Find their connection – How revolutionary ideas come along

MATSUZAKI, Shigemichi

National Institute of Technology, Kumamoto College, Kumamoto Campus

Sometimes, there is an “invisible” connection between two things that are apparently unrelated. For instance, the fact that a friend of yours has been a friend of another friend of yours. Or, the fact that *daifuku* with strawberry is actually the best combination ever. You may think that these connections are not that significant and don't even have any effect on this world. However, every once in a while, those tiny and invisible connections may bring us brilliant ideas that change everything.

Do you know how creatures evolve? Charles Darwin, who is one of the most famous biologists in the world, proposed the scientific theory of evolution by natural selection. According to him, the individuals that have better characteristics are more likely to survive. At the same time, he also mentioned mutation, which means a generation of individuals that accidentally occurs in the way not following natural selection. The evolution of creatures is the result of those phenomena. It was in the 19 th century that he discovered this theory.

After a hundred years, in the 1970’s, researches of computer science were getting active. Combinatorial optimization was one of the problems that were actively being worked upon. This is the problem to find the best solution from a number of candidates. For example, let’s think about finding the shortest route from a map. If you want to visit 5 cities, there are 120 different routes. So, what if you have to go to 100 cities? Or 1000? Or more? If we evaluate all possible candidates for the solution and check whether each candidate is suitable to the requirement, even if we use computers, it takes a large amount of time because there are tons of possible combinations. Researchers thought of a method that could solve the problems in a shorter time. A hint had been in the mechanism of evolution, which had been found a century before. They built the system of evolution as a computer program. In this program, a solution gradually approaches to the best answer, exactly like how real creatures evolve. This way of solving the problems is called “Genetic Algorithm”. Today it is used in many fields, such as control engineering, economics as well as software engineering.

Here is another example. I play softball. In softball, pitchers throw a ball by swinging their arms in a circle. It’s very difficult to throw the ball this way and I used to be unable to control my pitch at all. However, when I was studying mathematics, I came up with an idea. “Pitching is differential”. Differential is a mathematical term for “*bibun*” in Japanese, which you like. I mean, since the motion of an arm makes a circle when we throw a ball, we just have to differentiate the circle at a proper point so that the tangent line tends toward a catcher. Of course there’s gravity so the ball doesn’t travel straight but drops a little on the way to the catcher. My pitching technique was improved by this idea. It didn’t just make me a better pitcher but it also gave me more interest in mathematics. At the moment that math, which had been just a boring thing for me, was connected with pitching in my mind, it became something meaningful for me. And I like mathematics now.

The point is that there is apparently no relation between the theory of evolution and the field of computer sciences or softball and mathematics. If we’re interested in either only one of them, the connection between them would remain invisible. So how can we find it? I think that what is the most important is to know that everything may be related to one another. We shouldn’t think that we are studying several things separately but always keep in mind that there may be a connection between what you’re studying. In other words, we should always see things from different points of view. Imagine that the things you’re learning are possible to get together and transform into something totally new. Isn’t that wonderful!? This attitude will make studying more interesting to you and perhaps bring us revolutionary ideas in the future.

Hints are all around you. Find their connection.