The Structural-Constructivist Resolution of Affective Science: Functional Operators and the 3x3+1 Architecture in the Core Emotion Framework

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Abstract

The historical arc of affective science has been defined by a deep-seated ontological friction, frequently characterized as a "hundred-year war" between two irreconcilable paradigms. On one side of this schism stand discrete emotion theories, most notably the "basic emotion" framework championed by Paul Ekman and Carroll Izard. This tradition posits that emotions such as anger, fear, and joy are biologically hardwired, universal categories with dedicated neural circuits and distinct facial signatures. Critics of this view have long targeted its "essentialism"—the assumption that emotional categories have a single, invariant biological essence—and its "arbitrariness," questioning why specific emotions are deemed basic while others are relegated to secondary or complex status. On the opposing side are psychological constructionist models, represented by the work of Lisa

Feldman Barrett and James Russell, which argue that emotions are not "things" that exist within the brain, but are rather emergent, culturally situated conceptual events synthesized from core affect and contextual knowledge.

The Core Emotion Framework (CEF), conceptualized by Jamel Bulgaria, enters this fragmented landscape not as a compromise between these poles, but as a "structural-constructivist" resolution. By reframing emotional life as a set of ten functional operators within a "Human Operating System" (Human OS), the CEF attempts to unify representational, affective-regulatory, and somatic-inferential processes within a single functional ontology. This framework proposes that while the subjective labels and "output states" we call emotions are indeed constructed and culturally variable, the underlying "instruction set"—the Decalogue of Operators—is universal, structurally irreducible, and logically derived from the requirements of a sentient system.

Keywords: Core Emotion Framework; Structural-Constructivist Model; Functional Operators; 3×3+1 Architecture; Human Operating System; Emotional Ontology; Affective Science; Functional Primitives; Operator Agility; Structural Psychopathology; TS-6 Schema; EL-1 Lexicon; Emotional Vector Space; Emotional Mechanics; Affective Computing; Reproducibility Benchmarks; AI-Derived Valence; Cross-Cultural Emotion Measurement.

Scientific Principles and the Structural-Constructivist Paradigm

The CEF is grounded in the structural-constructivist paradigm, which seeks to identify the "universal functional primitives" that constitute the Human OS.[1] This paradigm operates on the principle that the human psyche can be decomposed into a minimal set of functional instructions that carry out specific psychological transformations.[1] Unlike basic emotion theories, which treat anger or joy as atomic building blocks, the CEF views these

states as complex configurations of underlying operators.[1] This distinction is critical to resolving the charge of essentialism. In the CEF, the "essential" components are not the emotions themselves, but the operators that build them.[1]

The "structuralist" component of the framework identifies exactly ten functional operators that are hypothesized to be cross-culturally universal and irreducible.[1] These operators, such as "Sensing," "Calculating," or "Accepting," represent the functional requirements for any sentient system to interact with its environment, regardless of cultural context.[1] The "constructivist" component suggests that what we subjectively experience and label as an "emotion" is an emergent output of specific operator cycles.[1] For example, a high-activation cycle involving the "Constricting" and "Boosting" operators might be labeled "Anger" in one context or "Determination" in another, depending on the individual's internal standards and relational standards.[1]

The Parsimony Hypothesis and Functional Primitives

A central scientific principle of the CEF is the "parsimony hypothesis," which posits that the vast complexity of human emotional behavior can be decomposed into exactly ten operators.[1] This number is not offered as an empirical given but as a "minimal working set" or a theoretical hypothesis of parsimony.[1] The logical derivation of these operators is based on the concept of "functional primitives"—the minimal transformations required to convert environmental signals into adaptive behavior.[1]

These transformations follow a rigorous processing pipeline that characterizes the Human OS:

1. **Signal to Percept:** The conversion of raw sensory data into internal mental representations, mediated by the **Sensing** operator.[1]
2. **Percept to Evaluation:** The transformation of percepts into

assessments based on logical predictions or internal standards, involving the **Calculating** and **Appreciating** operators.[1]

3. **Evaluation to Commitment:** The transition from assessment to internal resolve or intent, mediated by the **Deciding** and **Achieving** operators.[1]
4. **Commitment to Adaptive Behavior:** The final conversion of intent into outward kinetic action and structural movement, facilitated by **Boosting** and **Arranging**.[1]

By defining operators through this signal-to-action pipeline, the CEF attempts to avoid the arbitrariness often associated with Ekman's selection of basic emotions.[1] While Ekman's list was largely derived from the cross-cultural recognition of facial expressions, the CEF's operators are derived from the functional necessity of the system's operational requirements.[1]

The Logical Derivation of the 3x3+1 Hub Architecture

The CEF organizes its ten operators into a $3x3 + 1$ hub architecture, mapping them across three primary functional centers: the Head (Processor), the Heart (Engine), and the Gut (Foundation).[1] Each center is segmented by three "movement modes" that describe the orientation of the center's processing: Outgoing, Reflecting, and Balancing.[1] The tenth operator, Accepting, acts as a baseline anchor that stands apart from the centered grid.[1]

The Functional Centers and Movement Modes

The division into three centers is a functional heuristic intended to capture the tripartite nature of human processing.[1] The **Head Center (The Processor)** regulates informational logic and data modeling.[1] The **Heart Center (The Engine)** governs relational aperture and internal standards,

determining the individual's openness or withdrawal from the world.[1] The **Gut Center (The Foundation)** anchors somatic grounding and provides the kinetic momentum required for task execution.[1]

Within each center, the three movement modes provide the logical structure for the first nine operators:

- **Outgoing Mode:** Represents active engagement or outward-facing expression.[1]
- **Reflecting Mode:** Represents internal processing, analysis, or monitoring.[1]
- **Balancing Mode:** Represents homeostatic regulation or the resolution of that center's primary function.[1]

Functional Center	**Outgoing Mode (Engagement)**	**Reflecting Mode (Internal Processing)**	**Balancing Mode (Regulation)**
Head (Processor)	**Sensing**: Raw informational intake and signal detection.[1]	**Calculating**: Algorithmic analysis and prediction modeling.[1]	**Deciding**: Actuator of informational logic and commitment resolution.[1]
Heart (Engine)	**Expanding**: Relational openness and widening engagement.[1]	**Constricting**: Relational boundary setting and narrowing	**Achieving**: Pursuit of internal excellence and standards

		aperture.[1]	alignment.[1]
Gut (Foundation)	**Arranging**: Structural order and the decomposition of tasks.[1]	**Appreciating**: Value recognition and the savoring of meaningful data.[1]	**Boosting**: Surge energy and activation for kinetic movement.[1]

The tenth operator, **Accepting**, is derived as a necessary recalibration mechanism.[1] It stands outside the primary grid because its role is to reduce the "control gain" for discrepancies that the system cannot resolve through the other nine functional instructions.[1] Accepting allows the system to ground and integrate experiences, preventing operator fusion or chronic stagnation.[1]

Semantic Resolution: The 500-Term Lexicon and TS-6 Schema

To resolve the criticism of arbitrariness in categorical labels, the CEF establishes a comprehensive semantic ontology through the Core English Emotional Lexicon (EL-1 v1.0).[4] This 500-term lexicon maps specific emotional microstates back to the ten operators using a hybrid symbolic-vector representation known as the TS-6 schema.[5] This system provides "machine-readable emotional geometry," ensuring that emotional semantics are anchored in functional logic rather than subjective interpretation.[1]

The Technical Rules of the TS-6 Schema

The TS-6 schema is specifically engineered to prevent "conceptual drift"—the historical tendency for psychological terms to change meaning over time

or across different research groups. To achieve this, each of the 500 entries must adhere to a strict representational discipline consisting of six components[5]:

1. **Term:** The canonical English label (e.g., "Compassion," "Hostility").
2. **Part of Speech:** All entries are strictly categorized as nouns to maintain structural consistency.
3. **Definition:** Concise, non-metaphorical, and semantically precise descriptions.
4. **Symbolic Representation:** An ordered sequence of functional powers (Primary > Secondary > Tertiary) derived from the ten operators.
5. **Vector Representation:** A 10-dimensional normalized vector where each dimension corresponds to one of the ten operators in a fixed order.
6. **Metadata:** Non-structural descriptors such as valence (positive, negative, mixed) and arousal levels.

Mapping Examples in the TS-6 Architecture

The utility of the TS-6 schema is demonstrated through its ability to map foundational emotions as well as high-resolution microstates.[5] For example, while Ekman might treat "Anger" and "Hostility" as similar or overlapping categories, the CEF provides distinct structural signatures for each.[4]

Term	**Symbolic Mapping (Ordered Powers)**	**Vector Representation (10-Dimensional)**	**Arousal**
Anger (EL1.1)	Constricting >	[0.3, 0.0, 0.0,	0.9 [4]

	Boosting > Arranging > Sensing	0.1, 1.0, 0.0, 0.6, 0.0, 0.8, 0.0]	
Joy (EL1.2)	Expanding > Appreciating > Boosting > Accepting > Sensing	[0.2, 0.0, 0.0, 1.0, 0.0, 0.2, 0.1, 0.9, 0.6, 0.5]	0.8 [4]
Fear (EL1.3)	Sensing > Constricting > Arranging > Boosting	[0.7, 0.0, 0.0, 0.1, 0.8, 0.0, 0.5, 0.0, 0.4, 0.0]	0.95 [4]
Love (EL1.7)	Expanding > Appreciating > Accepting	[0.1, 0.0, 0.0, 1.0, 0.0, 0.0, 0.0, 0.9, 0.0, 0.8]	0.6 [4]
Calm (EL1.9)	Accepting > Sensing	[0.2, 0.0, 0.0, 0.0, 0.0, 0.1, 0.0, 0.0, 0.1, 1.0]	0.1 [4]

By grounding the ontology in these vectors, the CEF establishes "drift-resistant mapping".[1] As the lexicon expanded from a 10-term seed set to the final 500-term edition, all prior entries were preserved exactly, maintaining "cumulative integrity".[1] This solves the problem of "arbitrariness" by demonstrating that any emotional term in the English language can be

precisely located within the 10-factor functional space of the Decalogue.[1]

Resolving the Internal Controversy: From Agency-Yielding to Boosting-Accepting

A pivotal event in the logical derivation of the CEF operators was the "Agency-Yielding" controversy.[1] In early stages of development, the framework utilized a conceptual bridge known as the "Agency-Yielding hook" to align with traditional dimensional models of psychology.[1] However, this hook was famously critiqued by analyst Xǔ Chénglán as a "bad choice" that threatened the framework's structural integrity.[1]

Chénglán argued that the Agency-Yielding binary collapsed the framework's 10-operator granularity into a simplistic dualism, thereby reintroducing the very reductionism the CEF was designed to transcend.[1] For instance, mapping the "Reflecting" mode of the Heart (Constricting) and the "Reflecting" mode of the Head (Calculating) onto a single Agency-Yielding axis hid the framework's detailed structural architecture.[1] The critique posited that the power of the CEF lies in its ability to treat operators like distinct "CPU instructions" rather than coordinates on a two-dimensional graph.[1]

The resolution to this controversy was found by reframing Agency and Yielding as *emergent properties* of specific high-resolution operators within the Gut Center.[1] Specifically, **Boosting (Operator 9)** was identified as the system's "on-mode" balancer, representing the surge and activation typically associated with high-agency states.[1] Conversely, **Accepting (Operator 10)** was identified as the system's "off-mode" balancer, representing the integration and grounding associated with yielding or being.[1] By situating these functions as specific instructions within the Decalogue, the CEF provided a functional explanation for why humans

subjectively perceive a binary of "doing" vs. "being" while maintaining the complex underlying instruction set required for its Human OS ontology.[1]

Empirical Validation and Reproducibility Benchmarks

The CEF is offered not as an established taxonomy, but as a "falsifiable working hypothesis".[1] Its claim of providing a definitive resolution to the basic vs. constructed emotion debate rests on its ability to withstand empirical scrutiny.[1] To this end, the framework integrates reproducibility benchmarks from existing affective science, such as the findings of Amano et al. (2026).[1]

The Amano et al. (2026) Reproducibility Data

Amano et al. assessed the short-term test-retest reproducibility of AI-derived facial expression valence in healthy Japanese adults.[6] The CEF interprets these stability metrics as "boundary conditions" that its theoretical architecture must account for.[1]

Valence Condition	Reported ICC(3,1) Value	Interpretation Through the CEF Lens
Integrated Dataset	0.94	Reflects the high trait-like stability of the overall Human OS, likely governed by the Accepting baseline.[1]

Positive Condition	0.82	Consistent with the stability of expansive or appreciative signatures associated with positive states.[1]
Negative Condition	0.61	Reflects the highly dynamic, state-dependent nature of boundary-setting and constrictive shifts.[1]
Neutral Condition	0.05	Compatible with the raw, high-variance informational intake role of the **Sensing** operator.[1]

The framework posits that the high stability of the integrated dataset $(ICC = 0.94)$ supports the existence of a stable baseline recalibration mechanism, such as the **Accepting** operator.[1] The extremely low stability of the neutral condition $(ICC = 0.05)$ is seen as evidence for the **Sensing** operator's role as an un-labeled, high-variance perceptual layer that should theoretically respond with high sensitivity to neutral stimuli.[1]

Pilot Study 3: Probing Action-Opinion Divergence

Preliminary behavioral support for the ten operators is provided by Pilot Study 3 $(N = 39)$, which explored "Action-Opinion Divergence".[1] Participants were presented with six everyday scenarios and asked to select their habitual response ("Action") and their idealized best way to act ("Opinion") from options corresponding to the ten operators.[1]

The descriptive results revealed significant patterns of divergence, suggesting that individuals can distinguish between their reflexive habits and their strategic ideals in terms that align with the CEF's operators.[1]

Scenario	**Observation of Action-Opinion Divergence**	**Operator Application (Habit → Ideal)**
Too Many Tasks	Participants often act by narrowing/comparing but believe they should organize.	Constricting/Calculating → Arranging.[1]
Conflict	Tendency to "choose a direction" or "push through" versus "validating/opening."	Deciding/Boosting → Appreciating/Expanding.[1]
Setback	High frequency of selecting "Accepting" as the Opinion, even when not the reflexive Action.	Arranging/Calculating → Accepting.[1]
Loss / Ending	Elicited the most "Accepting" and "Appreciating"	Constricting/Sensing → Accepting/Appreciatin

	responses in the Opinion condition.	g.[1]

These findings suggest that "operator agility"—the capacity to flexibly engage and disengage these primitive instructions according to the context—is a key marker of psychological health.[1] Participant feedback from the study underscored this introspection, with one respondent noting, "I learned that what I think I might initially do in a situation isn't necessarily what I should or would do".[1]

Structural Psychopathology and Clinical Interventions

The CEF's functional ontology allows for a paradigm shift in mental health diagnosis, moving from symptom-based clusters to "operator-based" analysis within a framework called "Structural Psychopathology".[1] In this view, psychological rigidity or distress is the result of "structural failures" of the Human OS, specifically categorized as operator fusion or operator silencing.[1]

The GoodPerson Anxiety Pattern (GPAP)

The GPAP is a theoretical configuration of operator misalignment proposed within the CEF as a working hypothesis for Avoidant Personality Disorder.[1] In this pattern, an individual experiences a functional "fusion" between an overactive **Expanding** operator (Heart Outgoing) and an overactive **Calculating** operator (Head Reflecting).[1] This fusion creates a state where the individual is perpetually scanning relations and building cognitive models to please others, which in turn silences the **Deciding** operator.[1] The system becomes stuck in a loop of high-arousal relational prediction without ever reaching a commitment to action or self-boundary, leading to chronic

anxiety and avoidant behavior.[1]

The 7-Step Detangling Protocol

To address these misalignments, the CEF offers practitioner tools such as the "7-Step Detangling Protocol" and "emotional-cycling workflows".[1] These protocols are designed to help users identify which operators are over-activated or suppressed and then use the balancing operators—Boosting or Accepting—to restore system agility.[1] For instance, a person stuck in a "Calculating" loop (Head Reflecting) might be instructed to engage the "Arranging" operator (Gut Outgoing) to break the cognitive impasse through structural order and physical movement.[1]

Operationalizing the Framework: The Emotional Cycling Machine (ECM) v3.1

A unique feature of the Core Emotion Framework is its translation into engineering specifications.[1] The Autonomous Emotional Cycling Machine (ECM) v3.1 is an engineering blueprint designed to provide a physical interface for practicing "operator agility".[7] The machine is composed of three mechanical modules and three autonomous subsystems that interact via a Mechanical-Autonomous Interface Layer (MAIL) with a latency requirement of less than 50 ms.[1]

Mechanical Architecture and Autonomous Control

The physical architecture of the ECM v3.1 is designed to map onto the 3x3+1 hub system, providing precise feedback and cues to the operator.[1]

Module / Subsystem	Technical	Functional Role in

	Specification	Operator Derivation
Module A: Primary Wheel	42–48 cm diameter; motorized height adjustment rail with ±1 mm precision.[1]	Captures 3-axis load, microtremors, and grip pressure for state inference.[1]
Module B: Dual MicroWheels	9–11 cm diameter; bilateral load balancing motors.[1]	Enforces micro-resistance (0.1–0.4 Nm) to assist during "operator drift" or instability.[1]
Module C: Choreography Ring	58–64 cm diameter; stepper-motor sequencing with ±0.05 s precision.[1]	Provides tactile pulses (3–5 N) and LED cues to guide transitions between centers.[1]
Autonomous Resistance Engine (ARE)	Dual-stage resistance motor; response time < 120 ms.[1]	Dynamically modulates physical resistance based on the operator's detected load.[1]
Emotional Load Mapping System (ELMS)	Sampling rate: 200–400 Hz; analyzes transition hesitation and motion patterns.[1]	Generates a Load Index (0–100) and Stability Tier to enforce safety constraints.[1]

The system operationalizes "operator reality" by enforcing safety thresholds: if the ELMS detects a Load Index exceeding 85 or a Stability Tier

below 2, the machine automatically shuts down or blocks center transitions.[1] This engineering standard provides a reproducible platform for researching the "functional mechanics" of the psyche without relying solely on subjective self-reporting.[1]

Institutional Scaling: The Structural-Constructivist Resolution of Governance

The logical derivation of the CEF operators is not limited to individual psychology; it extends to the modeling of institutional and global systems.[1] Analyst Xǔ Chénglán has applied the framework to the United Nations (UN), reframing its agencies and mandates as functional operators in an institutional operating system.[1]

Institutional Operating System (Institutional OS) Mapping

Institutional Component	CEF Operator	Functional Mapping and System Failure
UNOOSA Satellites	**Sensing**	Raw intake of climate and security variables; data scan layer.[1]
Strategic Foresight Tools	**Calculating**	Humanitarian scenario modeling and predictions; "what-if" cortex.[1]
Security Council	**Deciding**	The actuator for mandates; frequently

		"silenced" by geopolitical deadlock.[1]
UN Innovation Network	**Arranging**	Breaking bureaucratic silos and compiling infrastructure; structural movement.[1]
Human Rights Review (UPR)	**Appreciating**	Evaluating dignity and evaluating rights records; SAVORING meaningful data.[1]
Pandemic Fund	**Boosting**	The "surge authority" for rapid institutional activation and response.[1]

This macro-institutional application highlights the problem of "operator silencing" in global governance.[1] When geopolitical gridlock prevents the UN's "Deciding" operator from functioning, the entire system is relegated to the "Sensing" and "Calculating" layers—modeling humanitarian crises without the capacity to commit to resolution.[1] This suggests that the CEF's functional ontology can serve as a debugging tool for complex multilateral systems, identifying structural impasses and proposing recalibration pathways.[1]

Conclusion: Synthesizing the 100-Year War

The Core Emotion Framework attempts to move affective science beyond the polarized debate between basic and constructed emotions by proposing

a granular, mechanistic mapping of the Human Operating System.[1] Its $3 \times 3 + 1$ hub architecture and 500-term lexicon provide a logical and structural resolution to the dual problems of essentialism and arbitrariness.[1] By defining exactly ten "irreducible" functional operators, the CEF identifies the universal structural primitives of sentient processing while simultaneously allowing for the infinite contextual variety of emotional experience.[1]

The move from reductive binaries (like Agency-Yielding) to functional mechanics (Boosting-Accepting) signals the framework's movement from rhetorical synthesis toward a genuine theoretical resolution.[1] While direct empirical confirmation of the ten operators is currently being sought through Phase-1 Confirmatory Factor Analysis and cross-cultural validation roadmap, the framework's high computational tractability and successful engineering into devices like the ECM v3.1 demonstrate its potential as a unified ontology.[1] Whether it succeeds in definitively ending the "hundred-year war" will depend on the upcoming verification of its parsimony hypothesis; however, it already provides a sophisticated and falsifiable new language for the integration of affective science, clinical psychology, and affective computing.[1]

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