

ENGLISH

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ERAKUSKETA.EXPOSICIÓN.EXHIBITION

Quantum physics is a field of knowledge with an ever-increasing presence in our lives through its technological applications, although it still evokes unknown territories, as well as having a philosophical and poetic dimension. This year, within the framework of the International Year of Quantum Science and Technology, and taking advantage of the involvement of local scientific institutions in this field, Tabakalera presents an exhibition that invites us to explore quantum physics from its most poetic, philosophical and aesthetic aspects through contemporary art.

The exhibition has been built around a mediation space, with content developed by the creative studio Morgan Crea in collaboration with the Donostia International Physics Center, which will welcome visitors. In the adjacent exhibition rooms, eleven contemporary art installations are on display. These have been created by artists who have worked in close dialogue with science in order to investigate the complexities of quantum physics.

This project is part of Tabakalera's *Art, Science, Technology and Society* line of work, which was launched five years ago with the aim of generating new knowledge from the encounter between artists and researchers, and of sharing this knowledge with society.

Visiones Cuánticas (Quantum Visions) has been curated by Mónica Bello, head of the Arts at CERN programme, and has been developed in collaboration with the arts centres HEK (Haus der Elektronischen Künste) in Basel and MU Hybrid Art House in Eindhoven, which the exhibition will visit after its stay in San Sebastian. In addition, the DIPC research centre, the Tekniker research and technology centre and the European Organisation for Nuclear Research CERN have participated as scientific and technological partners of the project.

The exhibition will be accompanied by an intense public and educational programme, in order to make the artistic and scientific contents more accessible to different audiences and to keep open a line of reflection and debate.

We would especially like to thank the curator and the artists for their work, as well as the partners in the scientific and technological field – DIPC, Tekniker and CERN – for their support. We would also like to extend our thanks to Morgan Crea for the mediation content, and to the Moduz collective, made up of designers and architects, for the design of the exhibition.

ABELARDO GIL-FOURNIER

The installation *La hoja de Fermi y el efecto Zenón* is inspired by an experiment by Enrico Fermi in the field of quantum physics. It shows a falling leaf, but in the form of a succession of static states that are activated sequentially, while reacting to the position of the visitors around the piece. It is related to the paradox proposed by Zeno, who imagined an arrow whose fall seemed impossible, as it was motionless in the course of its flight. Quantum physics has shown that observing a system can cause its movement to stop. In the installation, liquid crystal sheets and sensors detect people, making the fall of the leaf seem slow, inviting us to reflect on science and our connection to it.

ADRIANA KNOUF

Quantal Canto explores the idea that uncertainty is a fundamental feature of the universe. In this context, sound emerges as part of that uncertainty. In quantum systems, oscillators (like tiny vibrations) do not always follow perfect patterns, since sound and their design generate irregularities. This allows for an infinite variety of possibilities. The artist focuses on how to manipulate these specific variations, using matter as a common basis for everything. This connects the oscillators we find in both quantum physics and sound, showing that there are few differences between them. The installation, inspired by the structure of a quantum computer, invites us to reflect: Is this frequency distribution in the universe what we really want?

JAIONE CAMBORDA

The installation *Ensayo fílmico sobre la sordoceguera* transforms the function of the cinema screen, positioning it so that it no longer displays images, but hides their content. This makes the viewer feel drawn to what they cannot see, generating a desire to imagine what is hidden. The person observing plays a key role, as they are invited into a space where they cannot access the visual narrative. The work challenges the idea of what is desired and what can be speculated. The light from the projector also plays a fundamental role in the experience, as it indicates that something is taking place. However, instead of showing it, it highlights the materiality of the space through the beam of light, treating the screen as an architectural object.

JAIONE CAMBORDA

Ensayo fílmico sobre la sordoceguera, 2025

New production

This series of digital works offers an artistic interpretation of the possibilities of data transmission through quantum networks in the future.

SATHEX is a creative way of showing how quantum networks work with the help of satellites. These networks use the principles of quantum physics to ensure secure, long-distance data transmission. They apply quantum key distribution to securely share cryptographic keys, and employ quantum entanglement, which facilitates almost instantaneous communication. Quantum satellites function as connection points around the world. They make it possible to achieve secure communications, more advanced encryption systems, time transfers, and extremely precise detection techniques. The properties of diamonds are fundamental to these networks because they help store and control the quantum systems. Lasers are also essential to encode quantum information into particles of light (photons) and to manage quantum states during transmission. The title of the work refers to each satellite hexagon (sat-hex), in which a seed and a unique identifier are fused. This is projected onto a diamond wafer, generating colour diffraction patterns, which have important implications in the field of quantum communication networks.

PROTOTYPE is a digital work that explores the potential of quantum computing. With the appearance of a microscopic virus or an enigmatic planetary body, it transforms satellite data into a continuous stream of characters, overcoming the limitations of traditional binary computing. Through the interaction of colour and 3D images, it suggests a digital world beyond the limitations of binary representation. The work investigates the foundations of data processing and proposes a non-binary vision of computing, combining scientific speculation with art to imagine new ways of understanding and connecting with the digital universe.

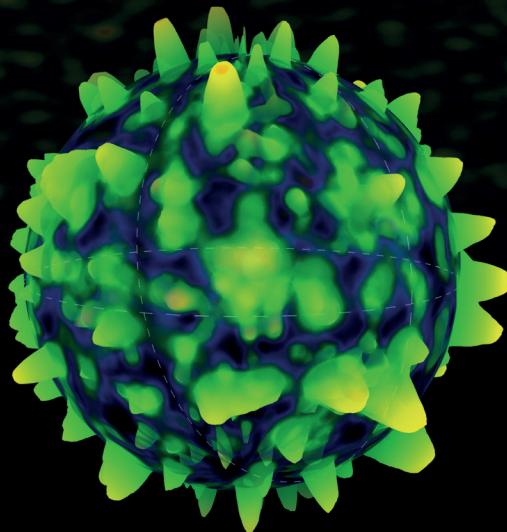
Hello, world! is like the alphabet of a programming language, a basic program that displays the text "Hello, world!" on the screen. This work randomly selects "Hello, world!" programs from a database of about 900 computer languages, from the 1970s to today. These program scripts are turned into a three-dimensional cube, like an urban landscape. Short scripts can form streets, while longer ones, often from older languages, can build entire cities. This visual approach shows how programming languages have evolved, turning their history into a fascinating, three-dimensional map.

From the Large Hadron Collider (LHC) to the International Space Station (ISS), scientists are investigating the tiniest particles in the universe. They analyse the signals left by particles that have been stored in terabytes of data, or captured on film, which are later analysed to explore the connections between matter and antimatter. The aim is to find out if there are answers to fundamental questions about matter or an error in nothingness. A key technique is the linear Hough transform, created in 1959 to analyse images from bubble chambers and now used in nuclear emulsion recordings. Based on interviews with CERN scientists, this work uses artificial intelligence to explore a fascinating enigma: Might it be possible to find non-matter?

JOAN HEEMSKERK

w3b4.net (PROTOTYPE), 2022

Courtesy of the artist

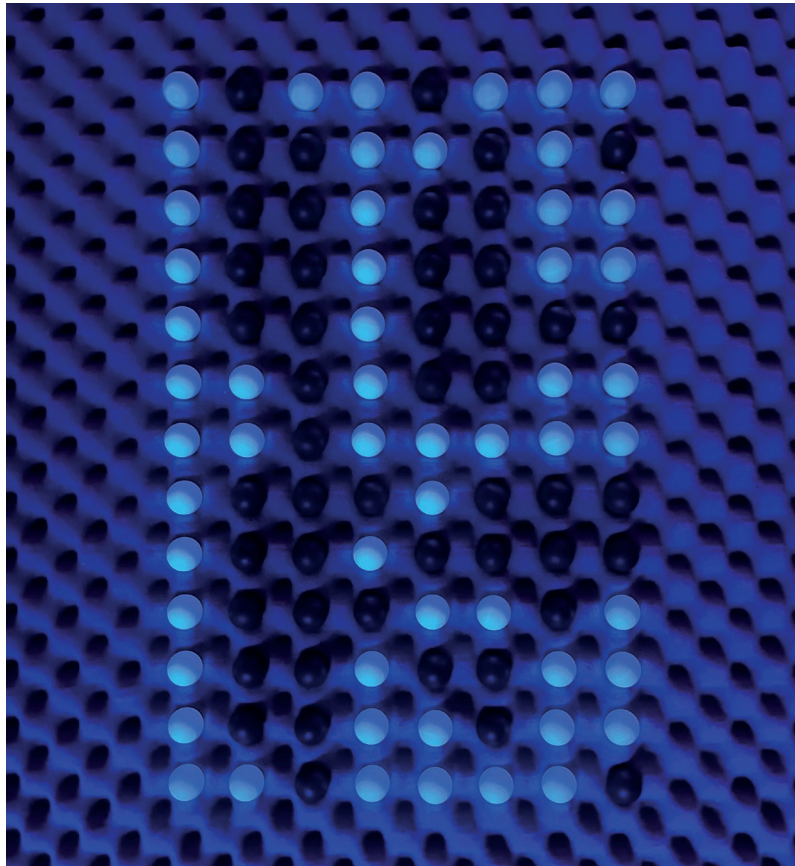


The installation *entangled binary network (Hello, world!)* depicts a quantum network between two entangled fields, Alice and Bob, saying “Hello, world!” in [non]binary format. It uses the interaction of ultraviolet (UV) and infrared (IR) light with atomic systems such as hydrogen. The hydrogen atom, which consists of a single proton and an electron, exhibits various energy transactions, affected by the absorption or emission of light. These interactions are used at the Niels Bohr Institute in Copenhagen to generate entanglement, which is essential for quantum computing. The universal presence of hydrogen and its predictable behaviour based on its light spectrum make it an ideal model to convey the basic concepts of computing, creating a common framework for understanding the exchange of quantum information between different forms of intelligence in our galaxy, whether human, AI or extraterrestrial life forms.

JOAN HEEMSKERK

entangled binary network (Hello, world!), 2024

Courtesy of the artist



SEMICONDUCTOR

Semiconductor invites us to explore the world of quantum physics through a series of drawings that make us reflect on the uncertainty and surprising nature of this reality. Each drawing of *Probable Drawings* is made with a single continuous line, which represents the electron orbitals, areas where electrons could be, but never with complete certainty. Instead of showing exact locations, these lines reveal a map of probabilities. The process of creating these works combines artisanal techniques, such as the use of carbon paper, with modern tools such as the plotter, and leaves visible the “noises” or imperfections that reflect the unpredictability of the quantum world. These drawings invite us to ask ourselves profound questions: Is a particle a fixed point in space or a wave that moves over time? By observing these works, we can rethink how we understand fundamental concepts such as space, time and existence itself.

SEMICONDUCTOR (Ruth Jarman & Joe Gerhardt)

Probable Drawings, 2025

Courtesy of the artists



VISIONES CUÁNTICAS

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A century ago, a revolution shook the foundations of our understanding of the universe: the birth of quantum physics. In the 1920s, scientists such as Werner Heisenberg and Niels Bohr proposed a bold new vision, known as *The Copenhagen Interpretation*, that challenged the very notion of reality.

Imagine a world where subatomic elements have no fixed position, but exist in a state of possibility, like ephemeral shadows moving in a nebula of eventualities. This *wave function*, defined through this new model, describes a cosmos in constant fluctuation, where certainty vanishes and gives way to ambiguity. The surprising thing about the proposal is the fact that the simple act of observing a system has the power to transform it. In a paradoxical way, observation *collapses* the wave function, forcing a specific element into a concrete reality, as if it were waiting for the observer to define itself precisely. It has been a century since the first quantum revolution, and its cultural and social impact has been immense. This discipline is, in a way, inviting us to reconsider the approach of modern epistemology, especially in terms of the relationship between subject and object.

Quantum physics has become a hallmark of how science and thought in the last century challenged the traditional perspectives of the Western world, leading to a broader acceptance of the complexity and dynamism of physical existence. This proposition brings us to the tension between the scientific aspiration towards objectivity and the limitations inherent in human language. As Nietzsche had suggested only a few decades before the emergence of quantum theory, since it was built from human language and its representations of time, space and matter, science would be unable to offer an objective reality. Physical existence is defined in a very different way from human experience and cannot be directly understood, as our perception is

limited to the macroscopic world, governed by classical laws, while the quantum universe operates on a minute scale with behaviour that defies our intuition.

Quantum theory continues to have important cultural implications, as it drives debates about the nature of the universe, its origins, its fundamental constituents, and the interactions that occur within it. Quantum physics also invites and encourages discussions within the framework of philosophy, the arts and the humanities. This is due, in part, to the fact that it maintains that reality is uncertain, which breaks with the deterministic vision of nature and the cosmos, where, until recently, everything was understood as fixed and defined. The implications for thinking have gone even further, since quantum physics questions the current principles that define the world as we perceive it. It calls into question the capacity of human experience to conceive a hidden nature that contradicts common sense. Quantum postulates have fostered other forms of thought and perception. The notion of a non-objective reality, subject to experience, has modified our view of the world and has become very widely accepted by thinkers and creators over the years. The ambiguity, fragmentation and uncertainty that they explore in their works resonate with the principles of the quantum universe, which opens new paths of expression and creative practice.

Today we think differently than those living in the society which saw the emergence of quantum physics. There is no doubt that the idea that nature exists completely independently has taken root. Due to the cultural development currently promoted by quantum thinking, we understand that the essence of the cosmos is hidden and changing, and that it does not depend on our perception or experience.

Visiones cuánticas is an exhibition that explores the contradiction and doubts that arise in the face of a world whose ultimate essence escapes our direct perception. The works of the eleven artists participating in this exhibition build a bridge between the indeterminate and the imaginable, by expressing these complexities through experience and a creative language influenced by quantum physics. By incorporating multiple perspectives and references, the exhibition reinforces the connections between science and research and art and thought.

NICOLE L'HUILLIER

BRÚJULA is a vibrational navigation instrument that listens and emits soft sounds through an elastic membrane at its centre that functions as both a microphone and speaker. This device embodies the balance between giving and receiving vibrations, acting as a compass to tune into our vibrational realities. By reimagining traditional scientific instruments, *BRÚJULA* questions the linear and extractive logic of Western navigation. As an alternative, it explores new ways of working with vibrational intelligences and relational connections. By interacting with the visitors, it translates sounds into unique compositions and collaborates with musicians and poets from the dislocated "Souths" to create shared sonic experiences.

NICOLE L'HUILLIER

BRÚJULA, 2025

Courtesy of the artist



LIBBY HEANEY

slimeQrawl is an installation that explores how quantum computing will transform our lives, both human and non-human. With crawling creatures and tentacles that glide across surfaces, viscosity symbolises our animal instinct and quantum particles, such as atoms and light, that defy the laws of the visible world. The work uses a technique created by Heaney with IBM's 5-qubit quantum computer, generating clips that flow in multiple parallel times. This non-binary approach reveals the hidden processes of quantum systems, inviting us to rethink our perception of time and matter.

The transparent glass works *Supraphrodite (i)* and *Supraphrodite (ii)* play with the refractive and reflective properties of glass, as well as its quantum particle-like qualities, by distorting the surrounding space and creating a literal prism to observe our macroscopic world in a fluid and quantum manner. The title refers to Aphrodite, the Greek goddess of love and beauty born from the sea foam, complemented by the Latin prefix *supra*, meaning "to go beyond", alluding to the transcendental nature of the quantum. Composed of two superimposed glass cells, they blur the boundaries between themselves and their surroundings, which also alters the visual works nearby.

ALICE BUCKNELL

Small Void is a collaborative game for two players inspired by the paradoxes of black holes and quantum entanglement. It explores the limits of human knowledge and speculates about alternative ways of understanding life and intelligence. It is also a queer dating simulator that addresses how love transforms identity and the world. The players, separated in the space-time of a black hole, must use senses such as sound and touch to find each other and achieve annihilation. With elements of theoretical physics, puzzles and a romantic narrative, it stands out for its unique and artistic approach.

cloud gazing (americium) uses a quantum random number generator (QRNG) to feed real random numbers into a simulation of the sky, causing changes in the formation or movement of clouds, light and colour. At the same time, visible celestial bodies are tied to the physical time and place of the artwork. While quantum computers can generate truly random numbers, conventional computers employ pseudo-random numbers, using external sources, often originating in the natural world, to generate entropy in some of the more precise applications. The installation uses the decay of the artificial radioactive element Americium-241 (first isolated and identified in 1944 at the University of California, Berkeley). The work also invites us to reflect on how, throughout history, we have sought ways to predict the future. Although quantum computing promises impressive advances, questions are also raised about its social impact and potential use in global conflicts. *cloud gazing (americium)* uses the symbolism of clouds as a modern form of "nephelomancy", the ancient practice of interpreting the sky to divine the future, now guided by quantum power.

MARINA ROSENFELD

μ , or “mu”, by Marina Rosenfeld, is an installation that takes its name from the mathematical term used to refer to friction or touch. Drawing on her exploration of the aesthetics and material culture of dubplates or vinyl records and turntablism, or their manipulation by DJs, μ is situated on a microscopic scale, within the grooves of a vinyl record. Here, the needle of the record player acts as an avatar in a space of quantum conditions where sound, touch and movement intertwine. The work explores friction as the origin of sound reproduction, where the proto-social and material aspects of music converge.

MARINA ROSENFELD

μ , 2024

Courtesy of the artist



YUNCHUL KIM

Amorph is a circular sculpture that transforms seaweed into a transparent hydrogel through thermal processing. Under mechanical stress, the hydrogel reveals colour patterns through photoelasticity. This visual effect, resulting from the matter's response to force, turns the algae into a shimmering artistic material in a process of "transmatterisation" that makes physical forces visible through optical phenomena. In the exhibition, forces are perceived visually, connecting with the senses and questioning the nature of matter and its transformation. This process, described as a "matterphor", explores the emotional properties of materials.

YUNCHUL KIM

Amorph, 2018

Courtesy of the artist



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Valentina Rodríguez

(HEK)

Sabine Himmelsbach

(MU)

Angelique Spaninks



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UNIVERSIDADES E INNOVACIÓN



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EXHIBITION HALL OPENING HOURS

Tuesday-Sunday
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