Turn your “discoveries” into “language”

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Do you remember the joy of drawing on the fogged-up window of a car driving through the rain? Do you remember the disappointment you felt when you drew so much that there was no space left? And do you remember that feeling of omnipotence when you realized that blowing your warm breath onto the glass would bring back a blank canvas for you to draw on once again? This was undeniably your very own discovery—your "understanding" of how things work.

This kind of "understanding" can occur when playing Jenga, for instance. Before you know it, you understand that you shouldn't touch a row where the middle block has been removed, and while a row missing an edge block is risky, it's still safe to pull out the opposite edge. This is an understanding cultivated by predicting an outcome, testing it, and observing the results. It is a "discovery" uniquely yours. Throughout my life, I, too, have made countless little "discoveries." These "discoveries" piled up within me, forming my intuition. Then one day, an opportunity arose to express those discoveries and that intuition in "words." That was the moment I first encountered physics, and this experience was the exact what drove me toward the path of science.

Galileo Galilei is said to have stated, "Mathematics is the language with which God has written the universe." Just like you, when I was around twelve years old, I thought of mathematics merely as a tool for calculation. But as it turns out, math is a language, and equations are its "words." Naturally, words carry meaning and are meant to be interpreted. And indeed, physics is a discipline that uses mathematics to describe the phenomena of our world, and there is a specific way to interpret those descriptions. I still remember how deeply moved I was when the equation of motion, $F = ma$, was first explained to me: "Applying a force (F) changes how something moves (acceleration a). The resistance to that

change in motion is its mass (*m*)." I was struck by how intuitive this expression was. This was the perfect example of taking the trivial "discovery" we intuitively understood—"if you push something, its movement changes"—and articulating it clearly through the "words" of mathematics. Captivated by witnessing my own "discoveries" being beautifully explained in words one after another, and driven by the desire to put my accumulated "discoveries" into "words," I chose the path of physics.

While studying physics, I learned the mechanisms behind the various "discoveries" I mentioned at the beginning, as well as how to express them in mathematical formulas. It turns out that drawing on the fogged-up window and the phenomenon where a warm breath revives your canvas can apparently be explained by concepts like "thermodynamics" and "phase transitions of water." Furthermore, that winning strategy in Jenga can seemingly be described using mathematical expressions like "rigid body dynamics" or "moment of force." I see—it seemed that the "discoveries" I had been making were already explained in someone else's "words." However, as I advanced my studies, I gradually learned how to verbalize "discoveries" that fewer people knew about. And so, aiming to "verbalize discoveries" that no one else knows yet, I have deeply enjoyed my journey in physics.

In this way, through my studies in physics, I have seen many of my past "discoveries" translated into the language of mathematical formulas. To be honest, it has been deeply satisfying. Recently, however, a new entity seems to have emerged—one capable of making "discoveries" just as we do. That entity is AI (Artificial Intelligence). The inner workings of AI are actually written in mathematics; therefore, the "discoveries" made by AI are also articulated using the language of "mathematics." My primary research right now focuses on a specific question: Are the "discoveries" made by AI of the same nature as the "discoveries" we humans made?

Specifically, my work falls within biophysics—a field that aims to understand the phenomena inside living organisms using physics, which serves as a tool for "verbalization through mathematical formulas." You might have heard of DNA, the molecule that stores our genetic information. Inside our bodies, there is a process where a copy of this DNA, called RNA, is extracted, and a "scanner" called a ribosome reads it to produce the proteins our bodies need.

In fact, the genetic information in this RNA is structured like a text written in just four letters, and the ribosome, acting as a scanner, reads this text to produce proteins that correspond to its contents. And just as you might read simple letters or sentences fluently in a language class but take more time with difficult ones, the reading speed and pace of the ribosome also vary depending on the letters and contents of the RNA text. It is said that this reading pace of the ribosome can be described by a mathematical model based on the intuitive "rule"—that it takes more or less time to read certain "words." This is a prime example of humans understanding the "discovery" of a "rule" through the "words" of mathematics.

However, just like the ribosome, AI can read the entire RNA text and derive the exact same results directly from its contents. In other words, AI is making a similar "discovery." What I am investigating is whether this "discovery" by AI is fundamentally the same as the "discovery" we articulate through physics using mathematical models.

Thanks to AI, one thing has become abundantly clear: even for a single phenomenon, there can be multiple ways of "understanding" and making a "discovery." The "discoveries" you know might just be entirely different from the "discoveries" of anyone else. I continue down the path of physics today because I want to verify that. And if you, too, wish to put into words the proud "discoveries" you have accumulated—if you wish to verify them for yourself—then you would do well to choose the path of science.

After all, ever since that day you reached out to the fogged-up window and realized you could draw, that very discovery has already helped your hand toward science.

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Note:

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I also used Gemini 3.1 Pro Preview to improve the English expressions and the grammar.