

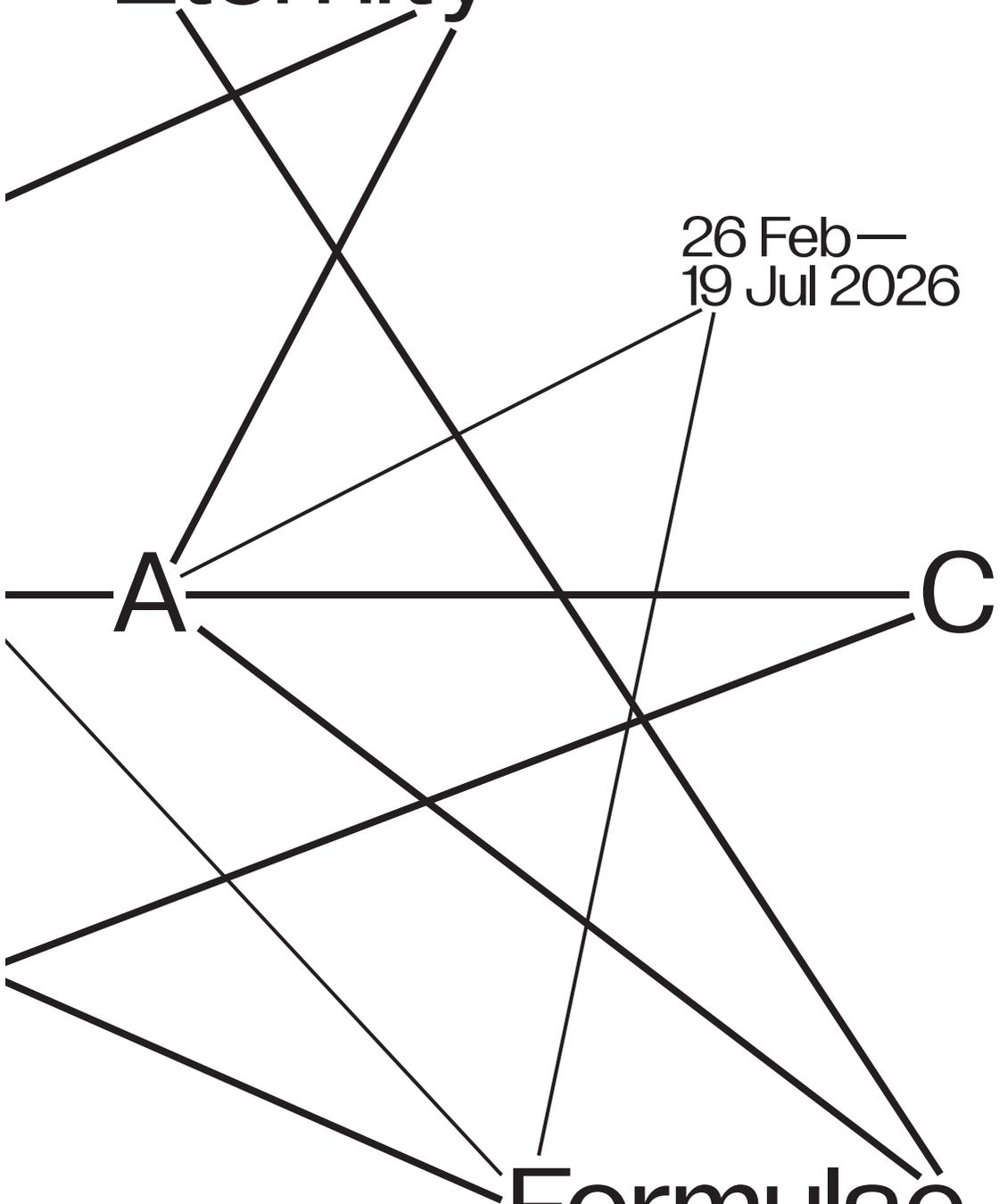
Eternity

26 Feb—
19 Jul 2026

A

C

Formulae





The *Eternity Formulae* project is a reflection on how shared meanings can be found in the most diverse and seemingly unrelated things, from industrial construction to the emergence of the Universe, and from nineteenth-century caricatures to the popularisation of science. These meanings, rooted in our sensations and experiences of the world, give rise to universal patterns in human culture.

The exhibition revolves around the concept of cold. The various implications of the notion are traced through the history of architecture, the visual arts, and the natural sciences, showing how people's aspirations in very different spheres may turn out similar when viewed through the prism of categories such as object and background, movement and stillness, event and constancy. Finally, cold itself, which is often perceived as something hostile, is also what enables awareness of phenomena and events that occur on an almost imperceptible scale and that form the basis of life.

The exhibition consists of three independent parts or novellas, each developing a separate narrative, variously connected with the theme of cold.

Refrigerator

This section tells the story of what was one of the largest industrial refrigerators in Europe at the time of its construction. Its design was one of the last projects to emerge from the studio of Ivan Zholtovsky, the architect of many buildings that defined the Soviet skyline under Stalin, in the 1930s–1950s. His design of the refrigerator was conceived in the early 1950s with echoes of the Doge’s Palace in Venice and was intended to show how the principles of Renaissance harmony could be applied to panel building technologies. However, by the time construction work began, in the second half of the decade, Stalin was dead and his successor, Nikita Khrushchev, had declared war on “excesses in architecture”. The rich decoration of Zholtovsky’s design was emasculated and the building, which still stands on Moscow’s Otkrytoye Highway, seems from afar to be a purely functional industrial facility. However, closer examination finds traces of the original project, including a decorative frieze that contrasts bizarrely with the surrounding urban landscape.

In this section, documents and materials about the refrigerator and its context enter into dialogue with the works of contemporary authors, showing how utility and fantasy interact in the history of industrial architecture, monument restoration, and the modelling of virtual space.

Winterreise

This section is devoted to the history of cold in European and Russian visual art from the seventeenth to the twentieth century. It brings together works from the largest Russian museum collections, interrogating the museum itself in its classic conception as a repository of cultural monuments, designed to protect exhibits from any undesirable changes, ensure their physical preservation, and assure their rightful place in the hierarchy of public values—a form of cold storage room.

The section has seven blocks, where cold is shown under different aspects: as a subject of genre scenes, a tool of artistic language, an allegory, an element of iconography, and others. The phenomenon of cold is explained or demonstrated by contrasts—a figure, movement, detail, footprint in the snow, which the eye needs in order to register the snow itself. Every artist who has tried to bring out the essence of cold has done so by depicting not the cold itself, but its signs, attempting to capture something elusive in a web of images. The perimeter of the hall bears the visual and poetic installation *Winterreise* (“Winter Journey”), based on poems from the eponymous cycle by the romantic poet Wilhelm Müller, which were put to music by Franz Schubert. Müller’s theme was the futile quest of a lyrical hero, who encounters the icy indifference of nature and of other people.

Relic Radiation

In this section, cold appears as the ubiquitous background of the Universe itself and, at the same time, of the lives of its researchers.

At the centre of the narrative is the phenomenon of relic radiation, which has uniformly filled the endless space of our Universe since the formation of the first atoms immediately after the Big Bang. The average temperature in this space is close to absolute zero, the theoretical limit of cold. But the panorama of its almost imperceptible fluctuations reflects the entire grandiose structure of the Universe: today, the study of relic radiation is the key source of scientific knowledge about space.

Scientists at the Special Astrophysical Observatory, located near Nizhny Arkhyz in the Russian Caucasus, have made a significant contribution to this research. The exhibition section reflects on their work and lives, and on the tasks of science as a whole, not only for research, but also for education. Here, cold is viewed both as an object of cognition and as a condition for it. The cosmic perspective, which at first seems quite alien to everything human, turns out to be what holds people together, helping us to become closer and more understandable to each other.

The section brings together works by contemporary authors devoted to the problems of astrophysics and the

poetics of chance, which, without going beyond statistical error, sometimes trigger processes on a universal scale. The section includes a performative and educational platform for public programme events, celebrating the work and energy of the Russian astrophysicist and populariser of science, Oleg Verkhodanov (1965–2020).

Sergei Kozlovsky

The Frozen Food Palazzo

On the history of Ivan Zholtovsky's unfinished project.

The industrial refrigeration enterprises that were created in the USSR between the 1930s and 1950s were intended as visible proof of “the tireless efforts of the Party and the Government to improve the material well-being and living conditions of working people,” as propaganda texts of the time repeated, just as tirelessly. As well as storing perishable vegetables and meat, they also produced ice cream, meat dumplings, chicken cutlets, and other prepared foods. People in towns where there was no industrial refrigerator had to do without all these products during the warm months of the year. As if to emphasise their benevolent mission, the buildings were often remarkable for their architecture. Such was the case of the refrigerator at the Leningrad Meat Processing Plant (1931–1933), built in constructivist style to a design by Noah Trotsky (1895–1940), and the Yerevan Refrigeration Plant (1945) with its façade in the style of an Armenian temple, designed by Grigor Aghababyan (1911–1977).

In 1952 a directive of the Nineteenth Congress of the Soviet Communist Party (Stalin's last Congress) called for near doubling in the provision of meat, fish, and dairy products to the general public. To achieve this, there was to be a “significant increase in the construction of refrigerators and warehouses.” Anastas Mikoyan, deputy chairman of the Soviet Council of Ministers, told the Congress that development of the refrigeration industry was “important for improving the nutrition of the population and for further reduction of food losses during storage.”

Work duly began in 1953 on the country's largest refrigerator (according to the Soviet press, the largest in Europe). This was Refrigerator no. 12, to be installed in Moscow with a capacity of 35,000 tonnes. New refrigeration technology was designed for the purpose by one of the country's many industry-specific design institutes—the All-Union Institute for Refrigerator Design. Previously, the cooling systems in large refrigerators were installed directly in the storage chamber, which caused the stored goods to dry out and spoil. Instead, it was proposed to install the coolers in a sixty-centimetre-thick heat-protective jacket in the outer walls, enabling food to be stored for much longer. The idea

of the Institute's chief designer, Viktor Safonov, was for walls made from multilayer panels of thermal insulation material faced with concrete slabs, each six centimetres thick. The walls were to be covered with a layer of white plaster on the outside to reduce the amount of heat absorbed from sunlight.

Each panel was as tall as an entire floor inside the refrigerator (three and a half metres), making assembly easier and increasing sturdiness of the construction. The width of each panel could be no greater than two metres, since they would otherwise be unliftable. The construction had thermal insulation properties comparable to those of a two-metre-thick brick wall but was much less bulky. How the technology was intended to look and to function can be understood from drawings and photographs published in magazines of the mid-1950s.

The architectural design of the refrigerator was led by academician Ivan Zholtovsky (1867–1959). Zholtovsky was a committed neoclassicist in style and author of one of the benchmark buildings of Stalinist architecture—the House on Mokhovaya Street, built for deputies of the Moscow City Council. In the early 1950s, already in his eighties, Zholtovsky devised a quite radical design for standardised residential buildings using prefabricated panels. While his younger colleagues tended to follow design principles used in Zholtovsky's earlier projects or in Moscow's new high-rise structures, the old master proposed completely abandoning the decoration of façade walls and even leaving joints between the panels visible.

“The issue of joints between the wall panels is very important,” Zholtovsky explained. “Some architects unnecessarily complicate this issue. Their fear of an open seam makes them resort to unnecessary details to mask the joints between panels. Such superimposed elements are completely unnecessary from a structural point of view, are an unjustified waste of material, and limit the range of artistic possibilities available to the architect. Why cover the joints between panels with pilasters, imitating brick architecture—why be afraid of open joints? Wall panels, each as high as a story, will help to create a new scale for the building, in keeping with the soaring ambitions of our construction industry.”

The structural features of large-panel construction led Zholtovsky to abandon what had been his hallmark technique—the massive cantilever cornice—replacing it with a cornice at the top of the wall in the form of a crown, assembled from light decorative elements. The architect's intention was to embellish the lower storeys with the same light ornaments, which, as he wrote, “are not part of the main wall panel.”

“We have sought to focus the decorative elements of the building in the main compositional nodes, in a way that would not interfere with rapid assembly of the main structures,” Zholtofsky said. “Such a concentration of décor, contrasting with the neutral smoothness of the panel wall, will enhance its impact and help to create a striking and memorable image.”

Zholtofsky’s innovative proposals won the first round of a design competition for panel-built residential blocks of eight to fourteen storeys, organised by the Moscow Architectural and Construction Council in 1953. However, the novelty of the concept made officials wary of its rapid implementation. The seven-storey refrigerator, with walls consisting of seven rows of white panels, would be an opportunity for the architect to demonstrate how his ideas could be put into practice.

Composition of the façades of Zholtofsky’s buildings was often based on Renaissance palaces designed by the outstanding Italian architect, Andrea Palladio (1508–1580). However, his inspiration for the industrial refrigerator came from an earlier monument—the Doge’s Palace in Venice, which is one of the greatest achievements of Italian Gothic architecture.

Zholtofsky’s conversations with staff at his studio, which also functioned as an architects’ school, were recorded over several years by Pyotr Skokan (1918–1991), who worked at the studio. They show that Zholtofsky had already decided on the overall composition of the refrigerator building by September 1952. He proposed leaving the façade without decorations, except for a “rich belt” of ornamentation at the top. One of the end walls would be treated differently from the other three sides of the structure, including the installation of a clock.

Sketches preserved in the archives of the Shchusev Museum of Architecture show that Zholtofsky initially proposed installing large decorative elements on the surface of the end wall, but subsequently abandoned the idea.

A special feature was the design of a perimeter for the railway platform, which was to be built alongside the main façade. In records of the consultation held on 3 August, 1954, Zholtofsky proposes “to make it like Sangallo”, probably referring to the arcade of the lower loggia at the Villa di Poggio a Caiano, created by Giuliano da Sangallo (1445–1516). However, three days later, Zholtofsky decided that “the arches don’t work” and the design should be more varied, including the use of rustication in the plaster work.

Zholtofsky studied the historical buildings, which inspired him throughout his creative career, during his travels before the Revolution and in the mid-1920s. The staff of his studio-school, deprived of the opportunity to travel abroad, followed the instructions of their leader, relying

solely on photographs and sketches. Eventually, in 1957, as Khrushchev's thaw took hold, the master was finally able to organise an educational tour of Italian cities for his assistants and students.

The first stage of the refrigerator should have been completed by the end of 1954, but the construction was delayed. "The pace of work is still not fast enough," *Pravda*, the country's main newspaper, reported in July. "This important construction project is experiencing interruptions in the supply of materials. In particular, there is currently a shortage of metal, just as the work is at its most intensive stage. Staff at the USSR Ministry of Construction are failing in the task of supplying materials for the refrigerator." The first phase of the work was mainly completed in January 1955.

By this time, with the death of Stalin and changes in the country's leadership, a political campaign was already underway to combat so-called "excesses in architecture". At the end of November 1954, Nikita Khrushchev, the new First Secretary of the Soviet Communist Party, set about the official rehabilitation of constructivism at a national meeting of builders, architects, and producers of construction materials in Moscow. "At one time," Khrushchev said, "we talked a lot about box-like houses, and we probably said too much. But some architects, fearing this, are designing houses that look like churches."

The "battle against excesses" had not yet been translated into official directives, but many construction organisations already took it as a guide to action. A caricature drawn by staff at Zholtovsky's studio-school in January 1955 gives a clue to the difficulties. Current projects, including the refrigerator, are indicated alongside a semi-humorous caption: "Constant clashes with foremen have awakened primitive instincts and stirred the blood and met the steadily growing natural needs of the population."

Final versions of the refrigerator design, dated 1955, show that Zholtovsky saw no need to change his approach in deference to the new Party line. He judged the design to be functional, economical, and capable of rapid completion.

However, by the end of the year, Khrushchev had moved from words to action. On 4 November, a joint resolution of the Central Committee and Council of Ministers ordered local Party bodies and industry ministries to "review within three months the design and cost documentation for facilities under construction in order to decisively eliminate excesses in architectural decoration, planning, and design solutions."

Relevant "solutions" in the design of thousands of buildings that were under construction at the time were either completely cancelled or significantly curtailed.

“Zholtovsky was clearly unlucky with his plans for prefabricated buildings,” says Selim Khan-Magomedov, an eminent art historian and member of the Russian Academy of Architecture and Construction Sciences. “Given three or five years, he could, once again, have been at the forefront of experimental research in Soviet architecture, combining very promising construction techniques with artistic and compositional developments. There was potential here for some unique artistic discoveries.”

Zholtovsky’s ambitious designs are barely discernible in the refrigerator building that we see today. Their only traces are the square half-columns of the perimeter and the edge-relief around the roof, designed to serve as a gutter. The gutter was made of concrete, but with an admixture of ochre for a warm yellow tone that would contrast with the white walls. But even this last decorative element is now almost erased—the edge-relief has been repainted white.

Sergei Fofanov Winterreise

I

The Museum

A museum is, by definition, a storage space. A modern museum building is something like a cultural refrigerator—a complex technical structure with climate control. Ideally, it should maintain a temperature of 20 °C with 50 % relative humidity. Such accuracy may not be possible if the museum is housed in a palace or castle that was built many years ago. In the old days, museums performed their storage function like enormous chests of drawers. They had columns and walls painted in solid, cosy, dark colours, and were heated with coal or wood. Palm trees and exotic plants were often arranged around the exhibition space between velvet-upholstered banquettes. These winter gardens were not meant to contrast with the art, but rather to complement it, bringing liveliness and even physicality to the space, making painting and graphics part of an omnipresent nature. They brought echoes of the Garden of Eden or Parnassus, home of the Muses, to our world, enabling visitors to steal a glimpse of a heavenly dimension and to bask in rays of light that escaped from the unattainable paradise of past times.

As a rule, these chests of drawers are filled with all sorts of things, and the sweetish smell of decay is clearly discernible in their specific, musty atmosphere. White wavy curtains are a frequent device of the décor where collections of old masters are on display, particularly in the post-Soviet space. Their intricate drapery evokes clouds or drifts of snow. Their folds convey notions of Hellenistic beauty and the splendour of court attire. They are endowed with a musical rhythm and sway gently in the air that enters through the open windows of former palaces, lacking proper climate control systems but full of the grandeur of art.

However disparagingly people speak of old museums, proclaiming them to be lumber rooms and graveyards of art, they continue to exist and art continues to live in them. Strolling at leisure through their halls, immersed in the masterpieces or casting cursory glances at them, visitors experience harmony and tranquillity. A traditional museum is, above all, a place of repose.

The traditional museum is far removed from its high-tech and often commercial descendant, built on the principle of the sterile “white cube”, exuding coldness like ice cubes in a drink—a freezer filled with products to serve rapidly changing fashions and the art market. Old and often unwieldy museum complexes, such as the Hermitage (the former Winter Palace of the Russian Tsars) do not freeze art, but on the contrary, allow it to live on and even develop. They are places of conservation, or more accurately, fermentation of culture. When an object enters a museum, it is immersed in a complex and rich environment and enters into a certain reaction with it. This living, organic process of mixing and fermentation sometimes produces quite unexpected results that cannot be explained by rational management or the state of the art market. When it receives museum status and an inventory number a work of art is, as it were, frozen and enters a state of continuous duration (what Henri Bergson called *durée*).

Such is the paradox of the existence of art objects in a museum: a frozen moment stretched out in eternity. And the principal task of museum workers, whose actions are governed by the highest artistic will (Alois Riegl’s *Kunstwollen*), is to maintain this eternity and constantly strive for immortality. Like Kai in Andersen’s *The Snow Queen*, custodians and curators piece eternity together from scattered fragments, trying to mend the broken mirror of world culture. This applies not only to the palliative techniques of conservation and restoration specialists, but to everyone involved in maintaining the museum tradition as such—not only scientific staff, but also visitors, without whom the existence of the museum is inconceivable. The process is everything; the rest is nothing. And although the goal itself—the prolongation of eternity—is absurd and obviously unattainable, the classical museum is an example of how duration (*durée*), understood as eternity, can be approximated in the enthusiastic deciphering of Warburg’s Mnemosyne Atlas with its endless cultural depths.

II

Winterreise

The Way of the Cross, with its fourteen stations on the road to Calvary, served for centuries as a symbol of the suffering and salvation of humanity. But in the nineteenth century, a new canon of the passions emerged, associated with Franz Schubert's song cycle *Winterreise* ("Winter Journey", 1827), which put to music a cycle of poems by Wilhelm Müller. *Winterreise* tells the story of an unnamed hero, a young man, cast out into a world without pity or sanctuary and forced to wander alone. Each of the twenty-four songs is dedicated to a specific episode with a specific emotional colour. There are occasional glimmers of hope, but the overall leitmotif of the cycle is a boundless sorrow of the soul amid an icy desert of indifference.

Death, like winter, is often compared to sleep. But, for the romantics, sleep and dreams are when the secret powers of the soul awaken. A few years before *Winterreise*, Schubert wrote a short autobiographical essay, "My Dream" (1822), which dealt with the never-ending journey and longing (*Sehnsucht*) that is the lot of the artist. The text can be read as a prologue to the future musical cycle. *Winterreise* begins with the song "Gute Nacht" ("Good Night"), where the hero departs alone from the home of his beloved. In the essay, Schubert had written: "I turned my steps away and, with a heart full of endless love for those who rejected this love, I went to wander in distant lands."

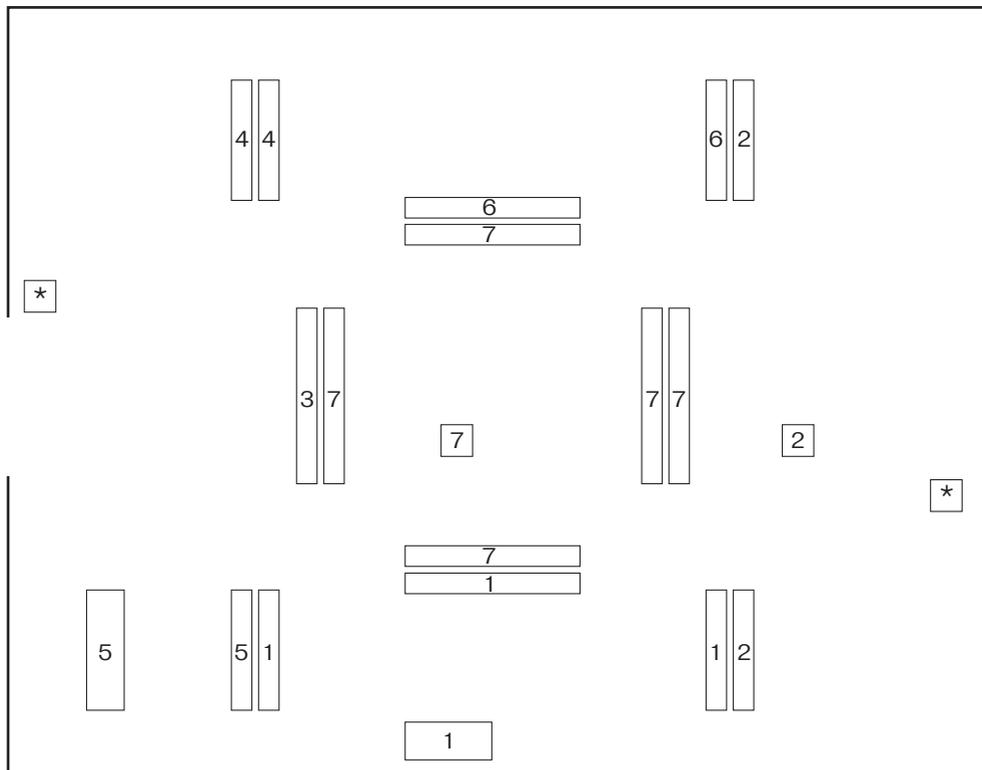
The artist, experiencing existential loneliness and disconnection with the people and reality around him, is driven to search for a possible salvation, not just for himself, but in the name of all humanity. And the solution is found in creativity, especially in poetry and music.

The poet Andrei Cherkasov was asked to reinterpret the poems of *Winterreise* especially for *Eternity Formulae*. He used the "blackout" technique, crossing out words and phrases to create a new visual and poetic work of twenty-four fragments, which serves as a frame for the whole of the exhibition space devoted to formulae of cold in the history of European and Russian art. Broken pieces of phrases and words woven together in unusual combinations offer a new poetic language and a new image of the artist-creator. This fragmentation and loss of the past, the impossibility of full comprehension presents a challenge for future generations. Culture cannot be frozen like a mammoth in permafrost. Artistic processes are unpredictable, coming

Eternity Formulae

and going like the occasional bursts of the northern lights. Art—both classic and contemporary—is given to us only in its connection with the present. The lines and words suspended on the emptiness of Cherkasov's blank sheets are mere traces in the snow, marking the path that we follow on our journey.

Winterreise



* Andrei Cherkasov (b. 1987)
Winterreise, 2026
Paper, digital print
Commissioned and produced
by GES-2 House of Culture



Cartography of Cold. Seven Poles

The exhibition traces the development of the theme of cold in European and Russian visual art from the seventeenth to the nineteenth centuries through seven episodes, separate in appearance and yet connected. They are brought together in a shared space that imitates a classical museum, shrouded in snow-white museum curtains. This historical suite of representations of cold and the culture surrounding it is performed by a selection of outstanding works from the collections of the Hermitage, the Russian Museum, and the Tretyakov Gallery.

The profundity of the philosophical concept contained in *Winterreise* can only be grasped by listening carefully to all of its twenty-four songs. The challenge proposed by our exhibition is less demanding, but in order to better understand the concept of this section, the viewer has to make a journey with seven stops. Each of them has its own theme, but they gradually come together in a single narrative about the metaphysical understanding of the formula of eternity in European culture.

1. The New Old World

Abraham Beerstraaten (1643–1666)
Winter View of Leiden, 1660s
Oil on canvas
State Hermitage Museum

Korsi (b. 1986)
Impossible Image. Jan Wildens, Hunter with Dogs in a Landscape, 2026
Direct gelatin silver handprint
Commissioned by GES-2 House of Culture and produced at the Vaults Centre for Artistic Production

Rembrandt Harmenszoon van Rijn (1606–1669)
Seated Beggar and His Dog, 1631
Etching
State Hermitage Museum
(on display until 26 Apr)

Rembrandt Harmenszoon van Rijn (1606–1669)
Beggar Seated Warming His Hands on a Chafing Dish, ca. 1630
Etching
State Hermitage Museum
(on display from 27 Apr)

In the European cultural tradition, winter is associated with sleep or the death of nature, and snow is both a protective blanket and a funeral shroud. The silent tranquillity of snow-covered expanses contrasts sharply with the riot of colours of southern nature. In the North was to be found the legendary land of Hyperborea—an antithesis to the Mediterranean civilisations of Greece and Rome. The dichotomy of North and South is one of the most important tropes of European art, and the Renaissance played out very differently on the two sides of the Alps.

The so-called Little Ice Age that gripped Europe from the end of the Middle Ages and lingered as late as the nineteenth century was an important driver of winter motifs in the landscape painting of European masters. The genre of winter landscapes and winter city scenes flourished in Northern European painting of the sixteenth and seventeenth centuries particularly in the Low Countries (now Holland and Belgium), where climate change coincided with profound political and cultural transformation.

After prolonged dynastic and religious conflicts, including war between the Catholic South (held by Spain)

Peeter Sneyers (1681–1752)
(on display from 27 Apr)
Winter, 1730s
Oil on canvas
State Hermitage Museum

Unknown photographer
Kamchatka. Studyony Dol ("Frigid Vale")—a high plateau at the snowline beneath the volcanic cones of the Klyuchevskaya group: Ploskaya, Kamen, and Zimina, late 19th–early 20th century
Paper, cardboard, gelatin silver print
State Hermitage Museum
(on display until 26 Apr)

Unknown photographer
The Settlement of Preobrazhenskoye on Medny Island—Winter View, late 19th–early 20th century
Paper, cardboard, albumen silver print, and varnish
State Hermitage Museum
(on display from 27 Apr)

Hans Bol (1534–1593)
Allegory of Winter, 1579
Pen, brush, and brown ink on paper
State Hermitage Museum
(on display until 26 Apr)

Vladimir Borovikovsky (1757–1825)
Allegory of Winter as an Old Man Warming His Hands by the Fire, ca. 1809–1810
Oil on cardboard
State Tretyakov Gallery

Jan Brueghel the Elder (1568–1625)
Winter Landscape, 1611
Dip pen, sepia, ink, brush on paper
State Hermitage Museum
(on display from 27 Apr)

Ivan Prokofiev
Winter, 1819
Plaster
State Russian Museum

Giovanni Antonio Cybei (1706–1784)
Winter, ca. 1770
Marble
State Hermitage Museum

and the Protestant North (the Netherlands), the seven northern provinces of the Lowlands seceded from the Habsburg Empire and declared their independence. The small but dynamic and economically powerful Dutch Republic quickly established itself as a centre of European trade, seafaring, and art, and gave the world a new cultural model. In the absence of a royal court and aristocratic patrons, wealthy merchants, craftsmen, and liberal professionals took a leading role in artistic life. Their tastes and interests determined the themes of Dutch and Flemish painting during the Golden Age. Images of snow-covered landscapes, frozen ponds, and winter pastimes—hunting, ice skating, sledding—became part of the cultural code of Dutch society. Artists such as Hendrick Avercamp (1585–1634), Jan van Goyen (1596–1656), Jacob van Ruisdael (1628–1682), and Adriaen van de Velde (1636–1672) created a visual canon of the Dutch winter, where cold plays an important social role, bringing people together in collective games and celebrations. At the same time, the freezing weather encouraged people to spend more time in the warmth and comfort of their homes, engaged in everyday activities. These activities attracted the interest of artists and were considered worthy of depiction. Hence the famous interior scenes of the Dutch masters.

2. Allegories of Winter

Since ancient times, winter has been depicted as a shivering old man warming himself by the fire: in most European languages, winter is masculine (*kheimón, l'hiver, el invierno, der Winter*). The image is associated with ideas of the death of nature, world-weariness, striving for peace and oblivion, which will give way to new life in the spring. The comparison of winter with an old man is also to be found in ancient Russian rituals and fairy tales: Moroz, the formidable lord of the winter forest, who seeks to destroy the unfortunate traveller, transforms into Grandfather Frost, a good-natured and easy-going character similar to Santa Claus. Russian secular genre painting effected a slightly different transformation: the personification of winter shifted from a powerful old man to a shivering, bearded peasant in a tattered coat, cursing his fate and glaring maliciously and fearfully at the viewer.

But there was also another, brighter, and more joyful image of winter—a pure and gentle image that gave hope for renewal. It is mostly personified in the Slavic tradition by the snow maiden, Snegurochka. Her canonical image was shaped by Russian writers, artists, and composers who found inspiration in folklore: playwright Alexander Ostrovsky (1823–1886), artist Viktor Vasnetsov (1848–1926), and

composer Nikolai Rimsky-Korsakov (1844–1908) all created works inspired by the fragile beauty of the snow maiden. They were perhaps influenced by French sculptor Étienne-Maurice Falconet (1716–1791) who had represented the winter as an innocent girl, her purity emphasised by snow-white marble, sheltering flowers with the hem of her dress so that buds can bloom again in spring.

3. Classicism. Cold as a Form

Anton Raphael Mengs (1728–1779)
Judgement of Paris, ca. 1757
 Oil on canvas
 State Hermitage Museum

European art is built on dichotomies: Apollonian and Dionysian, linear and pictorial, realist and abstract, classical and contemporary. However, the ancient tradition and the academic school with its rules and canons of beauty remain a crucial artistic reference point. Opponents of classicism often criticise its style as dry, lifeless, dogmatic, and cold. The criticism is nothing new: similar barbs have been directed at the classical tradition throughout its history, from high Greek antiquity to the first academies in Renaissance Italy. Often, it has been the adherents of classicism who have prevailed, occupying the heights of the artistic Olympus for decades or even centuries. Occasionally, they have been cast down and forced to do menial design work, furthering the whims and fantasies of various artistic despots who dared to proclaim themselves the new gods.

At one fascinating moment in the history of art, this smouldering confrontation between tradition and innovation was crystallised in the dispute between the camps of Nicolas Poussin (1594–1665) and of Peter Paul Rubens (1577–1640), two great masters who found themselves in the Eternal City at the same time. This dispute was not only about stylistic differences and the merits of individual painting styles. More fundamentally, it was a new round in the struggle between the art of the North and the South.

The classicism of Poussin and his school, with its academic clarity and ideal, geometrically precise compositions, was contrasted with Rubens' powerful and unrestrained painterly effervescence. There was no immediate winner in this fight between ice and flame, but the fashion for lavish Baroque with its huge complexity and physiological sensuality gradually retreated and the strict, clear language of classicism re-established itself as the "court style" and absolute canon of European art from the mid-eighteenth to the first half of the nineteenth centuries.

One of the last artistic battles between the outgoing Baroque and the reigning Classicism was the joint work at the Madrid court of the brilliant Giovanni Battista Tiepolo (1696–1770) and his younger contemporary, the German painter Anton Raphael Mengs (1728–1779). Tiepolo is rightly referred to as the last of the old masters: his art is lively

and organic, and his compositions of intertwined bodies, human masses transformed into whimsical ornamentation, are in sharp contrast with the animated ancient gods of Mengs' canvases.

French Enlightenment thinkers, with their penchant for rationalism and clarity, played a significant role in establishing the new classical canon. But the great art historian Johann Joachim Winckelmann (1717–1768) made an equally important contribution to the aesthetic principles of classicism. Winckelmann was inspired by the divine whiteness of ancient marbles (the idea that ancient sculptures unearthed by excavations had originally been painted was not yet current in the mid-eighteenth century) and a canon of beauty and grace associated with the snow-white coldness of marble sculpture became established in Europe. This coldness shines through in Mengs' paintings.

Classicism is a set of specific themes, compositional and pictorial techniques, and proportions. In a word, it is a set of rules. It is not surprising that classicism became the basis of the educational process at the new European art academies, which sprang up in the late eighteenth century (Copenhagen in 1754, Saint Petersburg in 1757, and London in 1768).

In this way it was the northern masters who became the harbingers of a new ideal form, gradually purifying the artistic language of Baroque and Rococo excess in a quest for "authentic" antiquity. The quest was led by the champion of the naked, heroic body—Bertel Thorvaldsen (1770–1844), a Dane who lived most of this life in Rome, and whose creations were revered on a par with ancient monuments. From the chisels of Thorvaldsen and his German pupils, Johann Schadow, Christian Rauch, and others, a new canon of restrained and abstract "cold" form emerged, the expression of a transcendent and emotionally detached ideal.

4. Romanticism. Ice and Fire

The Great French Revolution, Napoleon's rise to power, and his struggle to establish a single world order was a turning point in the development of European culture. A prophetic premonition of coming catastrophe and changes is evident in the works of young writers and philosophers at the turn of the eighteenth and nineteenth centuries. The supranational project contained in Napoleon's political doctrine had a very specific opposite effect on the educated youth of the other countries of Europe, who stepped forward to defend their homelands from the invader. So French expansionism sowed the seeds of national self-determination in the fragmented

Rockwell Kent (1882–1971)
Greenland Coast, 1931
Oil on canvas pasted on plywood
State Hermitage Museum

Rockwell Kent (1882–1971)
Road to Asgaard—Adirondack, 1960
Oil on canvas
State Hermitage Museum

states of Europe: German-speakers began to feel German, not Swabian or Saxon, and Russian aristocrats, from being more at home in French salons, touched their national roots.

The rise of patriotic feeling led to a re-evaluation of the language, traditions, and landscape of the artist's homeland. Northern Europe once again came to the forefront of world politics, culture, and art. The celebration of Christmas as a family holiday, described in the fairy tales of E.T.A. Hoffmann, dates from this time.

Despite the universalism of their poetic, artistic, and plastic language, the German Romantics were German first and foremost; they depicted not only the nature of their *Wahlheimat* ("elective homeland"), namely Italy, but also that of their original homeland. The most philosophical painter of his time, Caspar David Friedrich (1774–1840), after a short period of study at the Copenhagen Academy of Arts, returned to Germany and never left until his dying day. Friedrich was inspired by the wooded mountains of Saxony and the chalk cliffs of the island of Rügen, and his place of pilgrimage was not the Adriatic coast of Italy, but the harsh coastline of the German Baltic.

For the Romantics, winter was above all a symbol of man's universal loneliness and eternal wanderings across a land indifferent to his fate—as expressed most poignantly in the Schubert–Müller cycle. How to choose the right path and survive such adversity? Many romantics lived short lives that ended (sometimes violently) before they found answers. Perhaps they died so early because they realised that there was no right answer. These young titans who immortalised their names through art might be seen as examples of sacrificial creativity for the greater good.

The spirit of Romanticism lived on in the works of twentieth-century artists. The northern landscapes of American artist Rockwell Kent (1872–1971) may be very different from those of Caspar David Friedrich, but a likeness of inspiration between the two artists can be felt at once. And Romanticism is still alive in our time, manifesting itself in art, politics, music, and the actions of individuals and entire nations. Its spirit is contradictory by nature, at once hot and cold, ice and fire.

5. Politics

Legends of a distant and mysterious northern kingdom have stirred the minds of southern peoples for centuries, inspiring awe that sometimes bordered on sacred terror. The legends were not without a basis in facts: from the hordes of warriors who poured into the Roman Empire from North and East during the great migrations, to the marauding, sea-borne Vikings. This was another North, wild and untamed, utterly

Firs Zhuravlev (1836–1901)
Child Beggars, 1860s
 Oil on canvas
 State Russian Museum

William Elmes (active 1797–1816)
General Frost Shaving Little Boney, 1812
 Hand-coloured etching
 State Hermitage Museum
 (on display until 26 Apr)

William Elmes (active 1797–1816)
Jack Frost Attacking Boney in Russia, 1812
 Hand-coloured etching
 State Hermitage Museum
 (on display from 27 Apr)

Unknown engraver
Caricature "The Thaw of the Nation", 1792
 Paper, etching, aquatint
 State Hermitage museum
 (on display until 26 Apr)

Unknown engraver
Caricature "The Thaw of the Nation", 1792
 Paper, etching
 State Hermitage museum
 (on display from 27 Apr)

different from the utopian Hyperborea, bringing a threat of ultimate destruction. The thinking is vividly reflected in ancient German and Scandinavian tales of the death of the gods in a final battle (*Ragnarøkkr*)—an inexorable fate that would signal the end of time.

The cold North became particularly associated with Russia, and the association remains strong to this day. Since the time of the Hanseatic League, animal furs were among the most valuable commodities that Russia supplied to the European market—a resource that comes from the natural world and that serves to keep people warm. Since then other natural resources, namely oil and gas, have become Russia's principal export, but the essence remains the same: oil and gas, like animal furs, are commodities extracted from the natural world and used to keep people warm in the winter.

Siberia has a special place in the political atlas of cold. The northern and eastern parts of the Eurasian continent were conquered by the military campaigns of the Cossacks at the end of the sixteenth century and then colonised. Exile to Siberia as a form of punishment for criminals and political opponents dates back to this time.

In the historiography of Russian cold the winter journey is a metaphor for death but, unlike Schubert's lyrical hero, for whom death is a deliverance from personal despair, the Russian hero consciously sacrifices himself for the salvation of his homeland: in the legend, Ivan Susanin leads an enemy detachment into the depths of a snow-covered Russian forest, from where there is no return, but he is the first to die, when the enemy realises that their guide has led them to their destruction.

Many landmarks of military history, from the semi-legendary Battle on the Ice (1242) against the Teutonic Knights, and even entire military campaigns, such as Russia's Northern War against Sweden, have served to reinforce the image of Russia as a northern power that has used the cold climate as a strong ally. Russia's best-known Tsar, Peter the Great, sent exploratory and scientific expeditions across the Urals, to investigate and tame the frozen regions that stretch to Kamchatka and the Sea of Okhotsk.

After defeating Charles XII of Sweden at the start of the 1700s, Peter founded a fortress on the cold shores of the Baltic Sea, which would become the capital of the Russian Empire. The creation of Saint Petersburg, further north than the old capital, Moscow, cemented Russia's status as an "ice kingdom". At least a century would pass before the severe new city won accolades as the Venice of the North. In its first years, Peter's northern brainchild was viewed as an ill-advised venture not only by his enemies and detractors, but also by most of his closest associates. It has been suggested that Peter's love of the North was his undoing—approaching

sixty years of age and already suffering from weak health, he jumped into icy water to loosen a ship that had run aground, inducing a fever that contributed to his death.

When Peter moved the political, spiritual, and cultural centre to the north of the Russian Empire, he needed royal residences in the new city. Luxurious palace and park ensembles were created in Saint Petersburg and along the Gulf of Finland, and court life was divided into two cycles: out-of-town palaces during the summer and, during the winter, return to the city and the appropriately named Winter Palace (so called by Peter's daughter, the Empress Elizabeth Petrovna). The Winter Palace became the monarch's principal residence, because the winter in Saint Petersburg is much longer than the Baltic summer.

The northern paradigm stuck and was even cultivated by the Russian Tsars, playing an important role in their self-representation. The future Tsar Paul I, setting off on an incognito trip around Europe, took the pseudonym Comte du Nord.

Napoleon's disastrous Russian campaign of 1812 gave rise to the myth of General Frost, which English cartoonists and other satirists, sceptical of the successes of Russian arms, used to explain the defeat of the French Emperor and his army as autumn gave way to winter. This "general" was depicted as a terrifying monster, Jack Frost, or a bloodthirsty bear (sometimes a polar bear). Then, into the nineteenth century, northern epithets spread far and wide through Russian culture and society: *Northern Flowers*, *Northern Bee*, and *Polar Star* were just some of the names of intellectual and literary magazines that sprang up in Saint Petersburg as the century advanced.

The aristocratic youth of the Russian Empire saw themselves as the northerners of Europe, in life and in love, as exemplified in Pushkin's famous poem, "Winter Morning" (1829), where the poet calls his beloved the "star of the north" and invites her to awaken and "greet the northern dawn". In the early 1820s, Kondraty Ryleyev and Alexander Bestuzhev founded a literary almanac *The Polar Star* and the northern winter was at its height on 14 December 1825, when the two men were among the Decembrists who led troops onto Senate Square in Saint Petersburg in an abortive attempt to force reform of Russia's absolutist monarchy. Three years after the uprising, when several of the Decembrists had been executed and others sent to Siberian exile, the poet Pyotr Vyazemsky, in his bitter and lampooning poem "The Russian God" (1828), described a national deity that presides over the hungry and the cold, over injustice, despair, and hopelessness.

Later in the nineteenth century, Vyazemsky's verses might serve as a motto for the Peredvizhniki

(“Itinerants”)—a group of outstanding Russian artists, whose genre paintings depict and denounce hypocrisy and lawlessness in Russian society, as in the poignant images of Vasily Perov’s *Troika* (1866), Viktor Vasnetsov’s *From Dwelling to Dwelling* (1876), and *Child Beggars* (1860s) by Firs Zhuravlev.

The memoirs of Zinaida Gippius, written in Paris in 1943, recount a conversation with Konstantin Pobedonostsev, the all-powerful Procurator of Russia’s Holy Synod in the last years of the nineteenth century. The Procurator is reported as saying: “Do you know what Russia is? An icy desert, where a reckless man roams.” Pobedonostsev was portrayed in Andrei Bely’s classic novel *Petersburg* (1913) as the Senator Apollon Ableukhov—the embodiment of cold and detached power, which stifles the passionate but occasionally misguided aspirations of ordinary people.

6. Festivities

John Augustus Atkinson (1775–1830)
Tobogganing on the Neva, 1792
Oil on canvas
State Russian Museum

Karl Beggrow (1799–1875)
A View of Saint Petersburg in Winter from Admiralteyskiy Prospekt to Palace Square, Riding Mountain, 1836
Etching, watercolour, whitewash, and varnish
State Hermitage Museum

Boris Kustodiev (1878–1927)
Exhibition of Russian Art (March–April 1924), 1924
Chromolithograph on paper
State Russian Museum

Unknown printmaker
Façade and Plan of the Ice House, 1741
Paper, etching
State Hermitage Museum
(on display until 26 Apr)

Unknown printmaker
Dolphin-Shaped Ice Fountains, a Cannon, and a Mortar for the Ice House, 1741
Paper, etching
State Hermitage Museum
(on display from 27 Apr)

Unknown printmaker
Sectional View of the Living Room and Pantry of the Ice House, 1741
Paper, etching
State Hermitage Museum
(on display until 26 Apr)

The winter months are rich in Christian and folk festivals: Christmas, Maslenitsa, and late-winter carnivals that are celebrated in many European countries. Winter is a time of joy, merriment, and entertainment: carols, fortune-telling, sleigh rides, and ice skating.

Snow sparkling in the sun and the squeak of sleigh runners are stock images of Russian culture. Winter’s charms are ubiquitous in Pushkin’s poetry (“Winter, the peasant rejoices!”, “Frost and sun; a glorious day!”, and the bewitching description of the celebration of Tatyana’s January name day in *Evgeny Onegin*). Hence the stereotype of a carefree, bright and cheerful Russian winter, where snow, ice and frost are not harbingers of death and homeless melancholy, but, on the contrary, of joy and wild revelry.

Such was the spirit of the mock wedding of court jesters, staged in a house built from ice for the delectation of the Russian monarch. Each winter when the river Neva in Saint Petersburg froze over, it became a gathering place for markets and other entertainment.

The measured pace of village life suggested a different and more serene enjoyment of the winter months. Perhaps the first true winter landscape in Russian painting was created by Nikifor Krylov (1802–1831). Krylov’s merchant patrons built a studio for the artist with a view onto a village landscape near Petersburg and provided him with plenty of firewood. The result was *Russian Winter* (1827), showing the view from the artist’s window: two peasant women are in conversation, a girl with two buckets walks slowly beside a frozen river, and a boy in a sheepskin coat leads a horse by the bridle. In this rural idyll, life has slowed down, but on

Unknown printmaker
*Sectional View of the Dining Room
 and Bedroom of the Ice House*, 1741
 Paper, etching
 State Hermitage Museum
 (on display from 27 Apr)

a joyful note: the scene glistens like an ice crystal; the snow is flooded with bright light under a ringing blue winter sky; the viewer seems to breathe the invigorating air that fills the painting.

The festive image of winter helped Russian art to become a popular commodity abroad. Internationally best-known images from Russia include: *Festival at Shrovetide on Admiralty Square in Saint Petersburg* (1869) by Konstantin Makovsky, *Capture of the Snow Fortress* (1891) by Vasily Surikov, and the brilliant suite of winter-fair images by the first Russian surrealist, Boris Kustodiev, with his undisputed masterpiece, *Portrait of Chaliapin* (1922), which depicts the great Russian bass against a typical winter scene. Chaliapin left Russia forever in the year when the portrait was made, taking it with him to Paris.

The Soviet state, in its struggle to overcome “religious superstitions”, tried to abolish Christmas and partially succeeded: celebration of the Saviour’s birth was overshadowed by a more neutral celebration of the beginning of the calendar year. New Year’s Eve, with decorated fir trees, the chiming of the clock over the Kremlin gate, and presents for children became the Soviet celebration par excellence and remains the best-loved festival in Russia today.

The sweetmeats of New Year dinners helped to forge a strong link between the northern winter and confectionery products. Suffice to mention the Leningrad confectionery producer Nord with its cake of the same name, the popular Soviet chocolate sweets Mishka na Severe (“Bear in the North”, produced since 1939), and the Polar waffle cake (produced since 1957).

7. Northern Art Nouveau

Vladimir Baranov-Rossiné
 (1888–1944)
*Norwegian Rhapsody. Winter Motif
 from Trondheim*, 1915–1917
 Oil on canvas
 State Russian Museum

Boris Vorobyev (1911–1990)
Polar Bear Walking, 1958
 Plaster
 State Russian Museum

Konstantin Korovin (1861–1939)
Hammerfest. Northern Lights,
 1894–1895
 Oil on canvas
 State Tretyakov Gallery
 Bequeathed by Margarita Morozova
 in 1910 (from the collection of
 Margarita and Mikhail Morozov)

The turn of the nineteenth and twentieth centuries was marked by two contrary currents: on the one hand, a fin de siècle decadence and the decline of the Old World (*Der Untergang des Abendlandes*), and, on the other hand, the myth of redemptive light from the North and secret spiritual knowledge.

Northward explorations continued: the North Pole was reached for the first time and the first icebreakers, capable of Arctic voyages, were built. The intact remains of ancient animals and humans were discovered in the Siberian permafrost, and the skeleton of a mighty mammoth was displayed in all its glory for the first time in a museum.

Northern countries emerged as the new promised lands of European culture thanks to a deluge of Scandinavian literary and dramatic works by Knut Hamsun, Henrik Ibsen, and August Strindberg, musical compositions by Jean

Nicholas Roerich (1874–1947)
Saint Boris and Saint Gleb, 1942
 Tempera on canvas
 State Russian Museum

Nicholas Roerich (1874–1947)
Snowy Path, 1940
 Tempera, graphite, and gouache
 on cardboard
 State Russian Museum

Nicholas Roerich (1874–1947)
Slope of the Mountain Ridge, 1937
 Tempera, graphite, and gouache
 on cardboard
 State Russian Museum

Frits Johann Frederik
 Thaulow (1847–1906)
Night, 1880s
 Oil on canvas
 State Hermitage Museum

Mikalojus Konstantinas
 Čiurlionis (1875–1911)
The Offering, 1909
 Tempera, gouache, and graphite
 on cardboard
 State Russian Museum

Sibelius and Edvard Grieg, paintings by Edvard Munch (1863–1944) and Fritz Taulow (1847–1906), among the first acquisitions of Moscow art collectors Sergei Shchukin (1854–1936) and Ivan Morozov (1871–1921), as well as architectural masterpieces by Eliel Saarinen Sr. (1873–1950) and Fyodor Lidval (1870–1945). Scientists, ethnographers, and linguists were inspired to study the folklore of northern lands. Ancient sagas and legends of northern peoples had been discovered much earlier, but it was not until the late nineteenth century that they gained mass popularity. Ornaments and motifs from northern folk art, embroidery, bone carving, etc., came to the fore in the decorative arts.

The career of the brilliant Russian impresario Sergei Diaghilev (1872–1929) began with the Scandinavian Exhibition (1897) in Saint Petersburg. In 1898, Diaghilev exhibited paintings by young Russian artists alongside works by their Finnish colleagues. A storm of protest at this curatorial decision from champions of the Russian school had the paradoxical effect of bringing a group of young Russian artists (Mikhail Vrubel, Mikhail Nesterov, Konstantin Korovin, Valentin Serov, Leon Bakst, etc.) to international attention.

Diaghilev went on to be the ideologue of the *Mir Iskusstva* (“World of Art”) aesthetic movement that was unquestionably northern in spirit. A rather different North, the abode of ancient spirits and heroes of “distant antiquity”, is to be seen in the canvases of the Lithuanian artist and spiritualist, Mikalojus Čiurlionis (1875–1911). Echoing him in part, Nikolai Roerich (1874–1947), whom Diaghilev called on for the design of the opera *Prince Igor* (1908), created his own images of the legendary northern land. Roerich also designed sets for productions of *The Snow Maiden* (1912) by Alexander Ostrovsky and *Peer Gynt* (1913) by Henrik Ibsen. Years later, Roerich travelled to the Himalayas in search of the mysterious land of Shambhala, and spent several years in the region painting the snow-capped peaks of the sacred mountains.

Connections between Russia and other northern European countries had deep roots in war, trade, and dynastic marriages. Finland, as the Grand Duchy of Finland, was a part of the Russian Empire for over a hundred years, and the wife of Tsar Alexander III was the Danish princess Dagmar (married name, Maria Feodorovna). The arrival of the Danish royal inspired enthusiasm in Russia for products from the Royal Copenhagen Porcelain Factory, which differed strikingly in style from Russian, German or French porcelain. They were characterised by pastel colours and minimalist forms—forerunners of what later would be called Scandinavian design. The fascination with Danish porcelain had a direct influence on the development of the arts and

crafts industry in Russia and later in the Soviet Union. The porcelain figurine *Polar Bear Walking*, created in 1958 by Boris Vorobyov (1911–1990) and which became hugely popular, was clearly inspired by Danish prototypes.

Northern motifs permeated the mass culture of pre-revolutionary Russia. Kazimir Malevich's design for Severny ("Northern") cologne, produced by a Russian perfume factory, dates from 1908. The bottle is in the shape of an iceberg with a polar bear on the top. A year after the October Revolution, Malevich would create one of the most radical works in the history of modern painting, *White on White* (1918), following on from his famous *Suprematist Black Square* (1915)—a rebuke to classical art and would-be harbinger of its ultimate demise. But, as we know, art is eternal, or will be eternal for so long as we have classical museums, those chests of drawers with columns, crammed with all kinds of junk.

Alexander Moskvitin

The Cold Experiment

It is hard to imagine how different conditions in space are from what we are used to on Earth. The enormous distances that separate stars and galaxies are, for the most part, a vacuum. Despite the complex processes that happen there, space seems at first glance to be no more than a cold void.

Denser matter collects in huge gas clouds where gravity and pressure heat substances to enormously high temperatures, provoking thermonuclear fusion. This is how stars are born. They give off heat and light, and conditions conducive to the emergence of life can develop near them, as happened in our solar system. The rest of the Universe is cold and desolate but, fortunately for astronomers, it is relatively transparent to photons: the rays of light which consist of these particles cross immense distances without being scattered, making it possible for astronomers to observe unimaginably distant objects.

All stars, except for our Sun, are located at distances ranging from a few to billions of light years away from us, so that, regardless of their size and power, they appear to us as faint points against the dark sky. At night, far from city lights, we can see about six thousand stars of the Milky Way galaxy (of which our solar system is a part) with the naked eye. Signals from other, dimmer objects have to be collected literally photon by photon. Observational astronomy uses highly sensitive radiation detectors for this purpose. The equipment is cooled using thermoelectric elements (liquid nitrogen or helium) in order to eliminate most of the thermal noise. The remaining noise is carefully measured so that it can be taken into account and discarded when processing the obtained data.

At Russia's Special Astrophysical Observatory (SAO), most of the radiation receivers on the six-metre BTA telescope and the one-metre Zeiss-1000 telescope are cooled with liquid nitrogen. The light-sensitive matrix is contained in a vacuum chamber with a cryostat, to which a new supply of nitrogen is added twice a day. Without the coolant, evidence of stars and galaxies would be drowned in noise and the data would be unusable for astronomers.

The telescope itself also has to be cooled. The towers of the optical instruments at the SAO are opened in the evening before observations begin, and temperatures of the space under the dome and of the surrounding

environment are equalised in order to prevent thermal air currents during the night. Cooling systems may also be used. Human presence is excluded as far as possible, since people need warmth, while the telescopes require cold. Most observations are carried out remotely.

Gamma, X-ray, and ultraviolet telescopes are usually installed in space observatories because these wavelengths are unable to pass through the Earth's atmosphere. The receivers for these types of radiation must also be kept at a certain operating temperature.

In the case of infrared, submillimetre, and radio telescopes, which operate both on Earth and in space, the equipment in its entirety must be kept cool in order to prevent interference with the data that is received. In the Cold Experiment, the equipment of the RATAN-600 (a third telescope at the SAO) was cooled with liquid helium to increase its sensitivity. In addition, gaps between the telescope's shields and its foundation were sealed with a foil-like material and the foundation itself was covered with a special mesh to reduce ground interference and the so-called noise temperature of the antenna.

In sum, the process of obtaining astronomical data can be thought of as the observation of warm sources on a cold background. The colder the background, the greater the potential for registering very weak signals from those sources.

There is an obvious analogy with human behaviour. We call someone who allows their emotions to disrupt their understanding a "hothead". We sometimes lose our objectivity when we are overcome with feeling, just like radiation receivers that overheat. Important decisions must be made with a cool head.

The aggregate states of matter correspond to the complexity of its organisation. Hot gas is chaotic; as it cools, it becomes a fluid, and as it solidifies, it acquires a crystalline structure. The lower the temperature, the more slowly the atoms move, allowing new properties of matter to be discovered: superfluidity, superconductivity, and other effects that are indistinguishable in heat.

One of the coldest and most distant phenomena in space is relic radiation: a faint signal in the microwave range, an echo of the time when the Universe cooled slightly after its first hot phase, which lasted several hundred thousand years. A moment finally came when the first atoms of matter as we know it were able to come together, and when space became transparent to light. Billions of years later, we have evidence of this event as a microwave background radiation, or relic radiation, with a temperature of 2.7 Kelvin (-270.4°C), distributed fairly evenly across the sky. However, the radiation has miniscule inhomogeneities or

ripples, of the order of one hundred thousandth of a degree, that help astronomers to gain insight into the early stages of the expansion of the Universe and the distribution of matter—the events that created the Universe as we find it today, with clusters of galaxies, filaments, voids, and other giant structures.

After the discovery of relic radiation, it was not entirely clear how heterogeneous it would turn out to be. Different theories made different predictions, and various groups of scientists competed to make observations with levels of accuracy that would provide answers to the question. The most successful of these researches found a dipole component—a sign that we are flying through space relative to the distant relic background. Half of the sky would be approaching us, while the other half would be moving away at a speed of 370 km/s due to the Doppler effect. However, this two-part component had nothing to do with the distribution of the relic background itself. The situation was similar to attempts to reach the bottom of an ocean trench when successive dives go ever deeper but can only report, “The depth is such and such, the bottom was not reached.”

The principal goal of the Cold Experiment, which began in 1980, was to see the inhomogeneities of relic radiation and assess their scale. The newly built RATAN-600 radio telescope was used for this purpose and innovative techniques were tested: cooling the equipment with liquid helium and long signal accumulation by repeatedly scanning the same strip of sky. A number of challenges had to be addressed before fluctuations of the background radiation could be identified and studied: technical problems had to be overcome; terrestrial interference, seasonal changes, atmospheric noise, and the influence of the Sun had to be taken into account; and the contribution of our Galaxy and of other galaxies and quasars that fell within the data band had to be subtracted.

In the course of the experiment many light sources in the sky were studied and new ones were discovered, including some of great interest and at huge distances from Earth (a number of these were later observed using the six-metre optical telescope). However, fluctuations in the relic background remained below the sensitivity threshold. The experiment showed that our planet is simply too hot for observation of the inhomogeneities of such a cold research object as relic radiation. The only solution was to transfer the observation point to an environment that was closer to the temperature of the object of study, namely to space. The Relikt-1, COBE, WMAP, and Planck satellites eventually succeeded in discovering the expected effects and obtaining maps of the fluctuation distributions.

The multimedia installation *Cold Experiment* is dedicated to scientific research at the frontier of the unknown and to attempts at solving a problem which seemed to be insoluble. The trinity of telescope, human being, and space object is transformed into a cyclical process of observation and data accumulation in order to achieve the desired depth. Human beings who created the machine for their own purposes are compelled to serve as cogs in the same machine, all the while remembering what it was invented for.

On the one hand, the concept of cold is an integral property of the observed object: relic radiation is fractionally warmer than absolute zero, but far too cold to sustain human life. On the other hand, cold is precisely the tool that enables people to get closer to the object of observation. Cold is what is needed, while heat is an undesirable state of the system.

Most of the observations in the Cold Experiment were indeed carried out during the cold part of the year. But, although the conditions of the experiment were challenging, they were not dangerous to life, since most of the “cold” was contained in a closed helium circulation system. There is an analogy with the exploration of sub-soil wealth (oil and gas) in the frozen North of Russia, except that here the valuable resource is not beneath us but far above us, and it is not an export commodity, but truth.



Eternity Formulae

Exhibition
26 Feb—19 Jul
Pump Room

Artists

Daria Arbuzova
John Augustus Atkinson
Vladimir Baranov–Rossiné
Abraham Beerstraaten
Karl Joachim Beggrow
Hans Bol
Vladimir Borovikovskiy
Jan Brueghel the Elder
Andrei Cherkasov
Mikalojus Konstantinas Čiurlionis
Giovanni Antonio Cybei
William Elmes
Slava Fedorov
Artem Ignatiev
Severin Infante
Rockwell Kent
Konstantin Korovin
Korsi
Boris Kustodiev
Aleksai Medvedev
Anton Raphael Mengs
Alexander Moskvitin
Yuri Palmin
Alexandra Paperno
Olya Pegova
Ivan Prokofiev
Rembrandt Harmenszoon van Rijn
Nicholas Roerich
Peeter Sneyers
Frits Thaulow
Nurlan Tortbayev
Boris Vorobyev
Elena Yuferova
Firs Zhuravlev

Curators

Yaroslav Aleshin
Anastasia Proshutinskaya
Artem Timonov

**Archival research
for the *Refrigerator* section**

Sergei Kozlovsky

**Concept and research
for the *Winterreise* section**

Sergei Fofanov

Educational platform

Yulia Apanasenko
Stepan Ovchinnikov

Architecture

Sasha Kim

Lighting

Ksenia Kosaya

Producers

Varvara Arkhipova
Stacy Demytyeva
Veronica Luchnikova

Technical team

Andrei Belov
Artem Kanifatov
Pavel Luzhin
Mikhail Sarkisyants

Art logistics and registration

Angelina Korovina
Daria Krivtsova
Daria Maksimova

**Accessibility and inclusion
programmes team**

Aleksandra Kharchenko
Vlad Kolesnikov
Victoria Kuzmina
Varya Merenkova
Vera Zamyslova

Graphic design

Vasily Kondrashov

Editors

Daniil Dugaev
Olga Grinkrug

English texts

Ben Hooson

Media specialist

Anastasia Melnikova–Belinskaya

**The exhibition was organised
in collaboration with**

Central Scientific and Technical
Library for Construction and
Architecture
Russian State Archive of Literature
and Art
Russian State Library
Shchusev Museum of Architecture
State Hermitage Museum
State Russian Museum
State Tretyakov Gallery

Project partners

Special Astrophysical Observatory
of the Russian Academy of Sciences
Traektoriya Foundation for Scientific,
Educational and Cultural Initiatives



Exhibition

V

GES-2

