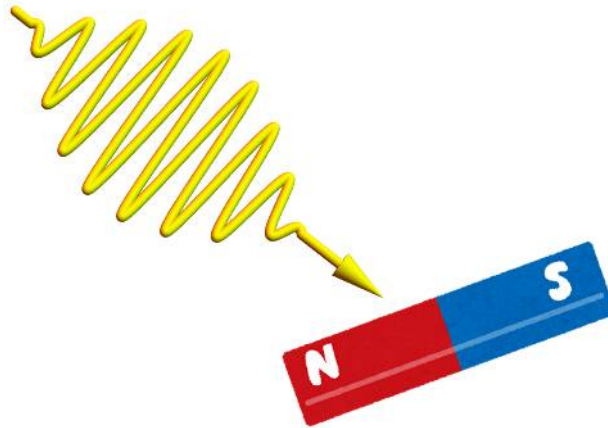


Title: Turning Materials into Magnets by Ultrafast Light Control

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Imagine holding a small piece of material in your hand. Then, imagine that this material suddenly becomes a magnet within a tiny fraction of a second simply by shining a light pulse onto it. You might think this sounds like science fiction and that it could never happen in the real world. However, with today's rapidly advancing technologies, this is no longer just a fantasy. In recent years, scientists have discovered that light can make certain materials into magnets at astonishing speeds—much faster than a single second [1].

I am currently studying condensed matter theory, a field of physics that aims to understand the rich behaviors of materials. What fascinates me the most is not only the exotic phenomena that materials exhibit but also the fact that we are starting to learn how to control these properties. The ultimate goal of condensed matter physics is to design and manipulate materials to behave exactly as we desire. My research focuses on uncovering the physical mechanisms behind the ultrafast changes in a magnet. Using mathematical models and equations from quantum mechanics, which is one of the fields of physics, I aim to understand the interaction between light and matter in the ultrashort time scale.

This level of control has a potential for future technologies, particularly in the field of spintronics, where the spin of electrons is utilized to store and process information. Light-induced magnets could pave the way for the development of faster and more energy-efficient magnetic memory devices. In the future, this technology may be found in smartphones and computers we usually use, opening exciting pathways toward the next generation of technologies.

Let me change the topic a little and tell you how I came to pursue the research I am currently involved in.

I really enjoyed math and physics before I entered university, during the time when I was about your age. I was amazed that by using numbers and formulas, we could explain what was happening around us like why a ball thrown into the air falls back down. Even more exciting was the fact that the same formula could describe many different phenomena.

In university, I discovered a branch of science called condensed matter physics. This field focuses on understanding why materials behave in interesting ways. I was surprised to see the variety of behaviors that materials could exhibit, and I was intrigued by the idea that there was an underlying mechanism to explain this. It felt like there was a secret system behind everything, and I wanted to uncover it.

After that, I discovered a fascinating aspect of this field—using light to change how materials behave and doing it in a very quick manner. By simply shining a quick flash of light, we can make a material act like something completely different! The interesting point is that we can not only observe this phenomenon in experiments but also predict it using theoretical models. It's like solving a big, beautiful puzzle with formulas. That's what drew me into the research I'm doing now.

Now that I have shared with you what I study and how I entered this field, I want to pass on a few things I wish someone had told me when I was your age.

First, if you find something even a little interesting, try diving into it. You don't need to understand everything right away. There will be a time when you find it interesting. It is often that something exciting is hidden before you fully dive in.

Second, don't be afraid to explore many different topics and cultivate your curiosity across many fields. You may not find your favorite things immediately, and it is totally okay. Indeed, I didn't have a specific area I wanted to major in and I didn't know about the current field until much later. What matters most is staying curious and open to new ideas.

Third, when you learn something like math or physics, try to broaden your perspective. Think about how these topics connect to the world around you. For instance, the phone you use and the computer in front of you are all built using ideas that started as simple questions in science. The more you understand, the clearer the connections between everything in the world will become.

Lastly, don't waste your time. I think you have a lot of time to explore freely, to read, think, and imagine. As you grow up, you will become busy doing other things. So, while you have time, use it wisely to pursue the things that you are really interested in.

Reference

[1] A. Kirilyuk *et al.*, *Rev. Mod. Phys.* **82**, 2731 (2010).

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