Journey Through the Story of the Universe

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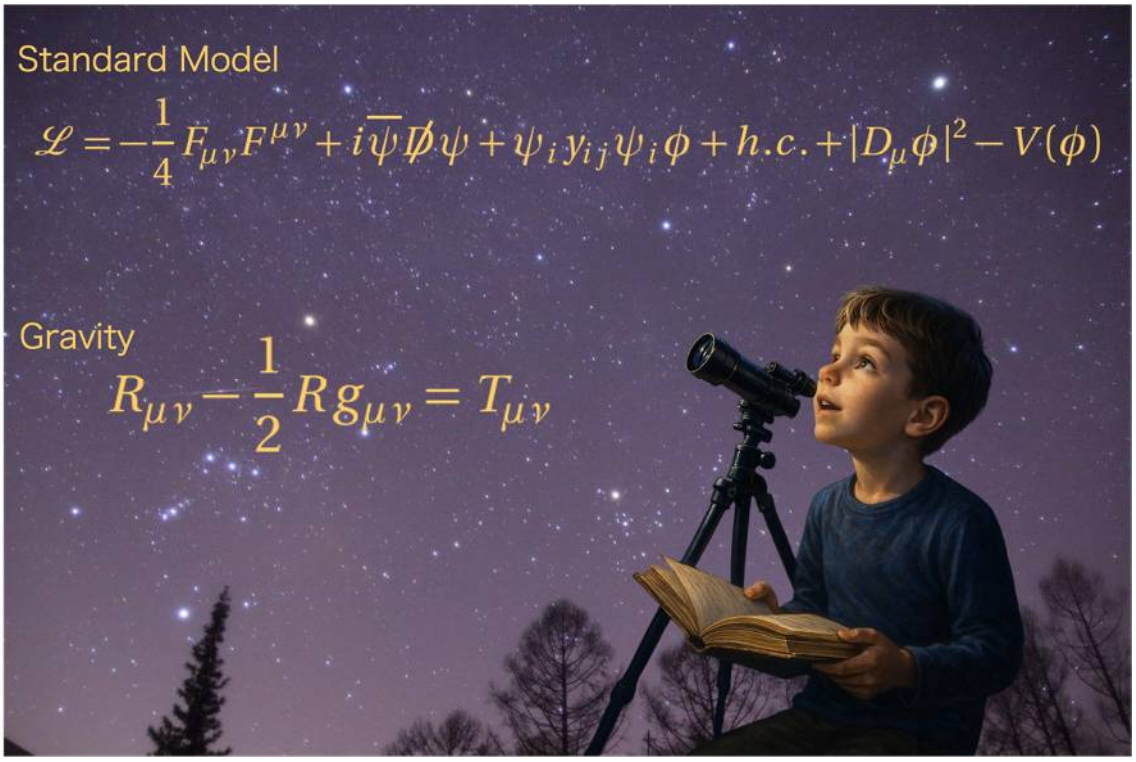

I study the universe—how it began, how it changed over time, and why it looks the way it does today. You've probably heard of the Big Bang—the powerful idea that the universe burst forth from a hot, dense state and has been stretching out ever since. This theory explains many things we observe, like how galaxies are moving away from each other and the leftover light from the early universe, called the cosmic microwave background.

But even the Big Bang theory leaves us with big questions. For example, there's a puzzle called the horizon problem. It asks: how did different parts of the early universe—so far apart they couldn't communicate—end up looking almost exactly the same in temperature? To solve this puzzle, scientists proposed a bold idea: inflation. Inflation says that in the very beginning, the universe expanded incredibly fast—much

faster than the speed of light—for just a tiny fraction of a second. This expansion made the universe smooth and even, and later, it slowed down and filled with light and matter.

We also study the building blocks of the universe: the tiniest particles that everything is made of. These tiny building blocks are described by a brilliant theory known as the Standard Model of particle physics. It's like a toolbox that describes how particles, like electrons, quarks and three of the four forces, such as electromagnetic force work. The Standard Model is very successful—but it's not complete. There are things it can't explain.

For example, scientists know that there's a mysterious substance called dark matter that pulls on galaxies with its gravity, but we can't see it. We also know that there's more matter than antimatter in the universe, which the Standard Model doesn't fully explain. It's yet another mystery that the Standard Model didn't predict.

So I explore what lies beyond the Standard Model—new particles and forces that could unlock the secrets of dark matter, the birth of the cosmos, and even our own existence. It's like looking for the missing pages in the story of the universe.

To me, science is not just a subject at school. It's a way of seeing the world with wonder and excitement. What I love most about my research is that it gives us a chance to ask the biggest questions humans have ever asked: "Where did everything come from?" "Why does the universe look the way it does?" These questions have no easy answers, but trying to answer them is what makes science so exciting.

The universe is like a giant mystery novel. Every star, every particle, every strange signal from space is a clue. And the fun part is—we don't have the ending yet. We get to be the detectives, piecing together the story using math, logic, and imagination. I

especially love that many mysteries remain unsolved. That means there's still so much more to discover. You could be the one to solve the next big mystery!

Also, the tools we use in cosmology are amazing. We build telescopes that can "see" not just light, but invisible signals like microwaves and gravitational waves. These incredible instruments let us peer back in time—literally—to witness the infant universe. When we observe light that traveled billions of years to reach us, we're looking at how the universe looked when it was a baby.

And I love that this research connects to so many other areas of science. To study the early universe, we need to understand both huge things, like the whole universe and tiny things, like particles smaller than atoms. That means we get to use knowledge from physics, mathematics, astronomy, and even computer science. It's like being a traveler who visits many different lands.

But what moves me most is the deep sense of connection I feel—to the cosmos, to life, and to everything that has ever been. We are tiny creatures living on a small planet, but we are made of the same stuff as the stars. The atoms in our bodies were formed in ancient stars that exploded long ago. When I study the universe, I feel a deep connection to all of nature—and to the past, present, and future. It's humbling and beautiful.

You don't know this yet, but someday you're going to start chasing questions that seem impossible to answer. And guess what? That's a wonderful thing.

Here's what I wish you knew:

First, your curiosity is your greatest power. What matters is your love of wondering, imagining, and exploring. Keep asking "why?" even when the adults around you are too busy to answer. Whether you're reading a book, watching the stars, or thinking about

something weird, enjoy it!

Your curiosity is powerful—and it needs tools. That's where math and science come in. Math and science are not just rules and numbers. They are languages that help you speak to the universe. At first, they may seem hard. That's normal. Just like learning to play the piano or soccer, it takes practice. Be patient with yourself. And when you start to understand even a small part of the universe—it will feel magical.

Don't forget: failure is not the end—it's the beginning. You'll get things wrong. You'll feel stuck. Sometimes your ideas won't work. That's okay. Every scientist you admire has been confused and discouraged at times. But those are the moments when you grow the most. Don't give up. You're stronger than you think.

You don't have to do everything alone. Science is a team effort. You'll meet friends and mentors who believe in you, even when you doubt yourself. Ask for help. Help others. Share your excitement. The best ideas often come from working together. Sharing those discoveries is one of the happiest parts of being a scientist.

Lastly, and maybe most importantly: believe in the future. The world needs dreamers, thinkers, and builders. The world needs you. So keep wondering, keep imagining, and keep going. All of that is a gift to your future self. The universe is waiting for you.

I used chatGPT to improve the language or grammar by the following instruction. "Read the following sentences, and point out the grammally mistakes or bad expressions." I used chatGPT to create the image of the kid. Background image and formula is made by myself.

This essay was reviewed by Kate Harris, an instructor in this class and Mikiko Anzo, a classmate in this class. I would like to thank both of them for useful comments.