Beyond Intuition: Connecting the Tiniest Particles to the Vast Universe

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Have you ever looked at the world around you and wondered whether it is really as simple as it appears? A table feels solid. Time seems to pass at the same speed for everyone. Empty space looks truly empty. When I was about twelve, I learned that all of these everyday impressions can be misleading. My path toward science did not begin with one famous teacher, one dramatic experiment, or one life-changing speech. It began with a much quieter helper: a popular science magazine called Newton.

I often found Newton in bookstores and libraries, and I opened it first because the pictures were beautiful. There were black holes, glowing galaxies, and strange drawings of worlds too small to see. But what kept me reading was not only the pictures. It was the feeling that nature was hiding rules far stranger than common sense. The magazine introduced me to the theory of relativity, particle physics, and string theory. At that age, I did not understand the mathematics behind them, but I understood the message: the universe is not required to match what humans find easy to imagine.

Relativity taught me that time is not a perfect clock ticking in the same way everywhere. If something moves extremely fast, or if gravity is very strong, time itself can behave differently. Particle physics showed me that matter is made of tiny building blocks much smaller than atoms, including particles that can pass through us without being noticed. String theory suggested an even more surprising possibility: perhaps the smallest ingredients of nature are not point-like dots, but tiny vibrating strings. These ideas sounded almost like magic, yet they were serious attempts to describe the real world.

That was what excited me most. Science was not just a list of facts to memorize for tests. It was a way to challenge the limits of human intuition. Our intuition is useful for throwing a ball, crossing a street, or pouring water into a cup. It is much less useful for understanding objects moving near the speed of light, particles smaller than atoms, or the universe just after the Big Bang. Newton helped me see that confusion is not a failure. Sometimes, confusion is the doorway to discovery.

As I continued studying physics, this childhood fascination gradually became a research goal. I am now working in observational cosmology. Cosmology means the study of the universe as a whole: how it began, how it changed, and what it is made of. Observational means that I do not only think about possible answers. I use real light collected by powerful telescopes, turn that light into data, and compare the data with our ideas about the universe.

A telescope is often described as a machine for looking far away, but it is also a machine for looking into the past. Light needs time to travel. The light from a nearby lamp reaches your eyes almost instantly, but the light from a distant galaxy may take billions of years to reach Earth. When we observe such a galaxy, we are seeing it as it was long before humans existed. By collecting many of these distant signals, we can study the universe when it was younger, hotter, and closer to the conditions of its beginning.

My research aims to connect the largest and smallest parts of nature. At first, galaxies and tiny particles seem unrelated. A galaxy is enormous, with countless stars. A particle is so small that we cannot see it directly with ordinary microscopes. However, the early universe links them. Soon after the Big Bang, the universe was extremely hot and dense. The behavior of tiny particles helped decide how matter spread out. Much later, that matter became stars, galaxies, and the huge cosmic structures that telescopes observe today.

This means that a map of distant galaxies can contain clues about invisible particles. For example, if a certain kind of particle existed in the early universe, it could slightly change how matter gathered together over billions of years. We may not be able to hold such a particle in our hands, but we can search for its fingerprints in the sky. In this sense, observational cosmology is like detective work. The crime scene is the whole universe, the evidence is ancient light, and the suspects are the hidden laws of nature.

What I hope to achieve is a clearer bridge between the micro world and the macro universe. I want to help reveal how the rules for tiny particles shaped the enormous cosmic scenery we see today. This may sound remote from daily life, but basic science often begins with questions that seem distant: What is space? What is matter? Why does the universe have the structure it has? Asking such questions expands what humans know and what future generations can imagine.

So, if you are twelve years old and science sometimes feels difficult, do not worry. You do not need a perfect plan, a famous mentor, or a dramatic moment. A book, a magazine, a video, a night sky, or one strange question can be enough to begin. When something seems weird, do not turn away too quickly. Ask why it is weird. Ask what rule might be hiding behind it. The universe is much larger than our intuition, but that is exactly why it is worth exploring.

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Declaration of AI usage: Gemini was used in the first draft to translate and edit the text and to generate the original image. ChatGPT was used to revise, edit, and format this final draft. The image was further edited with Python drawing tools.