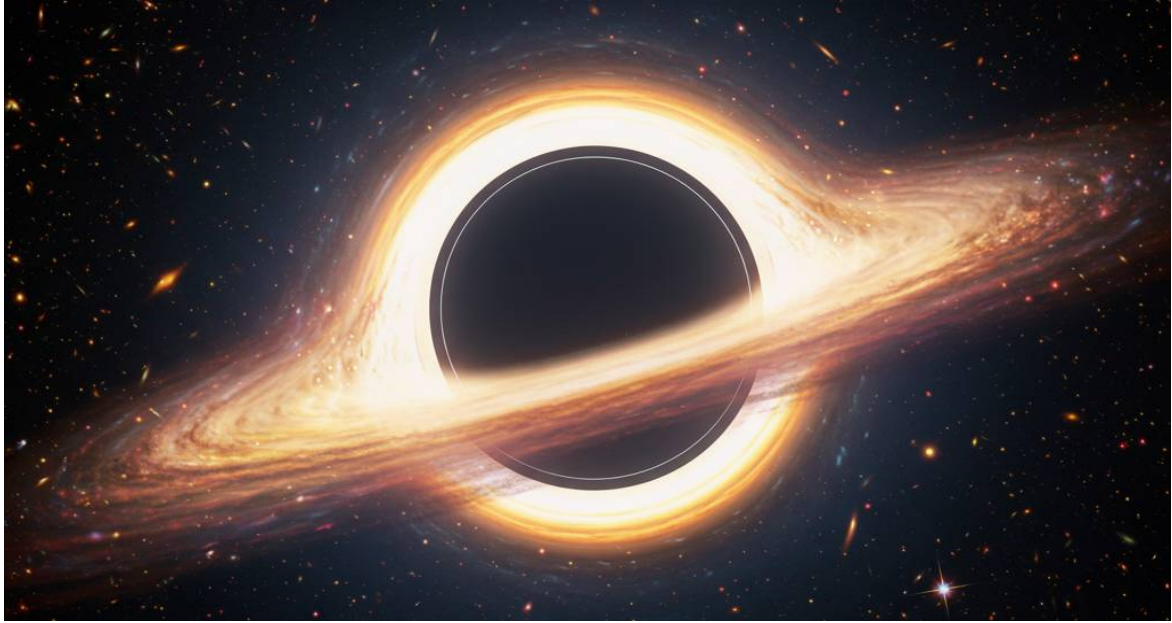


## Mysterious Heartbeats from Supermassive Black Holes

Keigo Kondo



### The Bursting Hearts of Galaxies

Have you ever heard of a place in space where even light can't escape? That mysterious place is called a **black hole**, and it's one of the strangest objects in the universe. They might sound like science fiction, but they are very real.

Black holes are formed when a massive star runs out of fuel and collapses under its own gravity. This collapse creates a point in space with a gravitational pull so strong that nothing—not even light—can get away. That's why black holes look completely black.

But there's something even more amazing: **supermassive black holes**. These giants are millions or even billions of times more massive than our Sun. Scientists believe that

almost every large galaxy, including our own Milky Way, has a supermassive black hole at its center. However, we still don't know exactly how these cosmic giants were born.

Most of the time, supermassive black holes are quiet and difficult to see. But sometimes, they “wake up” and begin to pull in nearby gas and stars. As this material gets closer to the black hole, it heats up and glows, becoming so bright that it can outshine all the stars in its galaxy. We call this glowing center an **active galactic nucleus**.

In some galaxies, however, scientists have observed something even more mysterious. Instead of flaring up just once, the black hole flashes over and over again in a repeating pattern—sometimes just hours apart—like a cosmic heartbeat. We call these strange flashes **quasi-periodic eruptions**, or **QPEs**.

The first QPE was discovered in 2018, and we have only found a few galaxies that show this behavior. My research focuses on QPEs to understand what causes these repeated bursts of light. One theory is that a smaller star might be orbiting the supermassive black hole, and each time it passes through a disk of gas surrounding the black hole, it causes a flare. But no one knows for sure yet. That's what makes it so exciting—and that's what I'm working on right now!

### **What Drives Me to Study the Universe**

Why do I find this so interesting? To answer that, I have to go back to my childhood.

My journey toward studying the universe began when my mother borrowed books about space from the library. They were filled with beautiful pictures of stars and galaxies, which I couldn't believe existed in the same world I lived in. Every evening after elementary school, I would read those books over and over, imagining these amazing objects far out in the sky.

This fascination with the universe naturally led me to an interest in **physics**—the science that explains how our world works. For example, it was fascinating to learn that gravity explains both why an apple falls to the ground and why the Moon orbits the Earth.

Learning physics felt like discovering the hidden laws of the world, and it was really fun.

That interest has stayed with me, and it's why I now study **astrophysics**—the science of studying the universe using the laws of physics. Astrophysics allows me to explore incredible events happening far away in space using what we know here on Earth. Isn't it amazing that we can calculate and even predict what's happening near a black hole billions of light-years away?

Thanks to better telescopes and creative new ideas, discoveries are being made all the time. There's always something new to explore, and that's what keeps me excited about my research.

**What I Wish I Knew at Your Age**

You might be wondering, “Did everything go perfectly on your path to becoming a scientist?” The truth is, no. I’ve had to make difficult choices, and I haven’t always known if they were the right ones. Even now, I sometimes wonder if I should have done things differently.

If I could give just one piece of advice to my 12-year-old self—and to you—it would be this:

**“Don’t worry too much about making the perfect choice. And don’t take your life too seriously.”**

That might sound strange. You probably feel pressure to get the right answers on exams or to always behave perfectly. You might think you need to make the “right” choices all the time to succeed.

But here’s the truth: it’s almost impossible to know the best decision at the moment you are making it. Often, you only realize whether it was a good choice much later, after you’ve seen the results.

And that’s okay.

You don’t have to have your whole life planned out right now. What matters most is that you follow what excites you. Try your best, stay curious, and don’t be afraid to make mistakes. Every decision you make helps you grow, even the ones that don’t turn out perfectly.

Remember this: even though your life feels incredibly important—and it is!—it's also just one small story in this huge, amazing universe. That's actually a wonderful thing. It means you don't need to be perfect. You just need to be honest with yourself, keep learning, and keep exploring.

So, that's what I study, what inspires me, and the advice I wanted to share. I hope you found it interesting and maybe even a little helpful.

Science is full of wonders, and the universe still holds many secrets. Maybe one day, you'll be the one to help discover them.

The universe is always waiting for curious minds like yours.

### **Acknowledgement**

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