please check all labs, and have these students return to the front desk. If Alex Cho and Sashi Kumar can hear this, please, for your safety, stay where you are and do not touch anything."*

Alex and Sashi just smiled at each other and looked back at the dinosaur. They would do exactly that!

Did you know ... that some genes can cause diseases, such as Cystic Fibrosis or Down Syndrome? By understanding genes better, scientists hope to develop treatments and even cures for these diseases. In the future, they may be able to eliminate these deadly genes from the DNA of an offspring.

Focus Words

cell	nucleus	chromosome
DNA	code	gene
trait	section	offspring