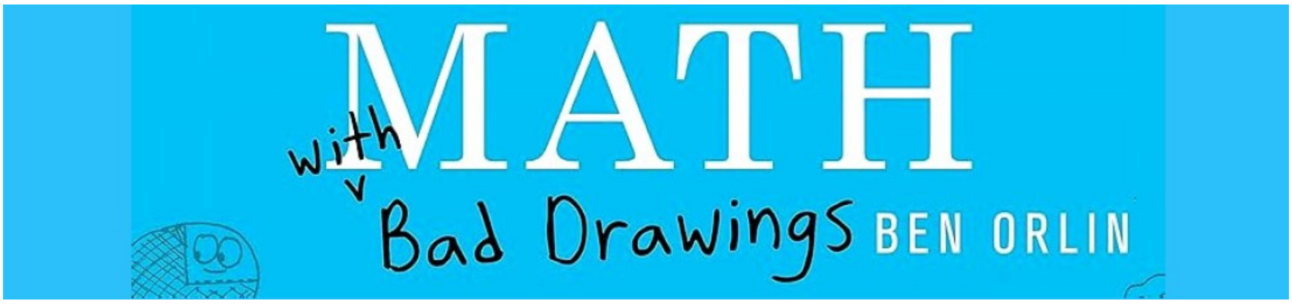
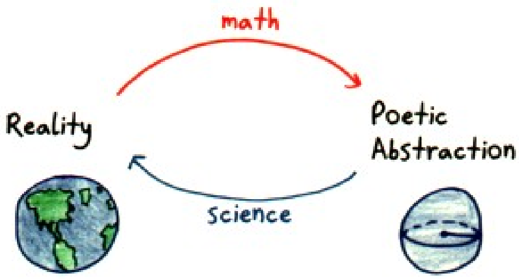


Math: a dreamy poet?



Whereas science sees itself as as the protagonist of an action movie, mathematics sees itself as the auteur director of an experimental art project.

That's because, on a fundamental level, mathematicians do not care about reality. […] Despite the aggressive ad campaign about its "real-world usefulness," mathematics is pretty indifferent to the physical universe.

What math cares about are not *things* but *ideas*. […] Math lives not in the material universe of science but in the conceptual universe of logic.

Mathematicians call this work "creative." They liken it to art.

That makes science their muse. Think of a composer who hears chirping birds and weaves the melody into her next work. Or a painter who gazes at cumulus clouds drifting through an afternoon sky, and models her next landscape on that image. These artists don't care if they've captured their subjects with photorealistic fidelity. For them, reality is nothing more or less than a fertile source of inspiration.

That's how math sees the world, too. Reality is a lovely starting point, but the coolest destinations lie far beyond it.

Math sees itself as a dreamy poet. Science sees itself as a supplier of specialized technical equipment. And herein we find one of the great paradoxes of human inquiry: These two views, both valid, are hard to reconcile. If math is an equipment supplier, why is its equipment so strangely poetic? And if math is a poet, then why is its poetry so unexpectedly useful?

To see what I mean, take the twisted history of knot theory.

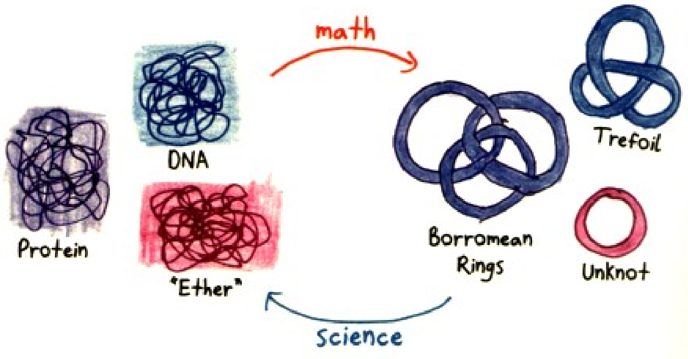
This branch of mathematics, like many, was inspired by a scientific problem. Before the discovery of atoms, some scientists (including Lord Kelvin) entertained the idea that the universe was filled with a substance called ether, and matter was made of knots and tangles in it. Thus, they sought to classify all the possible knots, creating a periodic table of tangles.

Before long, science lost interest, lured away by the shiny new theory of atoms (which had the unfair advantage of being right). But mathematics was hooked. It turns out that classifying knots is a delightful and devilish problem. Two versions of the same knot can look wildly different. Totally different knots can taunt you with their resemblance. It was perfect fuel for mathematicians, who soon developed an exquisite, complex theory of knots, unperturbed that their clever abstractions appeared to have no practical purpose whatsoever.

The centuries rolled along.

Then, science ran into a real snake of a problem. As you know, every cell inscribes its precious information on DNA molecules, which are fantastically long. If straightened out and laid flat, the DNA from one of your cells would stretch for six feet – a hundred thousand times the length of the cell itself. This makes DNA a long string stuffed into a small container. If you've ever shoved earbuds into your pocket or removed Christmas lights from their box, you know what this scenario creates: maddening tangles. How do bacteria manage this? Can we learn their tricks? Can we perhaps disable cancer cells by tangling their DNA?

Biology was flummoxed. It needed help. "Ooh," Mathematics cried. "I know just the thing!"

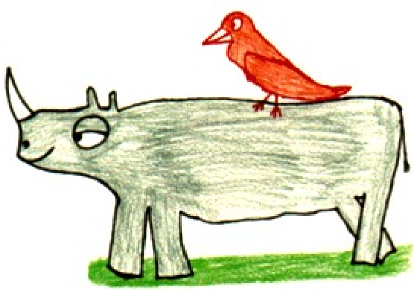


Here, then, is a brief biography of knot theory. It was born from a practical need. Soon, it grew into something deliberately impractical, a logic game for poets and philosophers. And yet somehow this mature creature, which had barely spared a thought for reality over the years, became profoundly useful in a field far removed from the one of its birth. […] No matter how many examples I encounter, this historical cycle of useful to useless to useful again remains a wonder and a mystery to me.

My favourite description of this phenomenon is a phrase coined by physicist Eugene Wigner: "the unreasonable effectiveness of mathematics." After all, bacteria don't know any knot theory, so why should they follow its rules? […]

So, how best to understand the relationship between the poet we call Math and the adventurer known as Science? Perhaps we ought to see them as a symbiotic pair of very different creatures, like an insect-eating bird perched on the back of a rhino. The rhino gets its itchy problems solved. The bird gets nourished. Both emerge happy.

When you visualize math, picture something dainty and elegant astride the wrinkled gray mass of reality below.



Ben Orlin, *Math with Bad Drawings*, 33-37.