



BIO 2026, San Francisco and a Desperate Remedy

**June 2026**

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## *Scientia*

***“Dear Radioactive Ladies and Gentlemen,”*** were the first words to arrive in a letter written by Wolfgang Pauli in 1930 to a gathering of physicists studying radioactivity in Tübingen, as he dramatically prepared to introduce what he described as a “desperate remedy” to save the law of conservation of energy.

Around this time, physics was undergoing a radical transformation as the quantum mechanical revolution had begun. The ground beneath our understanding of reality had become mushy, and much was left open to interpretation. The nascent models of the subatomic world were still being explored, and Pauli, already at the forefront of such questions after introducing his famous exclusion principle, decided to play his hand at a rather unsettling dilemma physicists were contending with.

Beta decay is a process whereby an unstable atomic nucleus emits particles in order to achieve stability, effectively shedding excess weight from its shoulders. In the 1920s, physicists noticed that, given all the particles they were able to detect with the instrumentation available at the time, and the amount of mass and energy loss predicted by the theoretical models, something (in beta decay) was not accounted for. Indeed, there must exist some undetectable particle sweeping beneath everyone’s noses, or else energy was not conserved (recall: the all too familiar “energy cannot be created nor destroyed” line we’ve all heard since grade school).

Pauli, out of a paradoxical mixture of both pragmatism and dogmatism, decided that he must save conservation of energy, and thus predicted the existence of a new particle, ***the neutrino***, as the carrier of the missing energy. Famously, he sent the aforementioned letter because he was unable to attend the conference in person, writing instead:

***“...da ich hier in Zürich wegen eines Balles unentbehrlich bin.”***

***“...because I am indispensable here in Zürich on account of a ball.”***

Pauli wagered all of his chips, his reputation, and his understanding of reality on the coherence of the prevailing models, namely on their underlying symmetry and, in some sense, their beauty. Importantly, this would not be an

easy task, as the neutrino is an extraordinarily elusive particle to detect, and it stood to reason, many years ago, that it might not even be possible. The neutrino interacts only through the weak nuclear force and gravity, allowing it to pass through ordinary matter almost entirely unnoticed. Indeed, trillions of neutrinos pass through your body every second without leaving the slightest trace.

This metaphysical gamble paid off more than twenty years later, only two years before Pauli's death, when a sufficiently sensitive instrument, designed by Frederick Reines and Clyde Cowan, detected the neutrino during a humid South Carolina summer, a discovery that would later earn Reines the Nobel Prize. After being notified of the result, Pauli simply replied:

*"Thanks for the message. Everything comes to him who knows how to wait."*

Thus, it was the willingness to move beyond the immediately empirical, to abandon the obvious, and to *have faith* in the abstract coherence of mathematics that fueled such a discovery.

Nor was this an isolated incident. One can find endless examples throughout the history of humanity's inquiry into nature. This story, of course, bears strong resemblance to Einstein's cosmological constant, what he once proclaimed to be his greatest blunder. In saving you the suspense, it was not a blunder after all.

Let us all be humble, yet convicted, like Wolfgang.

## INSIDE HDX

- **1517 Summit** - Early in June, we traveled to San Francisco for the annual 1517 Summit. On top of speaking with founders and builders across a range of scientific and hard-tech disciplines, we had the opportunity to give a talk titled *The Future of the Laboratory: Science Beyond Reductionism, Automation, and "The Scientific Method."*
- **BIO 2026** - Last week, the HDX team traveled to San Diego for the BIO International Convention. Over four days, we demonstrated Experiment Engine and had some great conversations about science and biotechnology with researchers from around the world. Ultimately, it was a great opportunity to introduce our work to a wider audience. To everyone we met who might be reading this, thank you for stopping by our booth to chat and, more than likely, grabbing one of our t-shirts!



- **Experiment Engine** - We recently added real-time context injection to Experiment Engine v1, allowing researcher operators to “nudge” the system during both object detection and live activity detection. This helps the model produce more accurate, concrete, and context-specific predictions of laboratory activity.

#### **COMING SOON:**

Development of Experiment Engine v2 continues as we work to introduce multi-camera procedural tracking, an integrated real-time laboratory assistant, and expanded experimental context modes.

#### **SAVE THE DATE:**

We are in the early stages of planning our annual Heterodox event, likely to take place on **Saturday, August 29th**. While the date is not yet finalized, we wanted to give everyone an early heads-up. We'll share additional details as plans come together.