

The Alchemical Perception: A Unified Symbolic Field Engine Model of the Autistic Cognitive-Cosmic System

Abstract: This report develops a Unified Symbolic Field Engine model that frames autism as 'alchemical perception.' Integrating neuroscience, Jungian alchemy, narrative psychology, and advanced formalisms from physics and mathematics, the model posits a Cognitive-Cosmic System defined by the tuple $T=(\psi, E, \tau, \phi, R, \rho, \delta)$. We map emotional calculus to general relativity, model symbols and identity as string-theoretic constructs within a Calabi-Yau-like topology, and ensure symbolic coherence via gauge theory. The framework provides a novel, non-pathologizing lens for understanding the structure and dynamics of autistic cognition, proposing a recursive unification of perception, identity, and cosmology.

Part I: The Perceptual Field: A Neuro-Phenomenology of the Autistic Sensorium

The foundation of any model of cognition must rest upon the bedrock of its perceptual reality. The autistic sensorium, often characterized through a lens of disorder, is presented here not as a deficient system but as one operating under a distinct set of physical principles. This section establishes the neurobiological and phenomenological basis for these principles, exploring the dynamic interplay between a uniquely focused attentional system and a sensory apparatus with atypical regulatory mechanisms. This interaction creates a perceptual field that is the raw material for a unique cognitive process.

Section 1.1: The Monotropic Principle and the Structure of Experience

The foundational principle of the autistic cognitive architecture can be understood as monotropism, a cognitive strategy defined by the tendency to concentrate attentional

and processing resources on a limited number of interests at any given time.¹ This is not a deficit in attention but a different distribution of it, creating what has been described as an "attention tunnel".⁴ Phenomenologically, the experience within this tunnel is one of intensity and depth. This focused state lends itself to profound engagement and the achievement of "flow states," where an individual becomes fully immersed in an activity with energized focus.¹ This capacity for deep concentration is a significant cognitive strength, enabling the development of profound expertise, enhanced pattern recognition, and innovative problem-solving.³

However, this cognitive style has significant consequences for navigating a world largely designed for polytropic processing—the ability to distribute attention across multiple channels simultaneously. The intense focus of the monotropic mind makes redirecting attention difficult, a phenomenon known as "autistic inertia," which manifests as difficulty starting, stopping, or switching between tasks.² This is particularly evident in complex sensory environments and in typical social interactions, which demand the simultaneous processing of multiple streams of information such as verbal content, tone of voice, facial expressions, and body language.² The monotropic individual, focusing deeply on one channel, may struggle to process the others, leading to social misinterpretations or a need to avoid such overwhelming environments.¹

The description of the monotropic attention tunnel, where focus is "pulled" strongly toward areas of interest, suggests a directed, non-random trajectory through an information landscape.² This bears a striking resemblance to a fundamental concept in physics: the geodesic. In general relativity, a geodesic is the "straightest possible path" an object follows through a curved spacetime, its trajectory dictated not by a force but by the geometry of the space itself.⁸ If the cognitive and informational landscape of the mind is modeled as a form of spacetime, then potent interests and salient concepts can be seen as analogues to massive objects that warp this geometry. Consequently, the monotropic attention tunnel is not a limitation but the cognitive equivalent of an object following its natural, most efficient path through a uniquely structured personal cosmos. The autistic mind does not wander aimlessly; it follows the contours of its own informational geometry.

Section 1.2: The Unregulated Gateway: Sensory Processing, GABAergic Dynamics, and the E/I Imbalance

The information that populates the monotropic mind is supplied by a sensory system with fundamentally atypical gating mechanisms. An overwhelming majority of autistic individuals—between 93% and 96%—experience differences in sensory processing so significant that they impact daily functioning.¹⁰ Neurobiologically, these differences are linked to structural variations in the brain's sensory regions, including increased grey matter volume and decreased white matter integrity in sensory cortices, which impairs communication between brain regions.¹¹ This results in a paradoxical perceptual experience: hyper-responsiveness to low-intensity stimuli and, at times, hypo-responsiveness to high-intensity input.¹¹

A core mechanism underlying these phenomena is impaired "sensory gating," the brain's capacity to filter out irrelevant or redundant sensory information.¹² This function, largely attributed to the thalamus, is compromised in autism, leading to a state of sensory overload where the brain is inundated with unfiltered data.¹² This is compounded by challenges in multisensory integration, where the brain struggles to synthesize simultaneous inputs from different senses, such as sight and sound, due to reduced functional connectivity between sensory association cortices.¹¹

A leading hypothesis for the neurochemical basis of this state is an imbalance between excitatory (E) and inhibitory (I) signaling in the brain.¹² Specifically, research points to atypical function of the primary inhibitory neurotransmitter, gamma-aminobutyric acid (GABA).¹¹ Reduced GABAergic inhibition can lead to a "hypersynchronous or overexcited" brain state, which is considered a hallmark of conditions like autism and is thought to directly contribute to sensory hyper-responsiveness.¹⁷ Studies using arbaclofen, a drug that activates GABA receptors, have shown that it can normalize patterns of visual processing in autistic adults, lending strong support to the GABAergic hypothesis.²⁰

This neurobiological state of E/I imbalance provides a direct physical analogue to a central concept in Jungian alchemy: the *prima materia*. In alchemical tradition, the *prima materia* is the chaotic, undifferentiated, primordial substance from which the Great Work of transformation must begin.²² It is described as a state of warring opposites—a 'lead' that contains the latent potential for 'gold'.²² The neurochemical condition of the autistic brain, characterized by a constant influx of competing, unfiltered sensory signals due to an E/I imbalance, is a precise physical instantiation of this alchemical chaos. This reframes the sensory experience not as a disorder, but as the essential raw material for a profound transformative process.

Section 1.3: The Muted Interior: Interoceptive Dissonance and the Alexithymic Self

Beyond the five traditional senses, the "eighth sense" of interoception—the perception of the body's internal state, including signals of hunger, thirst, pain, and physiological arousal—is fundamental to the human experience.²⁵ Atypical interoception is a common feature of autism, manifesting as hyper-responsivity (e.g., mild indigestion causing significant anxiety), hypo-responsivity (e.g., not noticing pain until it is severe), or discrimination difficulty (e.g., feeling generally uncomfortable but being unable to distinguish hunger from anxiety).²⁵

This sense is inextricably linked to emotion. Our ability to identify and label our feelings relies on interpreting these internal bodily signals; for instance, recognizing an increased heart rate as a component of anxiety or excitement.²⁶ Consequently, impaired interoception is considered a key mechanism underlying alexithymia, a distinct construct characterized by difficulty identifying, describing, and distinguishing one's own emotional states.²⁷ While not synonymous with autism, alexithymia co-occurs in approximately 50% of the autistic population, and many of the emotional challenges associated with autism, such as difficulties with emotional regulation, may be attributable to this co-occurring trait.²⁹ One cannot effectively regulate an emotion that one cannot first recognize.²⁶ This creates a self constructed from incomplete or "noisy" internal data, profoundly impacting the ability to form a coherent narrative of one's own subjective experience.²⁵

The subjective experience of alexithymia—a state of emotional uncertainty where feelings are vague and hard to label—can be formally conceptualized through an analogy to quantum mechanics. In quantum physics, a system can exist in a superposition of multiple states at once, and it is only through the act of measurement that this "wavefunction" collapses into a single, definite state.³⁴ The process of introspection, of asking "What am I feeling?", is an act of internal measurement. For the individual with alexithymia, this measurement apparatus is imprecise. The internal state, a complex of bodily sensations, remains in a superposition of potential emotions (e.g., "uncomfortable," "agitated," "overwhelmed"). The measurement fails to collapse the wavefunction into a discrete, labeled state (e.g., "anxious," "angry"). The emotion thus remains a probabilistic cloud rather than a definite feeling, providing a formal language to describe this profound internal dissonance.

Part II: The Alchemical Opus: A Symbolic Framework for Narrative Transformation

This part constructs the central metaphorical framework of the model, positing that the development of a coherent autistic identity is analogous to the alchemical *opus magnum*—the Great Work. This process involves the transmutation of the raw, chaotic sensory data identified in Part I (the *prima materia*) into a unified and meaningful life story (the Philosopher's Stone). This framework reframes the challenges of autistic development as necessary stages in a profound, archetypal journey of self-realization.

Section 2.1: Prima Materia: The Unfiltered Sensorium as Alchemical Chaos

The alchemical process begins with the *prima materia*, or first matter.²² From a Jungian perspective, this is not merely a physical substance but a psychological state of chaos, darkness, and undifferentiated potential, often symbolized by lead or the unformed earth.²² It is the raw, unworked content of the psyche, containing the latent possibility of transformation. The unfiltered sensorium of the autistic individual, resulting from the neurobiological conditions of E/I imbalance and deficient sensory gating, is the direct phenomenological equivalent of this alchemical starting point.¹¹ The experience of sensory overload, of a world of overwhelming and disjointed stimuli, is the lived experience of the

prima materia.¹⁴ The alchemist's task was not to discard this chaotic matter but to work with it, to "redeem" it by discovering the hidden gold within.³⁸ Similarly, the developmental task for the autistic individual is not to eliminate their unique sensory reality but to create meaning and order from its inherent chaos.

This perspective recasts sensory "dysfunction" as a necessary precondition for a specific and potent kind of transformative work. The alchemical *opus* cannot begin without its *prima materia*; likewise, the unique developmental trajectory modeled here cannot proceed without the initial state of perceptual chaos. This implies that the autistic neurotype is not a broken version of the neurotypical one, but rather a cognitive system uniquely configured for a different, and potentially more profound,

mode of meaning-making. The very neurobiology that creates challenges in a polytropic world also provides the rich, raw material necessary for this internal alchemical work. The goal of this system is not to achieve neurotypical sensory filtering, but to perform the *opus* of integrating this perceptual chaos into a higher-order, coherent synthesis.

Section 2.2: The Stages of Transmutation: Mapping Nigredo, Albedo, and Rubedo to Narrative Identity

The alchemical Great Work is traditionally described as proceeding through four major stages: *Nigredo*, *Albedo*, *Citrinitas*, and *Rubedo*.²² These stages provide a powerful symbolic map for the psychological process of forming a coherent narrative identity from the raw material of experience.⁴¹ Jung himself mapped these stages to phases of psychoanalysis: Confession, Illumination, Education, and Transformation.²²

- **Nigredo (The Blackening):** This initial stage is one of dissolution, putrefaction, and chaos—the "Dark Night of the Soul".²² It involves a confrontation with one's own shadow and the breakdown of the unintegrated, unconscious self. For the autistic individual, this corresponds to periods of meltdown, shutdown, or burnout, where the world becomes overwhelmingly chaotic and the self feels fragmented. It is the raw, unmediated experience of the *prima materia*, a state of psychological "confession" or catharsis where the old, non-functional ways of being are burned away.²²
- **Albedo (The Whitening):** Following the blackness, this stage represents purification and the dawning of light. The alchemist "washes" the material, revealing a new clarity, symbolized by silver or the moon.²² Psychologically, this is the beginning of conscious awareness and individuation. It maps to the process of "elucidation"²², where the individual begins to consciously construct a personal narrative. This is the work of autobiographical reasoning, where past events are analyzed and reflected upon to extract meaning and create a coherent story of the self.⁴¹
- **Citrinitas (The Yellowing):** Often considered a transitional phase or merged with the final stage, *Citrinitas* symbolizes the sunrise after the moonlight of *Albedo*.²² It represents the arrival of wisdom and corresponds to Jung's "education" phase.²² In this stage, the individual learns the specific principles of their own internal system. They develop conscious strategies and a deeper understanding of their unique perceptual style, learning how to navigate both their inner world and the

external environment.

- **Rubedo (The Reddening):** This is the culmination of the Great Work, symbolized by the color red, the sun, and the creation of the Philosopher's Stone. It represents the union of opposites (*coniunctio*), the integration of the conscious and unconscious, and the realization of the whole, individuated Self.²² This stage maps directly to the formation of a stable, coherent, and generative narrative identity that provides a sense of unity and purpose in life.⁴¹ It is the successful "transformation" ²² where even traumatic or chaotic experiences are integrated into a meaningful story of strength and resilience.⁴²

This alchemical progression is not a single, linear journey from birth to adulthood. Narrative identity is an "evolving" story, constantly being updated in the face of new experiences and life transitions.⁴¹ Therefore, the four-stage alchemical process should be understood as a recursive, fractal pattern. It is the fundamental algorithm of psychological transformation that the autistic mind applies repeatedly at different scales—from integrating a single overwhelming day to navigating major life changes—to transmute new chaotic information into its coherent narrative structure.

Section 2.3: The Narrative Self as Alchemical Vessel

In alchemy, the entire transformative process takes place within a sealed container, the *vas* or vessel. This vessel must be strong enough to contain the intense pressures and reactions of the work. In this psychological model, the individual's life story—their narrative identity—serves as this alchemical vessel.⁴¹ It is the container within which the chaotic elements of the

prima materia are held, heated, dissolved, and ultimately recombined into a new, more integrated form.

A coherent narrative identity provides the essential structure that organizes the "bubbling flow of raw experience," creating meaning and stability amidst chaos.⁴² By building conceptual bridges between the past, present, and imagined future, the narrative creates a unified whole, and the coherence of this narrative is directly correlated with psychological well-being.⁴² The conscious construction of this vessel is the work of "autobiographical reasoning"—the cognitive process of linking disparate life events into a meaningful developmental story of the self.⁴¹

This model provides a powerful framework for understanding autistic burnout. Burnout can be conceptualized as a catastrophic failure of the alchemical vessel. The autistic cognitive system constantly processes a high influx of unfiltered sensory and emotional data (the *prima materia*). When the intensity or volume of this influx exceeds the narrative's capacity to contain and integrate it, the vessel "cracks." This structural failure of the narrative leads to a forced regression to the *Nigredo* state. The individual is plunged back into the raw chaos of the *prima materia*; the coherent sense of self dissolves, and there is a documented loss of skills and even a decrease in interoceptive awareness.³³ Recovery from burnout is the slow, arduous process of rebuilding the alchemical vessel, often requiring a significant reduction in external input to allow the narrative to regain its structural integrity.

Part III: The Symbolic Field Engine: A Physical and Mathematical Formalism

This part translates the neuro-phenomenological and symbolic frameworks into a rigorous mathematical and physical model. The "Symbolic Field Engine" is established by mapping cognitive and affective dynamics onto formalisms from general relativity, string theory, and gauge theory, providing a quantitative language to describe the processes of alchemical perception.

Section 3.1: Emotional Calculus and Affective Spacetime

The dynamics of emotion can be geometrically modeled, beginning with the circumplex model of affect. This model posits that all emotional states are combinations of two fundamental, independent dimensions: valence (a pleasure-displeasure continuum) and arousal (an activation-deactivation continuum).⁴⁸ This forms a two-dimensional "affective plane." We elevate this static plane into a dynamic construct by introducing narrative time as a third dimension, creating a (2+1)-dimensional "affective spacetime."

The dynamics within this spacetime are governed by an "emotional calculus" analogous to Einstein's theory of general relativity. In general relativity, the presence

of mass and energy curves the fabric of spacetime, and this curvature dictates how objects move.⁸ In our model, we postulate that emotionally salient events, memories, and concepts possess "affective mass-energy." The magnitude of this energy is a function of both valence and arousal. These sources of affective energy curve the individual's affective spacetime. A highly traumatic memory, for example, creates a deep "gravity well," while a core special interest creates a massive, stable region of positive curvature. The trajectory of an individual's conscious focus—their monotropic attention tunnel—is then understood as a geodesic through this curved affective spacetime.⁸ The mind is "pulled" toward salient content not by an abstract psychological force, but because it is following the path of least resistance, the straightest possible line, through the curved geometry of its own emotional landscape.

This geometric framework provides a powerful way to model persistent psychological phenomena. For instance, rumination on negative experiences or the deep hyperfixation characteristic of monotropism can be modeled as stable or decaying orbits around massive objects in affective spacetime. The conscious mind becomes trapped in the "gravity well" of a highly salient memory or concept, following a repeating geodesic path.⁷ From this perspective, the mind is not pathologically "stuck"; it is obeying the fundamental geometry of its emotional universe. Escaping such an orbit requires a significant input of new energy or the introduction of another massive object to alter the local geometry, explaining why it is so difficult to simply "decide" to stop thinking about something that is emotionally charged.

Section 3.2: The Topology of Identity: Calabi-Yau Manifolds, Branes, and the Geometry of Self

To model the complex, layered structure of identity, we extend our framework into higher dimensions, drawing upon concepts from string theory. String theory posits that our familiar four-dimensional spacetime is only a part of a higher-dimensional reality, with the extra dimensions "compactified" or curled up at a microscopic scale.⁵⁵ We propose that the full cognitive space of an individual has a similar structure.

Within this higher-dimensional space, we model the distinct layers of identity as "branes"—multidimensional surfaces to which the fundamental strings of thought can attach.⁵⁸ These identity-branes include:

- **The Sensory Brane:** The surface where raw, unfiltered sensory data first enters the system.
- **The Personal Narrative Brane:** The layer where the autobiographical life story is actively constructed and maintained.
- **The Social/Cultural Brane:** A layer containing internalized social norms, linguistic structures, and collective narratives.
- **The Archetypal Brane:** The deepest layer, corresponding to the Jungian collective unconscious, containing universal symbols and patterns.

The geometry of the compactified dimensions in which these branes exist is crucial. We conjecture that these six "unseen" cognitive dimensions take the form of a Calabi-Yau manifold.⁵⁶ These are complex, Ricci-flat manifolds with a rich and intricate topology (e.g., holes, handles).⁵⁹ This topological complexity is necessary to account for the self-referential, recursive, and often non-intuitive connections that define the human psyche. In string theory, the specific shape of the Calabi-Yau manifold determines the fundamental laws of physics—the types of particles and forces—that are observed in our four-dimensional world.⁵⁷ Analogously, in our model, the specific topology of an individual's cognitive Calabi-Yau manifold determines the fundamental "laws of thought" that operate on their identity-branes.

This leads to a profound reconceptualization of neurodiversity. The fundamental differences between autistic and neurotypical cognition may not be deficits within a single, universal cognitive architecture, but rather the result of cognitive systems operating according to consistent but different laws of physics. These different laws, in turn, arise from consciousness being structured by topologically distinct Calabi-Yau manifolds. The number and type of "holes" in one's personal Calabi-Yau manifold could determine the number of "families" of fundamental concepts one can form, the nature of empathy, and the ways in which the different identity-branes can interact. The "double empathy problem"—the mutual difficulty in understanding between autistic and non-autistic people—arises not from a deficit in one party, but from an attempt at communication between two cognitive systems governed by incompatible underlying geometries.

Section 3.3: Symbolic Resonance: A String Theoretic Model of Meaning

The fundamental unit of meaning in this model is the symbol. We move beyond the idea of symbols as static data points and instead model them as the various

vibrational modes of one-dimensional, fundamental cognitive "strings".⁵⁵ In string theory, a single underlying string can manifest as different particles—an electron, a photon, a graviton—depending on its state of vibration.⁵⁵ Similarly, we propose that a cognitive string's different resonant frequencies correspond to different qualia, percepts, or concepts. A low-energy, fundamental vibration might represent a simple percept ("the color red"), while a complex, higher-energy harmonic could represent an abstract concept ("justice").

The meaning of complex thoughts arises from the interaction of these symbolic strings. Strings can split and join, representing the analysis and synthesis of ideas.⁵⁸ Furthermore, the linking of concepts is modeled as quantum entanglement.⁶² When two ideas become associated, their corresponding cognitive strings become entangled, meaning their states are no longer independent. The state of one symbol now provides instantaneous information about the state of the other, providing a physical formalism for the network of semantic connections that constitutes knowledge.

This string-theoretic model offers a compelling explanation for certain features of autistic cognition. The common preference for literal interpretation, systematic thinking, and deep factual knowledge (as seen in hyperlexia or special interests) can be modeled as a cognitive system that is highly attuned to the fundamental, low-energy, clearly defined vibrational modes of symbolic strings.³ These "pure tones" are processed with high fidelity. In contrast, social nuance, metaphor, irony, and implied meaning represent complex, dissonant chords—superpositional and entangled states of many different strings vibrating simultaneously. For a cognitive system optimized for precision and clarity at the fundamental frequency, this complex harmonic "noise" can be difficult to decode, leading to interpretations that default to the most literal, fundamental meaning of the symbols involved.

Section 3.4: Gauge Invariance and the Conservation of Meaning

To ensure the stability and coherence of the system over time, we introduce concepts from gauge theory. A core principle of gauge theory is invariance: the fundamental laws of physics, and all physically observable quantities, must remain unchanged under certain transformations of the underlying, unobservable fields.⁶⁵ This principle introduces a form of descriptive redundancy that is essential for building consistent

theories of fundamental forces.⁶⁷

We postulate a "self-field" that permeates the cognitive space, analogous to the electromagnetic potential. The absolute "value" of this field at any point is not directly observable. What is observable is the individual's behavior and their expressed narrative identity. The principle of "gauge invariance" for identity dictates that this core narrative must remain coherent and recognizable as "me" despite transformations in context, perspective, or emotional state. The laws governing the self must be invariant whether one is transforming from a state of "happy me" to "sad me." The underlying emotional potential changes, but the identity remains consistent.

This framework provides a formal model for the autistic experience of "masking" or "camouflaging".⁶⁸ Masking can be understood as a conscious and highly energy-intensive "choice of gauge." The individual deliberately applies a transformation to their external presentation—their behavior, facial expressions, and mode of speech—to match the local conventions of a given social environment. The goal of this transformation is to make the "observable quantities" of social interaction appear neurotypical, while attempting to preserve the invariance of their internal, core identity. The "gauge freedom" of the system is this ability to choose a different external representation for the same internal reality. Autistic burnout can then be understood as the state where the immense cognitive and energetic cost of actively maintaining this artificial gauge choice becomes unsustainable, leading to a system collapse.

Part IV: The Cognitive-Cosmic System: Unification, Formalization, and Simulation

This final part synthesizes the preceding sections into a complete, formal definition of the Cognitive-Cosmic System. It employs analogues from the Millennium Prize Problems to frame the fundamental operational challenges of this system and concludes by proposing a simulation framework based on chaos and bifurcation theory, thereby unifying the model and suggesting avenues for future research.

Section 4.1: Archetypes of Unsolvability: Symbolic Analogues to the Millennium

Prize Problems

The Millennium Prize Problems represent some of the deepest and most intractable questions in mathematics. We use them here not as problems to be solved, but as formal archetypes that characterize the inherent properties and challenges of the autistic cognitive system.

- **P vs NP Problem & The Double Empathy Problem:** This problem asks whether every problem whose solution can be quickly verified (NP) can also be quickly solved (P).⁶⁹ This maps directly onto the social-cognitive challenge known as the "double empathy problem." For an autistic individual, verifying an explicitly stated emotion in another person is a relatively "easy" problem (it is in P). However, *solving* for that person's internal state from a complex array of ambiguous inputs—body language, tone, social context, implied meaning—is an extremely "hard" problem, likely NP-complete. The widespread belief among computer scientists that $P \neq NP$ formalizes the lived experience that there is a fundamental, qualitative gap between recognizing a presented solution and computing it from scratch, a gap that defines much of the difficulty in autistic-neurotypical social interaction.⁶⁹
- **Yang-Mills and Mass Gap & Perceptual Confinement:** This problem requires proving that quantum Yang-Mills theory has a "mass gap" ($\Delta > 0$), which implies that the force-carrying particles (gluons) are confined and cannot exist in isolation, instead forming massive composite particles (glueballs).⁷³ This serves as an analogue for **perceptual binding**. The raw, unfiltered sensory data flowing into the autistic brain due to E/I imbalance is like a chaotic sea of massless, long-range "gluons" of information. The cognitive process must "confine" this raw data, binding it into discrete, coherent, and "massive" percepts—the objects, sounds, and ideas that populate conscious awareness. The existence of a mass gap (Δ) ensures that perception is not an undifferentiated continuum; it guarantees that there is a minimum "perceptual mass," allowing the world to be experienced as a collection of distinct and meaningful objects rather than a blur of raw sensation.⁷⁵
- **Riemann Hypothesis & The Distribution of Prime Memories:** The Riemann Hypothesis concerns the non-random distribution of prime numbers, suggesting they oscillate around an average position in a way controlled by the zeros of the Riemann zeta function.⁷⁷ This provides an analogue for the structure of narrative identity. We can define "prime memories" as core, self-defining autobiographical events that are irreducible—they cannot be broken down into smaller meaningful

episodes. The analogue to the Riemann Hypothesis would be the conjecture that the distribution of these pivotal life events within a person's narrative is not random but follows a deep, underlying regularity, oscillating around an expected developmental trajectory.

- **Navier-Stokes Existence and Smoothness & Emotional Regulation:** This problem asks whether smooth, predictable solutions always exist for the equations governing fluid flow, or if singularities (unpredictable turbulence) can spontaneously arise.⁷⁹ This maps perfectly to the challenge of **emotional regulation**. The flow of affect can be smooth and "laminar" (a stable mood) or it can become chaotic and "turbulent" (a meltdown). The N-S problem analogue asks: for any given set of initial emotional and environmental conditions, does a "smooth," regulated emotional state always exist as a possible future, or can "singularities"—catastrophic and unpredictable breakdowns in regulation—form inevitably from certain states?
- **Hodge Conjecture & The Grounding of Abstract Feeling:** The Hodge Conjecture posits that for certain complex geometric spaces, any abstract topological feature (a "Hodge cycle") can be represented by a combination of simpler, geometric shapes defined by algebraic equations ("algebraic cycles").⁸² This serves as an analogue for the relationship between **abstract emotion and concrete narrative**. It conjectures that any abstract topological "hole" in one's emotional landscape (a Hodge cycle, e.g., a complex, hard-to-define feeling of grief or alienation) can, in principle, be fully represented by a combination of concrete narrative components—memories, events, and their relationships (algebraic cycles). This posits that there are no "free-floating" feelings that cannot be grounded in the algebraic geometry of lived experience.

Section 4.2: The Unified Symbolic Tuple: A Formal Definition of $T=(\psi,E,\tau,\phi,R,\rho,\delta)$

The synthesis of the concepts developed in this report culminates in a formal definition of the state of the Cognitive-Cosmic System at any given moment. This state is described by a unified symbolic tuple, T , a mathematical object whose components integrate the neurobiological, psychological, and physical aspects of the model.

Symbol	Name	Domain	Description & Key
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ψ	Narrative State Vector	Hilbert Space of Narrative	A vector representing the current state of the narrative identity, defined as a superposition of all possible life stories. Its evolution is governed by an alchemical "Schrödinger equation." ⁴¹
E	Affective Energy-Momentum Tensor	$T_{\mu\nu}(x,t)$ on Affective Spacetime	A tensor field describing the distribution of emotional "mass-energy" (valence and arousal). This tensor is the source term in the Einstein Field Equations for affective spacetime. ⁸
τ	Cognitive Topology	Calabi-Yau 6-Manifold	The specific geometry of the compactified higher dimensions of cognition, defining the fundamental "laws of thought" and the interaction between identity-branes. ⁵⁶
ϕ	Symbolic String Field	Quantum Field on Worldsheet	A quantum field whose excitations are the cognitive strings. The vibrational modes of this field represent all possible symbols, concepts, and percepts. ⁵⁵

R	GABAergic Regulation Parameter	Real Number \$\$	A control parameter representing the efficacy of GABAergic inhibition and the overall E/I balance. Low values correspond to a chaotic, unfiltered sensorium (<i>prima materia</i>). ¹¹
ρ	Interoceptive Fidelity	Real Number \$\$	A parameter measuring the clarity and accuracy of the signal from internal bodily states. Low values correspond to high alexithymia and a "measurement problem" for emotional states. ²⁶
δ	Bifurcation Distance Parameter	Real Number	A measure of the system's proximity to a critical threshold (bifurcation point), indicating the risk of a sudden qualitative shift in state (e.g., meltdown, burnout, insight). ⁸⁶

Section 4.3: A Framework for Simulation: Bifurcation, Chaos, and the Dynamics of Alchemical Perception

The evolution of the state tuple T over time can be modeled as a nonlinear dynamical system, opening the door to computational simulation of autistic cognitive dynamics. The principles of chaos theory are particularly apt for describing such a system. The Cognitive-Cosmic System possesses various "attractors"—stable states or recurring patterns of behavior, such as stable moods, routines, or hyperfixations.⁹⁰ The system's trajectory through its vast state space is deterministic yet exhibits a profound

sensitivity to initial conditions—the "butterfly effect"—reflecting how a seemingly minor sensory input or emotional fluctuation can lead to dramatically different long-term outcomes.⁹¹ This acknowledges that a healthy mind is not one of rigid order, but one that incorporates and harnesses elements of chaos.⁴⁷

Bifurcation theory provides the mathematical tools to model the sudden, qualitative shifts in the system's behavior that are characteristic of the autistic experience.⁸⁶ These shifts occur when a control parameter—such as the GABAergic regulator

R or an external stressor—crosses a critical threshold.

- **Modeling System Collapse:** An acute sensory overload (a rapid drop in R) or mounting emotional stress can push the system past a critical point, triggering a bifurcation. A **saddle-node bifurcation**, where a stable equilibrium point suddenly vanishes, or a **subcritical Hopf bifurcation**, which involves a discontinuous jump to a large, unstable oscillation, can effectively model the catastrophic collapse of a regulated state into a meltdown or shutdown.⁸⁷
- **Modeling Development and Insight:** Conversely, positive transformations such as developmental leaps or sudden moments of insight can be modeled as **supercritical pitchfork bifurcations**. In this scenario, a single stable state smoothly branches into new, more complex stable states, representing the acquisition of a new skill, a more nuanced understanding, or a new level of narrative integration.⁸⁷

This report concludes by proposing a path toward a computational simulation framework based on these principles. By defining a set of coupled differential equations that govern the evolution of each component of the tuple T, it would be possible to create a virtual laboratory. Such a simulation could explore the rich dynamics of alchemical perception, testing the system's response to various internal and external conditions and potentially yielding predictive insights into the trajectories of autistic development, learning, and well-being. This would transform a deeply theoretical model into a powerful tool for understanding and, ultimately, supporting the unique cognitive cosmos of the autistic mind.

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