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Quantum Computing

Reading 1

The Unreasonable Effectiveness of Mathematics in the Natural Sciences

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Abstract

In this text, that is based on the article: "The Unreasonable Effectiveness of Mathematics in the Natural Sciences" by Eugene Wigner, two ideas are extracted arbitrarily and discussed, according to the interest of the author.

1 Idea 1

Science as a tool, science as an art
Let us make the following mind experiment: let there be a caveman, and let us wonder if this being needs science. The obvious answer for our last question is no, this being does not care or need science. We can create a time line that brings us from the time the cavemen were alive to the present, extract a characteristic human from that time, and then repeat the same mind experiment over and over, and at some point in time, the subject in our mental experiment will have the necessity of creating, storing and sharing knowledge about the world; and from there, it is very likely that the following individuals on the experiment have this same necessity, or at least, that their lifestyle rely on science in a way. This may be a naive approach to showcase that science is a necessity in our every day lives but I believe that is enough to point that science is a tool that has been proven resourceful along the history.

Right now, science is seen by many as a part of a cascade, where science is at the top creating knowledge, and then technology is right below it using this knowledge, so engineering may be in a third position using the technology made possible by the efforts of science and technology. Of course, this is a very raw approach that does not define some interesting interactions between this trinity of progress, but the point that I would like to mention is that, even when everybody can be an artist in his or her own way; being a scientist represents the most profound form of art. What we have achieved is poetic: we can just think about how we tamed the infinities with calculus, we figured out the shape of our universe, we figured out how things in a very small scale behave. I see science as a fraternity, where you look up to all those persons that have worked towards the understanding of the universe, mathematics is the language in which we all communicate, and there are a lot of persons willing to collaborate to figure out the misteries of the nature.

2 Idea 2

How to know that what we know is true?
The Nobel laureate, Eugene Wigner talks about some epistemological principles, and this made me think of a person that happens to have an accelerometer (let us call him the insider). Let us assume that this person has an algorithm to manipulate the data provided by the accelerometer to get its position at a given time. Also there is a person (let us call him the outsider) that knows the actual position of the person. Let us suppose that the outsider and the insider can communicate and that the insider can modify its algorithm to better fit the "ground truth" provided by the outsider. In this specific mind experiment, the insider's algorithm to know his position will have enough accuracy to predict "the truth" given some inputs.

The analogy is that the insiders are ourselves, scientists, but we do not have means of communicating with the outsider to know the ground truth, therefore, it is much more difficult for us to adjust our algorithms, i.e. our physical theories of nature. In this way, it is almost impossible to know if a physical theory is correct, or just a very good approximation that happens to have a good numerical coincidence, e.g. Newton's law of gravitation being very accurate for not so massive bodies travelling at low speeds but breaking up for really massive objects, or objects travelling really fast.