DIALOGUE BETWEEN WORLDS

"Dialogue Between Worlds" is a collaborative project dedicated to exploring robust modalities for science valorization and deep societal engagement. Co-developed and presented during the Astroparticle Symposium 2025 at Institut Pascal, this work establishes a rigorous partnership between fundamental astroparticle physics and fashion design, transforming complex cosmic concepts—from quantum beginnings to dark matter phenomena—into tangible, wearable art.

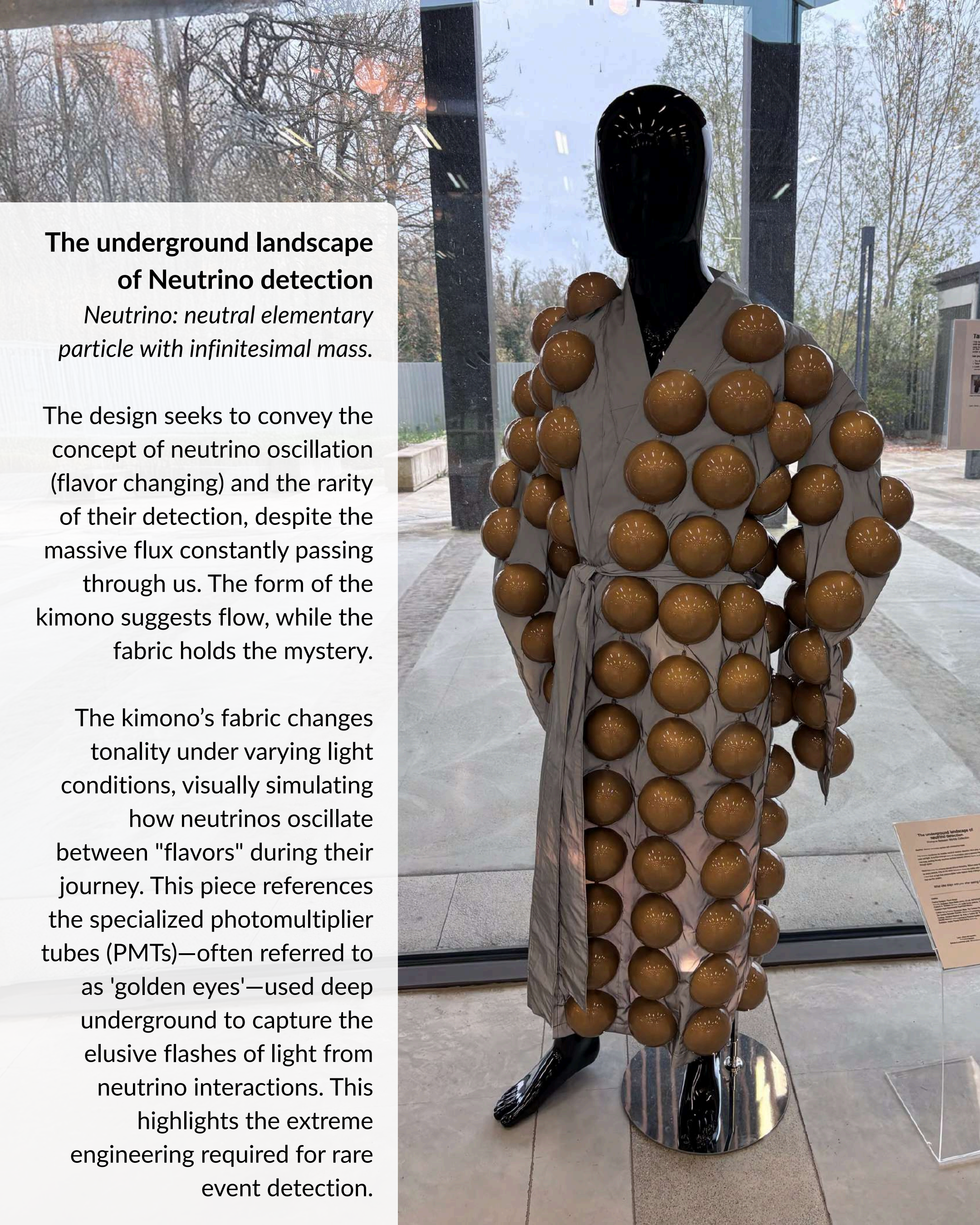
This collection goes beyond traditional aesthetic commentary; it provides an experimental framework for impactful scientific communication. Each garment serves as a technically informed device, designed to translate abstract data, foundational physics principles, and experimental methodologies into meaningful learning experiences. Crucially, this initiative focuses on reaching publics who may not traditionally engage with scientific discourse, thereby establishing connections between specialized knowledge and broad societal understanding through accessible and experiential translation.

Layers of Light and Shadow

Thermal shielding: reflecting radiation to protect instruments in space.

The design translates the physics of thermal management —the precise balance between heat reflection and insulation— required for sensitive instruments operating in Earth orbit. The challenge was to transform a purely functional, industrial material into a statement piece.

The suit is constructed using the same Multi-Layer Insulation (MLI) material provided by INVAP (Argentina) used to shield satellites. Its highly reflective surface addresses the physics of radiative heat transfer in vacuum. This provides a tangible illustration of the complex engineering needed to maintain operational stability, directly connecting advanced solutions to the fundamental research outcomes they enable.



The underground landscape of Neutrino detection

Neutrino: neutral elementary particle with infinitesimal mass.

The design seeks to convey the concept of neutrino oscillation (flavor changing) and the rarity of their detection, despite the massive flux constantly passing through us. The form of the kimono suggests flow, while the fabric holds the mystery.

The kimono’s fabric changes tonality under varying light conditions, visually simulating how neutrinos oscillate between "flavors" during their journey. This piece references the specialized photomultiplier tubes (PMTs)—often referred to as 'golden eyes'—used deep underground to capture the elusive flashes of light from neutrino interactions. This highlights the extreme engineering required for rare event detection.

Bubble imprints of Subatomic interactions

Bubble-chamber tracks: vapor trails of particles.

The design aimed to capture the fleeting nature of subatomic events and project them onto a common, durable material. It specifically references the classic, iconic images that defined the early days of high-energy particle physics research.

The patterns are direct, large-scale prints of actual photographs taken from the Fermilab 15-foot bubble chamber, illustrating the paths of charged particles. The choice of denim is deliberate, serving as a material bridge that connects the monumental scale and location of these American experiments to the familiar and the everyday.

The unseen architecture of the Universe

Gravitational lensing: light distorted by unseen matter.

The design seeks to visualize the effect of a massive component (dark matter) that cannot be seen directly, but only inferred by the distortion it imparts on background light—the principle of gravitational lensing.

This piece uses a layered approach: a field of painted stars is viewed through a transparent layer, deformed by heat, which simulates the refraction and geometric distortion light signals undergo when crossing a gravitational lens. The resulting deformations serve as evidence, tracing the presence and influence of the invisible mass distribution in the cosmos.

The birth of the Universe

Cosmic inflation: the rapid expansion that shaped space and time.

The design aims to represent the exponential expansion of spacetime during the first instants of the Universe. It visualizes how microscopic quantum fluctuations were stretched to macroscopic size, thereby seeding the largest structures we observe today.

The skirt's wide, rapidly expanding form visually maps the exponential curve of cosmic inflation. The printed sections represent the stretched quantum fluctuations that eventually became the density variations seen in the Cosmic Microwave Background (CMB). This design powerfully links quantum physics (the smallest scale) with cosmology (the largest scale) in a singular garment.

The Hat that Sees the Cosmos

Scintillator: revealing the invisible showers of cosmic particles.

The design challenge was to make the constant, invisible flux of cosmic ray muons (particles that pass through us hundreds of times per second) immediately tangible and experiential for the audience.

This is the most instrumented piece: a functional scintillator is integrated into the hat. Each muon detected by this sensor triggers a measurable light pulse on the dress, directly translating raw scientific data into a fleeting visual event. This approach demonstrates the potential of portable instrumentation for public engagement and underscores our constant connection to deep space physics (particles originating in our galaxy).

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