

A Letter to My 12-Year-Old Self: The Future Is Made of Light

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Dear 12-Year-Old Me,

Right now, you're probably curious about how your computer works, or maybe you're playing with one, wondering how it can be so fast. I know you love building things, and asking "why?" all the time. I'm happy to tell you: that curiosity hasn't gone away. In fact, it's taken you somewhere amazing — into the world of quantum computers.

A regular computer is like a very fast thinker. It follows clear instructions, one step at a time, using tiny switches to process 0s and 1s. But even with all their power, regular computers are starting to reach their limits. That's where quantum computers come in — and they're completely different.

Instead of regular bits, quantum computers use qubits, which follow the strange rules of quantum physics — the science that explains how the tiniest things in the universe behave. In the quantum world, something can be in many states at once, and two things can affect each other even from far away. It sounds like science fiction, I know — but it's real science. And it's opening up entirely new ways to solve problems.

In a way, regular computers are like running along a straight path. Quantum computers are like exploring a maze with hundreds of doors — all at once.

Imagine a world where answers come instantly — not in hours or minutes, but in the blink of an eye. A world where computers can try out millions of possibilities at the same time. Doctors could discover new medicines in days instead of years. Weather forecasts could predict storms weeks in advance. Scientists could simulate a living cell, molecule by molecule, to understand life in a completely new way.

And what if artificial intelligence could learn faster than ever, becoming a helpful partner in solving the world's biggest problems — like climate change or food shortages? With quantum computers, those dreams are getting closer.

Right now, I'm working on building a special kind of quantum computer — one that uses **light** instead of electricity. Yes, light! Like the beam from a laser pointer or the sunlight shining through a window. And here's what makes it exciting: light is the fastest thing in the universe. If a normal computer is like a person running, an optical quantum computer is like a jet fighter flying at top speed. We're not just changing how we calculate — we're changing how fast we can even think about problems.

But how can light do math?

Great question. Light isn't just something we see — it carries many hidden features: its

color, shape, and the way it vibrates. Scientists have learned to use these features to store and process information. In my research, we use tiny packets of light.

Here's the amazing part: optical quantum computers actually do calculations by repeating something called **quantum teleportation**. Don't worry, it's not about teleporting people (not yet!). It means sending quantum information from one place to another — not by physically moving anything, but by using the mysterious connection between particles. It's like solving a puzzle where the answer jumps to the right place, just by setting up the pieces correctly.

By linking lots of these teleportation steps together, we can perform complex operations — not with wires and electricity, but just with light. That's what I work on every day: making these teleportations faster and more reliable, so that one day, we can build powerful quantum machines.

You might think, "That sounds way too complicated — I could never do that." But here's something I wish I had known when I was your age:

Yes, you can.

I used to think science was only for geniuses. I didn't know that real science is about trying, failing, and trying again. You don't have to be the smartest kid in the class. You just need to be curious, ask questions, and keep going, even when things are confusing or hard.

If I could give you a few pieces of advice, they would be:

1. **It's okay not to know everything.**

The best discoveries begin with "I don't know."

2. **Science is creative.**

Building a quantum computer might sound hard, but at its heart, it's not so different from building with LEGO — piece by piece, trying things out, seeing what fits. You've done that before. And if you don't dream it, you can't build it.

Every invention starts with a strange idea — maybe even one of yours.

I chose applied physics because I wanted to understand how the world works and use that knowledge to build something meaningful. You've always liked making things — and that love didn't come out of nowhere.

Our grandfather ran a small factory, crafting precision instruments with care and creativity. He loved solving problems with his hands. Although I never met him — he died before I was born — I always felt a quiet kind of awe. Even as a kid, I dreamed that someday, I might build something just as real, just as useful.

Now, that same spirit is guiding me as I work to build something that could change the world — not with metal and gears, but with **light** and **quantum physics**.

So keep exploring. Chase what excites you, even if it doesn't all make sense yet. The future is made of light — and you're already closer to it than you think.

With love and curiosity,

Future You



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Guideline

This essay was written by SUZUKI Takumi and revised using only Grammarly as a grammar and spelling checking tool. No other AI assistance was used.