



Traces: Toward a Bulk Modulus of the Human

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Abstract

This essay introduces the trace as both a conceptual and an operational term for a painting practice situated between qualitative research and studio production. The term is borrowed from solid mechanics, where the trace of the stress tensor measures the hydrostatic pressure acting on a material at a single point. By analogy, the author proposes a human equivalent: a fluctuating measure of how much emotional and cognitive pressure a person can absorb before their internal state changes. A companion idea – a human bulk modulus – is developed to describe individual resistance to such pressure, alongside the claim that, unlike diamond or steel, people can deliberately modulate their own resistance through awareness, attention, and intention. Drawing on a background in computer science and user-experience research, the text frames the interview as a method for collecting traces and the canvas as a structure capable of holding them. Colour and shape are treated as a language for emotional pressure, positioned in relation to Kandinsky's and Rothko's arguments for colour's direct address to feeling. Two bodies of work are discussed: the Traces series, which records personal and witnessed states of pressure, and Insolation, which scales the question of human capacity against planetary time. Together they ask what it means to register, survive, and be transformed under load without being destroyed by it.

Keywords

perceptual awareness, emotional resilience; colour theory; painting; structural physics.

1. Introduction

I am a multimedia artist working between Portugal and a professional background in computer science and user-experience (UX) research. My work blends qualitative inquiry with painting and is shaped by recurring themes of displacement, identity, and human perception. This essay sets out the single idea that organises that practice: the trace, a concept the author has developed across two earlier essays (Kritchko, 2025a, 2025b). By trace I mean the specific quality of pressure a person carries at a specific moment – the exact feeling of one's capacity being tested. A trace is at once particular, belonging to a person and a context, and universal, because everyone

has felt their capacity exceeded and everyone knows the sensation of holding more than they believed they could. The essay first develops the concept by way of a deliberate metaphor drawn from materials science. It then describes how I collect traces through research interviews, how I translate them into colour and form, and how two project bodies – Traces and Insolation – make these states visible at human and planetary scales.

2. The Trace: A Term Borrowed from Mechanics

We are part of an ecosystem governed by physical law, and the vocabulary of solid mechanics turns out to describe inner life with surprising precision. In engineering,

trace is a technical term: the trace of the stress tensor measures the hydrostatic pressure experienced by a material at a given point – a single value summarising how strongly the material is being compressed or expanded uniformly in all directions (Callister & Rethwisch, 2018). The trace allows engineers to anticipate deformation under load and, more importantly, to recognise when a material approaches failure. When the trace exceeds a material’s limits, the structure cracks or collapses; the value marks a threshold at which external pressure overwhelms internal capacity and forces a change of state.

A material’s resistance to such uniform pressure is quantified by its bulk modulus, a fixed property describing how strongly it resists compression. The contrast between materials is instructive, ranging across several orders of magnitude (Table 1).

Material	Bulk modulus (GPa)
Diamond	443–540
Steel	160
Copper	140
Granite	50
Water	2.20
Polypropylene	1.1–1.6

Table 1. Approximate bulk modulus of selected materials, ordered by resistance to compression. Adapted from standard values in materials science (Callister & Rethwisch, 2018).

3. A Bulk Modulus for the Human

What if humans also possess something like a bulk modulus – a quality determining how much emotional or cognitive pressure we can withstand before our state fundamentally changes? My hypothesis is that in moments of pressure, when external demands exceed our current trace, we undergo a state change: mood shifts, thoughts reorganise, and emotions surface. This happens because the configuration that served the previous moment can-

not manage what is asked of it in the moment after. There is, however, a crucial difference between people and materials: we can influence our own bulk modulus. Unlike diamond or steel, we can choose – through awareness, practice, and intention – how deeply we resist pressure and how we meet it, so that it transforms us without destroying us. The beauty and the vulnerability lie precisely here. We move through a day without knowing what our trace will be in the next moment, without knowing when external forces will exceed our capacity, and without knowing whether we will deform elastically and recover, or plastically and carry the mark forward.

I find it useful to name a further variable: hypersensitivity, which I treat as the underlying mechanism that generates traces. If the trace is the momentary reading, hypersensitivity behaves like a coefficient in the formula of an emotional state – a constant that determines how strongly external stimuli register internally. A single day can demonstrate the whole system. A high trace in the morning absorbs a small disruption with delight; an hour later, in traffic or under the pressure of other people’s visions in a gallery, the sensors recalibrate and the state changes again. The trajectory through a day is simply the consequence of these shifting measurements.

4. Methodology:
Collecting Traces Through Qualitative Research

The methodological basis of this work is qualitative. It draws on semi-structured research interviews and unmoderated user-experience studies carried out over nine years of professional practice, treated here as a means of collecting traces. I suspect I became a user-experience researcher in order to collect more traces (Kritchko, 2025a). To conduct an interview is to remain focused on another person and aware of their reactions throughout, dedicating attention to every question and to the speaker. Over time this attention becomes a way of seeing: in interview after interview I have watched the moment when a voice changes, when the eyes shift, when pressure becomes visible. People are moved by different things and with different intensity, yet their emotional responses are true, often formed by experiences they carry every day. Awareness of these traces

returns to me a sense of humanity, honesty, and care. Many readers will recognise the earliest version of a trace from childhood - the instant of seeing something that touched you deeply, the freezing, unknowing reaction, and the single question that remained when an adult said "let's go." That instant of questioning is a clear trace: the intuitive feeling of how much pressure can be held before something breaks. Such moments are too precious to remain only in transcripts or in memory. My practice derives from qualitative research - the discipline of observing a subject and the ability to capture subtle correlations between consequences and real-life narratives. These elements come together as scenes on canvas, and the scenes evolve into narratives that carry both conceptual depth and strong emotional resonance.

5. Colour, Shape, and Energy as a Language

Words are good for sharing meanings, but they cannot always hold a trace; colour can. I have mixed colour since childhood, treating it almost as alchemy in order to arrive at the exact hue that reflects a particular state. Artists have long claimed this expressive power for colour. Kandinsky (1911/1977) argued that colour produces psychological vibration and acts directly on feeling, comparing the artist's hand to a player drawing the soul into resonance, and assigning emotional registers to individual hues - yellow as restless, blue as deep and withdrawn, red as warm and vital.

Decades later, Mark Rothko pressed the claim further. In his large colour-field canvases he sought a tragic and timeless emotional experience, insisting that he was interested not in relationships of colour or form but in expressing basic human emotions- "tragedy, ecstasy, doom" (Rodman, 1957). His chapel in Houston demonstrates the conviction that colour relationships alone can induce profound contemplative states. Physics offers a parallel: colour is wavelength, with red near 700 nanometres carrying physical warmth and violet near 380 nanometres reading as cool and distant. The relationship between colours can hold conflict, complementarity, or dependency; shapes hold energy; and the relationship between shapes and colours can carry a story. My paintings function as healing structures that hold traces, where colour carries the emotional quality, shape carries the energy, and their relationship records someone reaching a limit - and what happened next.

6. The Traces Series

The Traces series records states of pressure directly. Each canvas isolates a threshold - the band where one configuration gives way to another - and asks the viewer to stand at that edge.



Figure 1. Traces 1 - Afterwords. Oil on canvas, 80×60 cm.

A pale field is divided by a dark horizontal band; loosened marks scatter above and below it.

In *Afterwords* a dark horizon splits the picture in two. Above it, drifting orange and blue notes hold the charge of a moment before it is named; below, the same notes return, displaced and quieter. The band is the threshold itself the line a trace crosses when pressure forces a change of state and the title points to what remains once the word, or the moment, has passed.

The World turns the threshold outward. Saturated reds bleed downward over grey in vertical washes, a field of warmth and vitality pressing in from every side. Here the pressure is environmental rather than personal: the weight of the world as a uniform compression, the hydrostatic stress of simply being among others.



Figure 2. Traces 2 - The World. Oil on canvas, 60×80 cm.
Vertical reds and pinks descend over a grey ground in saturated.



Figure 3. Traces 3 - Self-possession. Oil on canvas, 80×60 cm.
Pink and green forms cross an orange field traced by looping white lines.

Self-possession is the series' answer to its own question. Against an orange heat, white lines loop like the curve of a life or the path of attention, and pink and green forms keep their shape rather than dissolving. The painting describes the human exception to the law of materials: the capacity to meet pressure and retain one's form - to be deformed, but elastically, and to recover.

7. Observations: From Interview to Canvas

A second group of works grows out of witnessing rather than introspection. These are observations: traces gathered from others and rebuilt as scenes.

Silent Recognition stages the interview itself. A face surfaces from a thicket of marks at the instant of being understood without words - the moment a researcher and



Figure 4. Silent Recognition. Oil on canvas, 40x30 cm.

A grey, half-formed face emerges from a dense, dark figurative field.

a subject meet at the surface of a feeling. The density of the paint is the density of attention; the recognition is mutual and unspoken.

Changing Perspective is about reorientation under load. A single blue figure torques across incompatible colour

zones, neither fully in one nor the other. It is the body of a person whose trace has shifted - thoughts reorganising, the self turning to meet a new demand from a new angle.

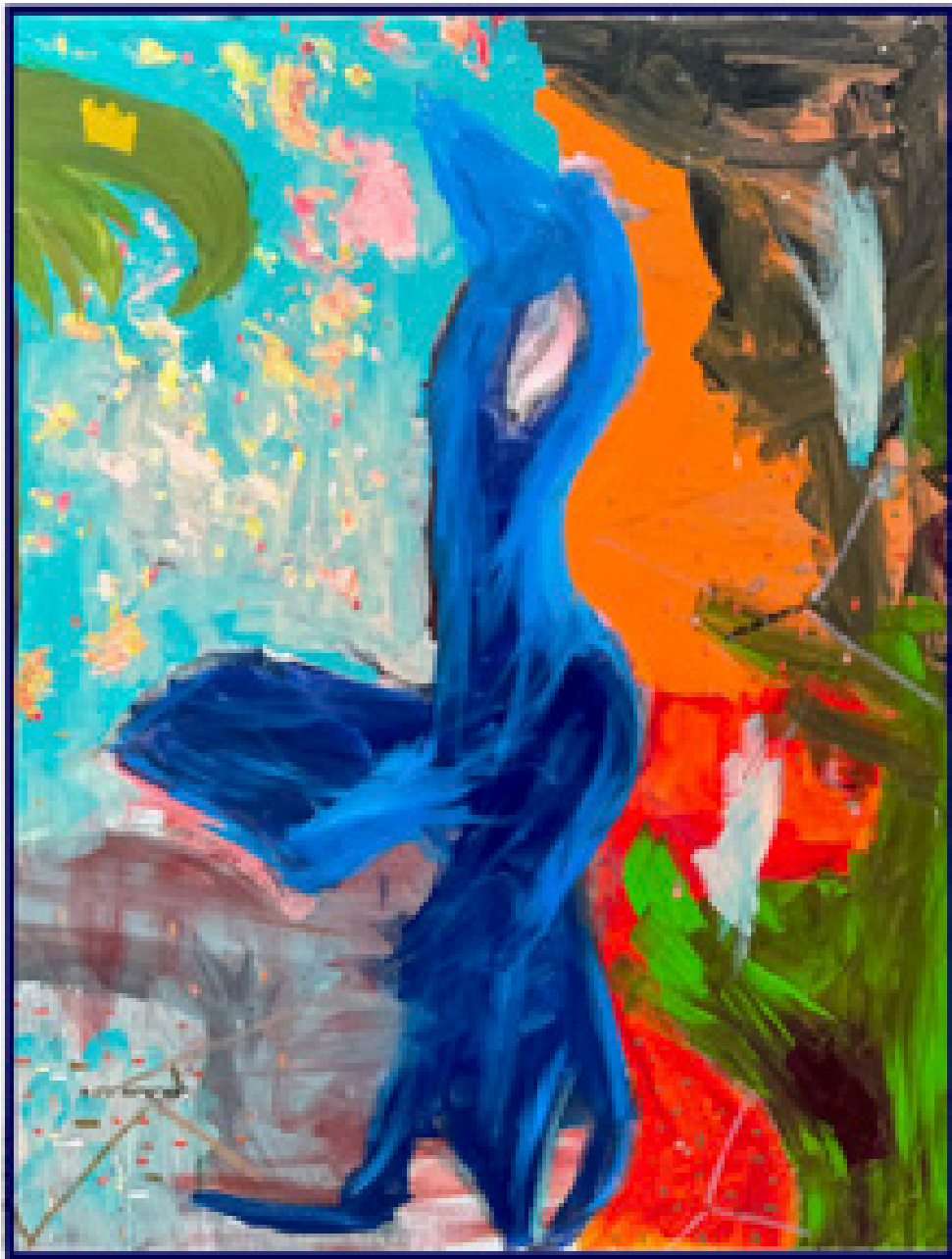


Figure 5. Changing Perspective. Oil and acrylic on canvas, 80×60 cm.

A blue figure twists across contrasting fields of turquoise, orange, and green.



Figure 6. City. Oil and acrylic on canvas, 55×40 cm.

A large eye presides over a purple dotted field set against green and red.

City addresses hypersensitivity directly. A watching eye presides over a divided ground - an overstimulated purple field of repeating marks pressed against vivid green and red. It is the urban condition in which the sensors

never rest and the coefficient runs high. City was published in The Penn Review (University of Pennsylvania, Spring 2026, Issue No. 75).



Figure 7. Detroit. Ink and acrylic on canvas, 150×80 cm.
Black calligraphic gestures cross a grey ground edged with pink spatter.



Figure 8. Theater of Rational and Spiritual. Acrylic on canvas, 78×50 cm.
An energetic red-and-blue mass on the left meets a gold-and-dark swirl on the right.

Detroit is a trace of place. Sweeping black gestures move across a worn grey field bordered by pink, like the residue of movement through a city that leaves its mark. If Self-possession is elastic recovery, Detroit is plastic deformation: the mark that does not spring back but is carried forward, a record of displacement.

Theater of Rational and Spiritual is the practice reflecting on itself. The canvas splits between an analytic red-and-blue energy and an intuitive gold-and-dark turbulence - research and art, measurement and feeling, staged as a single dialogue. The painting argues that the two are not opposed but co-authors of the same trace.

8. Insolation: The Trace at Planetary Scale

Insolation enlarges the central question until the human figure almost disappears. We choose every day, but toward what? Can we trace the curve of a life and still call Earth our home? We can be genuinely present at every point where we place our attention, and yet it can still feel like too much. The project works with that disorientation, and its title holds a deliberate double sound: insolation, the incoming solar radiation that drives the planet, against the isolation it nearly names. Insolation is offered less as a finished statement than as a shared methodology and approach.

The first element is a dataset spanning hundreds of thousands of years of Earth's climate history, built from the LR04 benthic oxygen-isotope stack and the parameters of orbital forcing - precession, obliquity, and summer insolation (Lisiecki & Raymo, 2005). Rendered as a heatmap, it provokes a sense of human smallness in the face of planetary power, presenting the Earth as a self-regulating organism that governs its own climate across cycles of glaciation and warming. The dataset becomes a conceptual embodiment of the planet's deep memory - its force, autonomy, and time - through which we perceive our own limitations more clearly.

The second element is a triptych whose medium immerses the viewer in layering, complexity, and multidimensionality. Oil, dry mist, leaves, and controlled drying processes build a dense, textured surface that evokes the accumulation of time and the stratification of planetary processes, while threads of copper trace a faltering curve across the panels like a life drawn against geological depth. The material structure lets the work be experienced not only visually but physically, as a place where multiple temporal and emotional layers coexist.

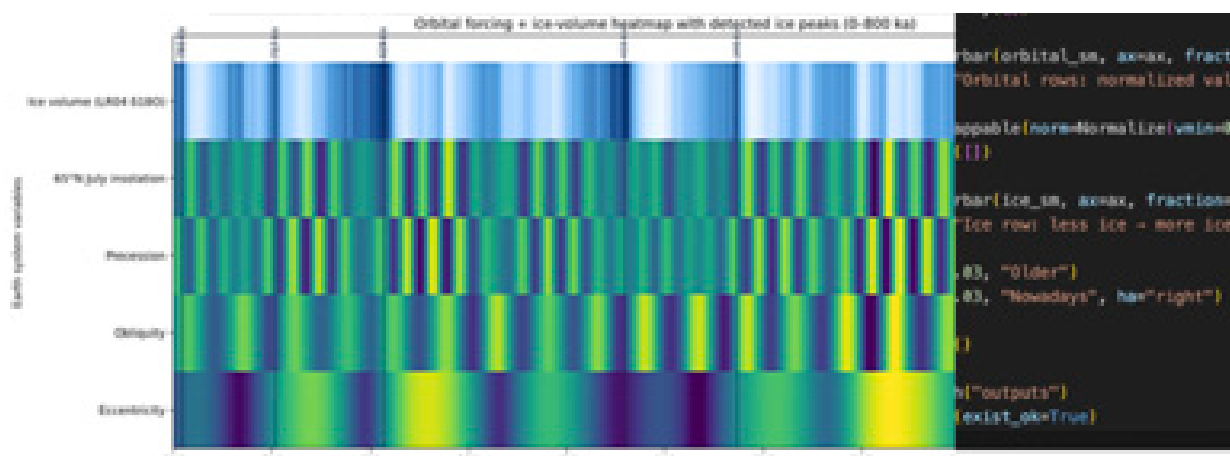


Figure 9. Insolation (dataset). Orbital forcing and ice-volume heatmap with detected ice peaks, 0–800 ka, including the LR04 benthic record and 65°N July insolation.



Figure 10. Insolation (triptych).

Mixed media: oil, dry mist, leaves, copper, and controlled drying, on three panels, 90×30 cm.

Coda

The paintings are the conclusion. They do not resolve the disorientation described here but ask the viewer to stand inside it: to notice their own capacity, to feel where it is tested, and to consider how, unlike diamond or steel, they might choose the way they meet the pressure of being here.

Conflict of Interests and ethics

The author declares no conflict of interest. All insights presented here arise from the author's own research practice, developed over nine years of work in user-experience research, rather than from any external, commercial, or funded interest. The author declares full adherence to the journal's research-ethics policies, namely those involving the participation of human subjects, anonymity, and consent to publish.

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