Video Abstract Transcript for *Idealizations in Physics* by Elay Shech

Science tells us amazing things about our world. It tells us that our universe is expanding and even accelerating. That all of matter is made up of fundamental particles too small for the naked eye to see. That there exist correlations among such particles, entities like electrons and photons, even when they are light years apart.

However, anyone who's taken even an introductory course in physics knows, idealizations, abstractions, approximations, all of which are falsehoods of sorts, are ubiquitous in science.

We talk about a frictionless plane, point and test particles, non-interacting particles, non-viscous fluid flow, the perfect vacuum. We talk about infinitely thin wires or infinitely long cylinders and planes.

We study the simple pendulum, and the ideal gas law, and so on.

Thus, the question arises: How can science discover truth when it appeals to lies in the way of idealizations?

We could even take a step back and ask: What are idealizations? Why do we appeal to them and how do we justify them? If idealizations are false and inaccurate, how can they provide true explanations, genuine understanding, and realistic descriptions?

In fact, if the reasons for us believing in the amazing things that science tells us is that, say, fundamental particles like electrons are indispensable to our best theories, does it follow that we should also believe in the existence of indispensable idealizations? What would that even mean? Should we think about idealizations as abstract objects akin to platonic forms, or fictions like literary characters?

In this Element, *Idealizations in Physics*, I will tackle such questions and introduce you to the various philosophical debates that revolve around these issues.

I'll suggest, for example, that idealizations are essential to physics, but not in the way we usually think about it. Not for the purpose of simplifying, or making the math easier.

Rather, I'll argue that idealizations allow us to explore the structure of our theories and that sometimes they're essential for understanding what certain phenomena are in the first place.

I'll also talk about characterizations of idealizations, as well as the need and means to justify them, and so on.

So, if you're interested in the conceptual sides of science, or if you want to introduce your students to cutting edge philosophical debates at the undergraduate or graduate level, this Element, *Idealizations in Physics*, is perfect for those goals.