

How You See

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A: Hi. I'm Saya Yamamoto.

B: I'm Satsuki Fukunaga.

C: I'm Mao Miura. Hello.

ABC: We are from Tokuyama College.

A: We, KOSEN students, need to face physics every day to be great engineers no matter how much we are interested in other subjects.

B: I like physics but I'm not very good at it.

C: Actually, physics is everywhere in our lives and we have no choice but to be interested in it.

A: As KOSEN students, we have been learning classical physics. But what about quantum physics? We have heard about it but don't learn it so much at school.

B: Today, we are going to approach this difficult topic. What is quantum physics? What is the difference between classical physics and quantum physics? What can we do with quantum physics?

C: I'm sure you've heard at least one of the following words: quantum physics, quantum mechanics, and quantum computer.

A: Before getting into our main topic, do you know anything about quantum?

B: Let us explain a little about quantum first.

C: In general, a quantum is a very small unit of matter or energy. We used to think atoms, neutrons, and protons were the smallest, but we have learned they are made of even smaller stuff.

A: A quantum is the smallest unit that makes matter or energy. Simply saying, classical physics explains the rules of what we can see, and quantum physics explains the rules of what we cannot see. It is not very accurate but you could roughly say that.

B: We have a physics teacher named Mr. Nakamura. He is young but very strict. Many students cannot pass his exams.

C: One day in class, Mr. Nakamura suddenly said, "All substances in this world exist in the two states: particles and waves." We didn't understand what he was saying at first.

A: He continued, "OK. Here: this is a pen. If you see or observe this pen, it exists as a particle. However, if you don't see or observe it, it exists as a wave. This concept is called wave-particle duality and is the very basic idea of quantum physics."

B: We couldn't understand or even believe what he was saying. But after his class, we read books about this physics at the school library, searched for quantum physics on the Internet, watched a lot of YouTube videos, and finally we now understand a little about quantum physics.

C: Let us introduce an experiment. Some people say that it is the most beautiful experiment in the world. It is the Double-Slit Experiment. Please look at this photo.

A: Imagine having a device that sprays sand. What do you think will be left on the

- screen on the other side of the cardboard when you spray this sand onto a cardboard with two slits?
- B: The actual experiment sprays elementary particles such as electrons and photons instead of sand. As a result, such traces remain when this experiment is done while observing.
- C: The results are different depending on how people are observing the experiment.
- A: From this experiment, it is known that every particle has a wave function.
- B: I am sure that many of you still don't get what we are talking about and even think it has nothing to do with your life.
- C: Actually, the theory of quantum is everywhere in our life and it is no exaggeration to say that we cannot live without it.
- A: The theory is fundamental to semiconductors used in computers, and DVDs, lasers, digital cameras, smartphones, etc. cannot exist without it.
- B: In addition, there are a lot of advanced technologies based on quantum mechanics such as "quantum computers" and "superconducting motors" used for the linear *Shinkansen*.
- C: Recently, these types of technologies have been developing rapidly and will be entering our daily lives even more in the future.
- A: Here is something interesting. Waves go through a wall just as sound goes through a wall because sound is a kind of wave. And all the substances exist in the two states: particles and waves. This means that, theoretically, something, some matter, could possibly travel through a wall.
- B: That could mean that even a person could go through the wall—but we're not sure how, yet.
- C: I hope you understood a little about quantum physics. Now, we'd like to see this physics from a little different point of view.
- A: It may be only our imagination. But I hope our imagination makes a difference.
- B: As we talked about in the Double Slit Experiment, whether you observe things around you makes a difference in the behavior of things. Observing is not just about seeing, it is about how you are aware of the things around you, which can change the reaction of things and the events that occur.
- C: Have you ever experienced something like this? Good things happen if you think good things, and bad things happen if you think bad things. This is commonly referred to as the law of attraction, and Michael J Losier's book shows various examples.
- A: For example, one day when I forgot my parasol, I thought, "I don't want it to rain," and it rained. Another example is if I go to bed one night thinking about meeting my favorite boy, I will meet that boy the next morning.
- B: Of course, there is no certainty that this law is related to quantum mechanics, but if human consciousness and thoughts influence things around us, it is hard to say that they have nothing to do with them.
- C: Wouldn't it be so good if humans were better aware of and observed things around them so that bad things wouldn't happen and only good things would happen? Yes, this sounds like fantasy, but we are just saying it might be possible.
- A: Please look at these pictures. These are pictures of the golden ratio. Even if humans do not observe it, nature will look beautiful like this.

B: We humans may be seeing things in a wrong way. Many bad things are happening in the world every day.

C: It may not be possible to see everything in the right way, but it should be possible to see some in the right way. If we can see things in the right way, they may look better and more beautiful as they originally are and only good things may happen.

A: This may also be true for the people around us. How you see them may change their behavior.

B: Yes, that's all about how you see things. It really makes a big difference in this world.

C: We hope that each of us will have a better way of thinking and a better way of observing things and even people around us so that the world will be a better world. Thank you for listening.