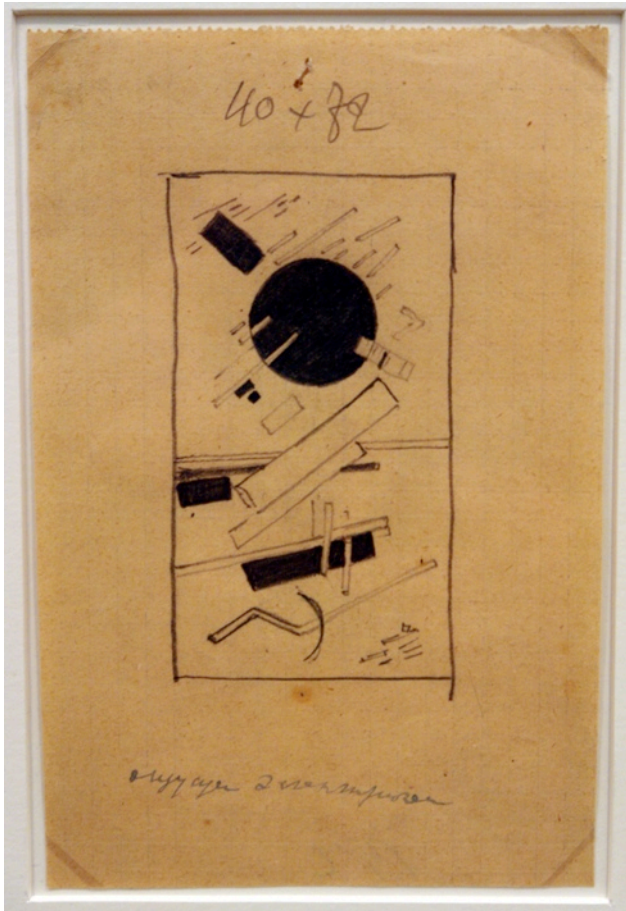


Artistic pursuit: towards hyperspectral percipience

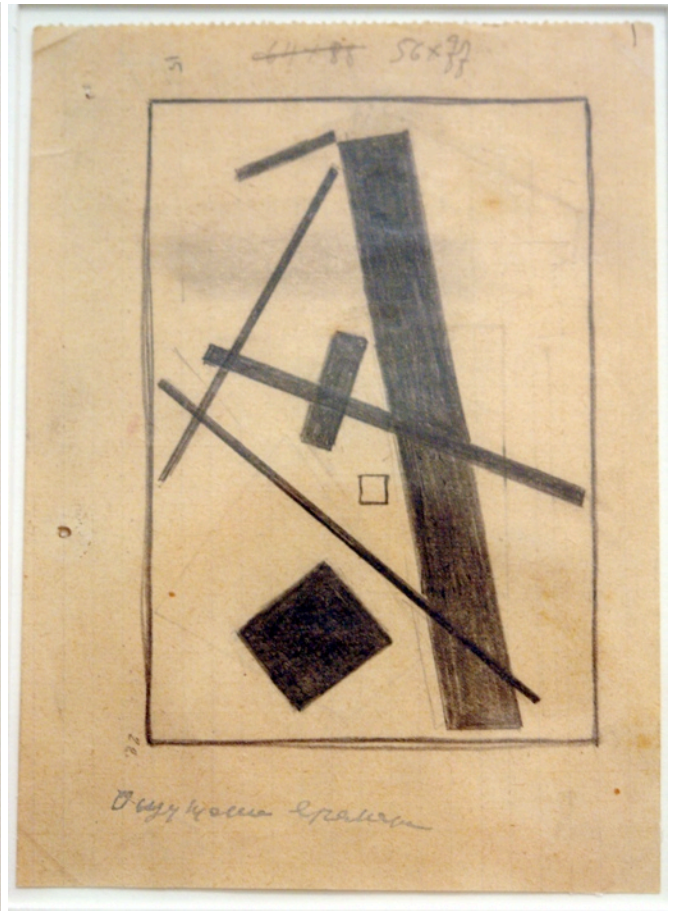
Between the atomic scale and the macroscopic world, lies the mesoscopic scale. Any attempt to delineate this mesoscopic tipping point has failed thus far, despite quantum physics' extremely successful predictions of macroscopic instruments' measurements of micro-systems. One of the reasons for this failure to localize a hypothetical quantum threshold, is that the measuring apparatus always becomes part of the examined system. However, unlike a data-gathering device, an observer is capable of psycho-sensorially coupling with reality, eliminating the need to distinguish between the apparatus and the system. Yet there is another, deeper quantum slipperiness and ubiquity: entangled "consequences of events in one place propagate to other places faster than the speed of light. This happens in a way that we cannot use for signalling. Nevertheless, it is a gross violation of relativistic causality. [...] It may be that a real synthesis of quantum and relativity theories requires not just technical developments but radical conceptual renewal" [J.S. Bell, *The Speakable and Unsayable in Quantum Mechanics*]. Our first step towards this transformation of awareness was the abandonment of playback and simulation ("signaling") media: the ever-transforming interchange between the observer and a non-virtual mesoscopic phenomenon can never be reproduced or simulated – reduced to a signal. The observer and the observed must emerge simultaneously, in as intimate contact with one another as possible.

Accordingly, our artworks are not complete without being directly experienced, because they strive to alter and renew perception. It is a form of anarchy to leap beyond the settled and well sieved sensory streams commonly accepted as discrete senses. There is never anything in these artworks that will let the mind slip into familiar troughs of meaning. We always try to suspend ourselves and our audience in the most ephemeral and measureless environs that we can "tame". Though without familiar symbolic content, such fluid unfoldings are usually staggering in complexity and multidimensionality and can slightly unveil to a "suspended" mind an exponential avalanche of quantum emergence. At this instant, the expansion of a particular sensory envelope can take place.

In the midst of the quantum revolution in the 1920s, Russian futurist Mikhail Matyushin developed a practice of the "expanded gaze" (расширенное смотрение). Among other means, this was achieved by training both peripheral and central vision to function simultaneously with maximal focus. Besides contriving the most effective use of color in painting, architecture and urban planning for new communist cities, he tried to connect the scientific description of color with a synesthetic or synthetic perception of color coupled with hearing, chronoception, as well as vestibular, kinesthetic and tactile apprehension. Although Matyushin was not directly investigating synesthesia, he intuited from his experiments that the expansion of sensory capacities has something to do with cross-modal perception. His close friend and artistic affiliate, Kazimir Malevich, was also working towards the expansion of the sensory palette: in 1916, he made 2 curious drawings: *Sensation of the Electron* (Ощущение электрона) and *Sensation of Time* (Ощущение времени).



Malevich "Sensation of the Electron"



Malevich "Sensation of Time"

The first five years of our collaborative work were absorbed by the experience of reality as waves and fields. Though a seemingly innocent preoccupation, such a pursuit can entail a devastation and reorganization of the entire structure of consciousness. Nonetheless, there is a tremendous payoff: a potential sensorial key to the very depths of humanity's scientific insight. Perhaps, at present, mental functionality and knowledge are advancing much faster than one's senses. Contrarily, the capacities of synesthetes and savants have always gleamed on the horizon as a potential step in the evolutionary race of cephalisation, re-folding the brain into ever finer and more interconnected fissures.

Our apprehension of customarily imperceptible physical and chemical phenomena has incited us to meticulously modulate and fuse the senses. Because the spatial and temporal signatures of these phenomena are often totally unfamiliar to the observer, only under proper mind-focusing conditions can the senses intuitively fill in one another's perceptual blanks.

Memory Vapor: the subatomic observatory

Every second, Earth's inhabitants are bombarded by billions of charge carriers, arriving from every possible direction in outer space. As they traverse the supersaturated gas within a cloud chamber, these subatomic messengers, known as *cosmic rays*, macroscopically disclose their identity and the plenum underlying the empirical void.

The immense diversity of energy signatures corresponds to the scope of cosmic origins, ranging from solar emissions and those of other stars to hitherto uncharted physical processes at the edge of the perceivable universe. Some of these cosmic bullets reach speeds that are a thousand times faster than anything ever launched at the Large Hadron Collider, and approximately once a year, a particle that is 10 million times more energetic arrives. Their origins are presumed to be supernovas and active black holes. One such candidate, supernova 1054, exploded so intensely that in the year from which it gets its name, Chinese and Arab observers noted that it was bright enough to see in broad daylight for 23 days. Its remnants comprise the Crab Nebula. Significantly outlasting the timescale of stellar and galactic explosions, the highest energy cosmic rays unfold over multiple stages, entailing an accumulation of accelerative processes.

As soon as a cosmic ray reaches the ionosphere, the upper layer of our atmosphere, it ripples into a billion other particles, comprising a ubiquitous subatomic cascade. This cosmic shower can reach the senses by means of an experimental environment called a cloud chamber, invented by Charles Wilson in 1894 (perfected in 1911) to study the nucleation of atmospheric clouds -- an idea that came to him during his mountaineering trips when he observed such phenomena as auroras and glories.

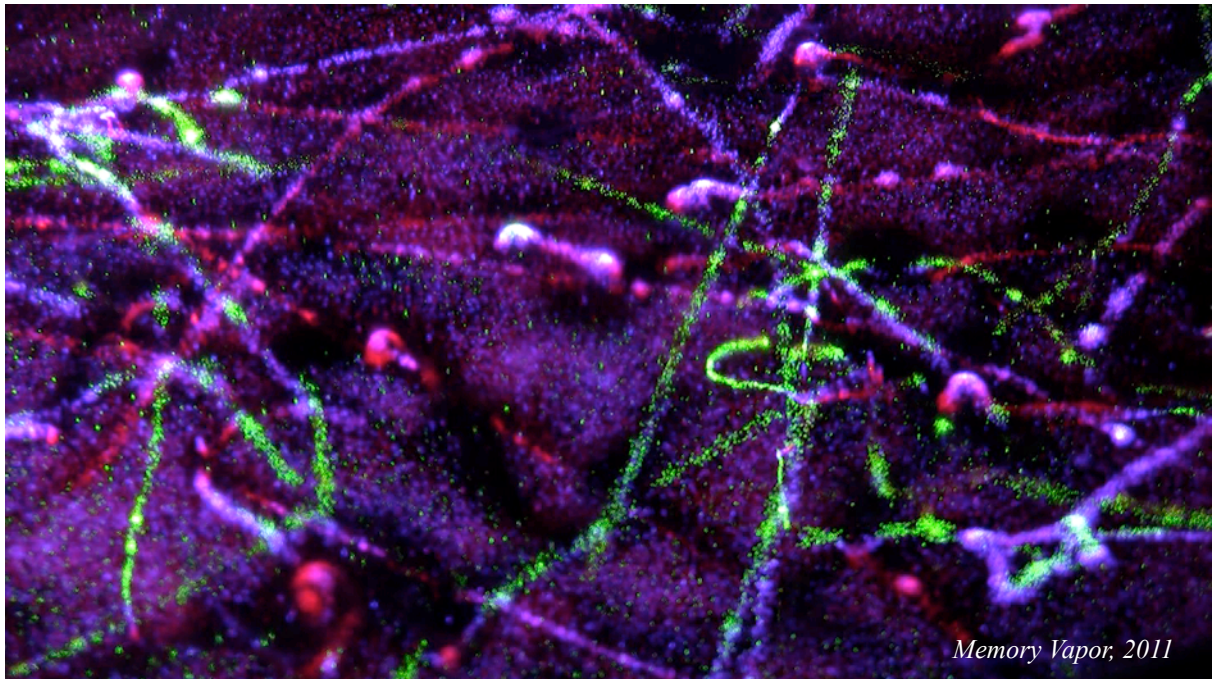
Two years later, in 1896, Henri Becquerel discovered radioactivity, the source of which was suspected to be radioactive elements embedded in the Earth. This was the dominant theory until 1912 when Victor Hess measured four times more radioactivity at a height of 5300 meters than at ground level. Making further measurements during a near-total eclipse, Hess also dismissed the Sun as a potential source of this highly penetrative radiation. In 1925, Robert Milikan definitively labeled these ionizing emissions *cosmic rays*. While using a cloud chamber to determine the precise charge of a single electron, Milikan came across a plethora of other charge carriers. He interpreted them as the photonic "birth cries" of new atoms ceaselessly created by God to counteract the entropic heat death of the cosmos. Such assumptions put a rapid end to Milikan's scientific career.

Recently, the Cloud Project at CERN and parallel research conducted at the Lebedev Institute in Moscow has revealed the significant role of cosmic rays in atmospheric and biological processes. Variations in cosmic ray showers have been found to affect tree growth more than changes in temperature or precipitation. The phenomenon known as *relativistic runaway electron avalanche*, hypothesized to seed lightning, has been directly linked to decaying cosmic rays – as has the seeding of clouds.

Memory Vapor: technical realization

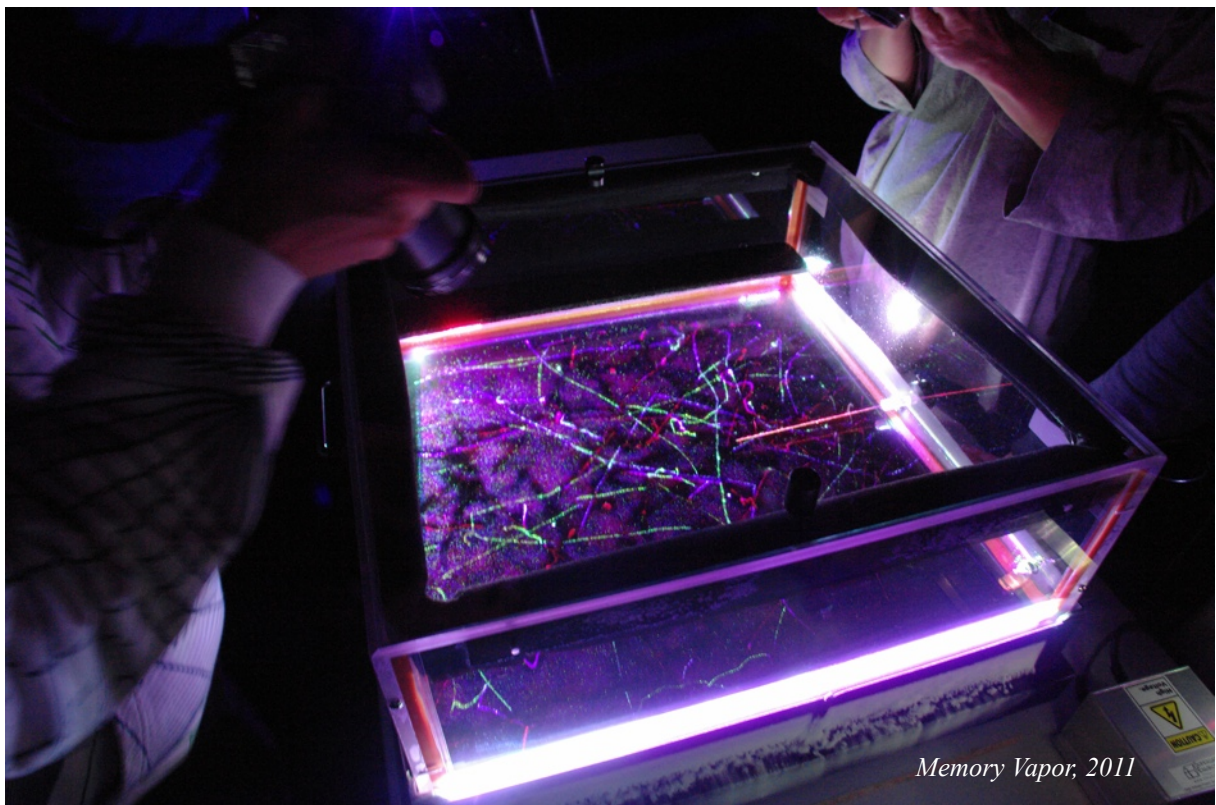
The artwork, Memory Vapor, is comprised of a 1 x 1 meter cloud chamber to which electric and magnetic fields are applied, making it also a particle accelerator. At the bottom of the chamber, liquid ethanol begins to evaporate into a thin cloud once the temperature drops to -200° C. The cooling is achieved with 8 liters of liquid nitrogen placed directly below the chamber.

Our unique artistic contribution lies in the use of a pulsating white laser sheet to illuminate the tracks of ionized nuclei, muons, electrons, positrons and antiprotons. The laser turns each micro-droplet of these ephemeral condensation trails into a luminous lens. The light gets trapped in the droplet just like sound gets trapped in the whispering chamber modes of gothic



Memory Vapor, 2011

cathedrals. As reflections accumulate, the light is amplified, turning the droplet into a laser cavity. The pulsation of the laser also incites a sense of altered temporality: in the same way that a flying bullet can be photographed with rapid flashes of light, the naked eye can register such micro-temporal dynamics without any need for a recording medium. Resultantly, the spatio-temporal perception of particle tracks is vastly enhanced – an unusual sensation of



Memory Vapor, 2011

iridescent depth emerges. The observer's instantaneous connection with quantum reality can only be truly achieved through unmediated and expanded experience.

We would like to conclude with the words of theoretical physicist and philosopher, David Bohm, so eloquently emphasizing the senses and the inner senses as the optimal instruments for tuning into hidden frontiers: “While humans’ scientific instruments do constitute an effective extension of their bodies and sense organs, there are no comparable external structures that substitute for the inward side of the perceptive process (in which the invariant features of what has been experienced are presented in the ‘inner show’). There is always finally a stage where an essentially perceptive process is needed in scientific research – a process taking place within the scientist”.