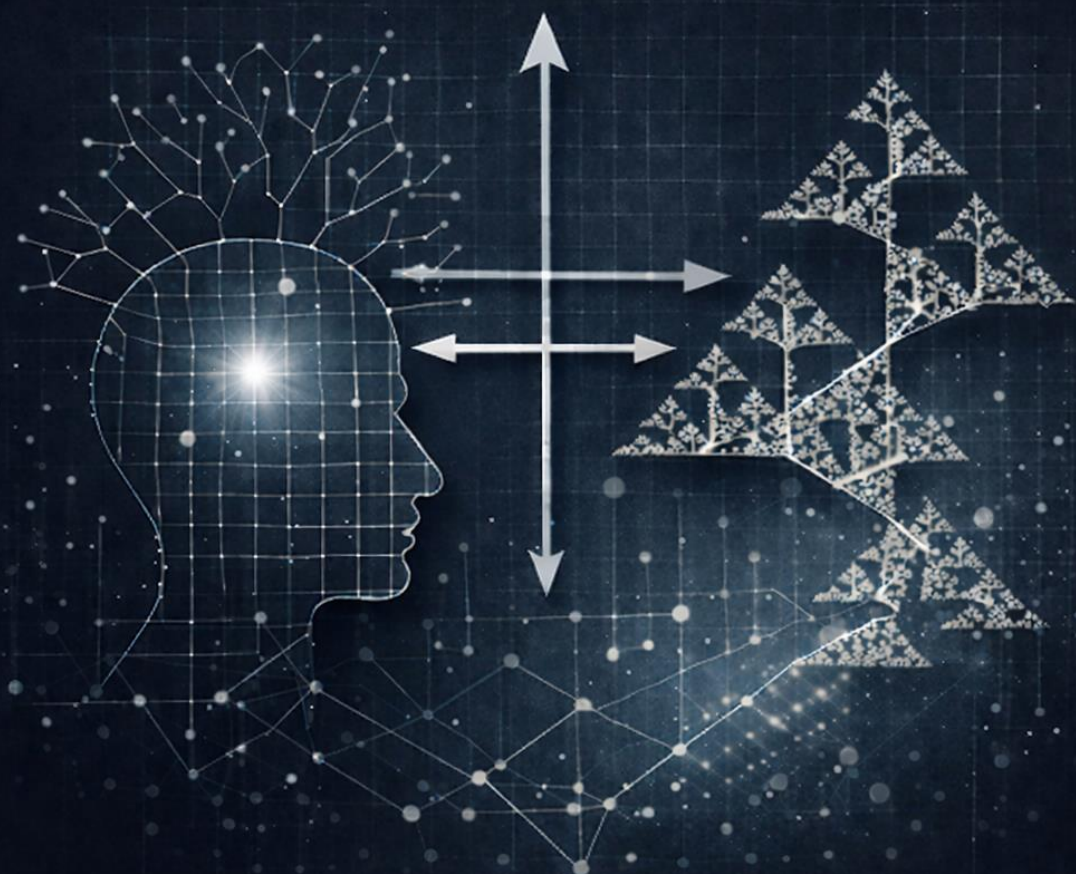


HUMAN BEHAVIORAL PATTERNS

Fractal Models of Individual and Social Behavior

ANNOTATED BIBLIOGRAPHY



Tracy C. Coyle

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Supporting Referents and Grounding
for the Manuscript

Tracy C. Coyle

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Preface

This annotated bibliography accompanies *Human Behavioral Patterns: Fractal Models of Individual and Social Behavior*. The manuscript advances a structural argument: that recurrent features of human social organization arise from developmental patterns operating within embodied individuals and that these patterns scale outward—from dyadic interaction to large social systems—because the same organism remains the unit of action at every level.

The present document serves a different purpose. Rather than extending the argument, it provides the theoretical and empirical grounding for the claims made in the manuscript. Each entry identifies a work drawn from relevant disciplines—including evolutionary biology, developmental psychology, social psychology, anthropology, and behavioral science—and summarizes the conceptual contribution for which it is cited. The annotations also indicate how that contribution supports a specific claim within the framework.

The bibliography is organized by claim. Within each section, selected works are briefly described and their relevance to the claim is identified. An integrative note then summarizes how the cited literature converges in supporting the proposition under discussion. The intent is not to offer an exhaustive review of the literature, but to show that each element of the framework rests on established lines of inquiry.

This document may therefore be read in two ways. It can serve as a reference companion while reading the manuscript, allowing readers to examine the grounding behind individual claims. Alternatively, it may be read independently as a

structured map of the theoretical traditions that inform the framework.

Together, the manuscript and this annotated bibliography form a paired set: the first presents the model; the second documents the intellectual foundations on which that model rests.

Section 1 — Biological Substrate And Developmental Tuning

CLAIM 1

“They emerge from organisms shaped by sexual reproduction, and by the asymmetric biological roles that reproduction entails.”

Robert Trivers (1972)

Trivers, R. (1972). *Parental Investment and Sexual Selection*.

Theoretical contribution:

Trivers formalized parental investment theory, demonstrating that reproductive asymmetry between sexes generates predictable differences in mating strategy, risk tolerance, competition, and behavioral organization. Because reproduction imposes unequal biological costs, selection pressures act differently on males and females across evolutionary time.

Relevance to claim:

This work establishes the foundational principle that behavioral tendencies emerge from reproductive structure rather than social prescription. The claim’s assertion of asymmetric biological roles directly descends from Trivers’ model of differential reproductive investment.

John Maynard Smith (1978)

Maynard Smith, J. (1978). *The Evolution of Sex*.

Theoretical contribution:

Maynard Smith analyzed why sexual reproduction evolved and persisted despite substantial biological cost. His work demonstrates that sex differentiation is not incidental but structurally embedded in evolutionary strategy, shaping organismal development and population dynamics.

Relevance to claim:

Provides evolutionary grounding for the existence of sexually differentiated organisms themselves. The claim's reference to organisms "shaped by sexual reproduction" relies on this demonstration that sex is an adaptive organizing principle rather than a superficial biological distinction.

David C. Geary (1998)

Geary, D. (1998). *Male, Female: The Evolution of Human Sex Differences*.

Theoretical contribution:

Geary integrates evolutionary biology, developmental psychology, and comparative evidence to show how reproductive asymmetry produces sex-differentiated developmental trajectories affecting cognition, motivation, social behavior, and life-history strategy.

Relevance to claim:

Extends evolutionary asymmetry into human developmental outcomes. Supports the transition from reproductive structure → organismal development → behavioral tendency implied by the

claim

Integrative Note:

No single referent states this claim verbatim.

The claim synthesizes established evolutionary theory demonstrating that sexual reproduction and asymmetric reproductive roles constitute the primary biological conditions from which sex-differentiated development emerges.

CLAIM 2

“Evolution does not merely produce bodies suited to these functions—it produces developmental systems tuned to support them.”

Phoenix, C., Goy, R., Gerall, A., & Young, W. (1959)

Phoenix, C. et al. (1959). *Organizing action of prenatally administered testosterone propionate on the tissues mediating mating behavior in the female guinea pig.*

Theoretical contribution:

Phoenix and colleagues established the organizational–activational hypothesis, demonstrating that prenatal hormonal exposure permanently organizes neural systems that later regulate behavior. Hormones do not simply activate preexisting capacities; they shape developmental architecture itself.

Relevance to claim:

Provides the foundational empirical demonstration that evolution acts through developmental organization, not merely

anatomical form. The claim's assertion that evolution produces *tuned developmental systems* directly follows from organizational effects occurring prior to behavioral expression.

Melissa Hines (2004)

Hines, M. (2004). *Brain Gender*.

Theoretical contribution:

Hines synthesizes experimental, clinical, and developmental evidence showing that prenatal androgen exposure systematically influences later patterns of play behavior, spatial preference, aggression, social orientation, and interest formation.

Relevance to claim:

Extends organizational theory into human development, demonstrating that evolutionary pressures operate through endocrine-mediated developmental pathways rather than through morphology alone.

McCarthy, M. M., & Arnold, A. P. (2011)

McCarthy, M. & Arnold, A. (2011). *Reframing sexual differentiation of the brain*.

Theoretical contribution:

This work reconceptualizes sexual differentiation as an active developmental process involving hormonal signaling, gene expression, neural plasticity, and environmental interaction across developmental time.

Relevance to claim:

Supports the claim that evolution produces integrated developmental systems rather than fixed sex-specific structures, reinforcing the idea of tuning occurring through coordinated biological development.

Integrative Note:

No single referent states the claim directly.

Together, these works establish that evolutionary pressures shape neural and endocrine developmental pathways that organize later behavioral expression, supporting the manuscript's framing of development as a tuned system rather than a passive outcome.

CLAIM 3

“Prenatal and early postnatal endocrine environments bias later behavior.”

Carole Hooven (2021)

Hooven, C. (2021). *T: The Story of Testosterone, the Hormone that Dominates and Divides Us*.

Theoretical contribution:

Hooven synthesizes endocrinological, developmental, and behavioral research demonstrating how testosterone functions both organizationally during development and activationally across the lifespan, influencing behavioral tendencies including competitiveness, risk-taking, and social dominance sensitivity.

Relevance to claim:

Provides integrative evidence that endocrine environments influence behavioral predispositions through developmental processes rather than momentary hormonal states alone.

Auyeung, B. et al. (2009)

Auyeung, B. et al. (2009). *Fetal testosterone and autistic traits.*

Theoretical contribution:

Empirical studies measuring fetal testosterone exposure via amniotic fluid demonstrate statistically reliable associations between prenatal androgen levels and later behavioral and cognitive traits, including attention patterns, social behavior, and systemizing tendencies.

Relevance to claim:

Offers direct empirical support linking prenatal endocrine conditions to measurable later behavioral outcomes, grounding the claim in longitudinal human developmental evidence.

Melissa Hines (2011)

Hines, M. (2011). *Gender development and the human brain.*

Theoretical contribution:

Hines reviews clinical and developmental evidence (including CAH populations) showing consistent relationships between prenatal androgen exposure and later sex-typed play, interests, and behavioral preferences.

Relevance to claim:

Strengthens the causal developmental pathway between endocrine organization and later behavioral bias, reinforcing that observed tendencies arise from early biological conditions.

Integrative Note:

These works collectively demonstrate that hormonal environments during critical developmental windows systematically bias later behavioral expression. The claim reflects convergence across endocrinology, developmental neuroscience, and longitudinal behavioral research rather than a single theoretical assertion.

CLAIM 4

“Infants do not enter a symbolic world. They enter a sensory one.”

David Marr (1982)

Marr, D. (1982). *Vision: A Computational Investigation into the Human Representation and Processing of Visual Information*.

Theoretical contribution:

Marr distinguishes levels of analysis in perception—computational, algorithmic, and implementation—demonstrating that perceptual systems operate first through sensory processing mechanisms prior to symbolic interpretation or conceptual representation.

Relevance to claim:

Grounds the assertion that cognition begins with embodied sensory processing rather than symbolic reasoning. Symbolic understanding emerges downstream from perceptual organization.

Nikolaas Tinbergen (1963)

Tinbergen, N. (1963). *On aims and methods of ethology.*

Theoretical contribution:

Tinbergen's four explanatory domains (mechanism, development, function, evolution) establish that behavior must first be understood at the mechanistic and developmental level before higher-order interpretive or cultural meaning can be assigned.

Relevance to claim:

Supports the conceptual clarification that organisms initially engage the world through biological mechanisms of perception and response rather than symbolic systems.

Integrative Note:

Together, Marr and Tinbergen provide the epistemic grounding for distinguishing sensory engagement from symbolic cognition. The claim clarifies developmental ordering: perceptual embodiment precedes abstraction.

CLAIM 5

“These weightings are not learned as propositions.”

John Tooby & Leda Cosmides (1992)

Tooby, J. & Cosmides, L. (1992). *The Psychological Foundations of Culture*.

Theoretical contribution:

Tooby and Cosmides argue that human cognition develops through evolved psychological mechanisms that structure perception, attention, motivation, and inference prior to explicit learning. Cultural learning operates upon pre-existing cognitive architectures rather than creating them de novo.

Relevance to claim:

Provides grounding for the assertion that behavioral weightings arise from developmentally organized cognitive systems rather than propositional instruction or explicit belief acquisition.

Melissa Hines (2004)

Hines, M. (2004). *Brain Gender*.

Theoretical contribution:

Hines synthesizes evidence showing that prenatal hormonal environments bias preferences, interests, activity patterns, and attentional tendencies before linguistic or symbolic learning occurs.

Relevance to claim:

Supports developmental primacy: behavioral tendencies emerge through biological organization rather than learned

verbal rules or social propositions.

Integrative Note:

Both referents converge on the same ordering principle: developmental tuning precedes explicit cognition. Behavioral weighting operates implicitly, becoming later interpretable but not originally learned through instruction.

CLAIM 6

“These pathways do not produce two discrete types. They generate overlapping distributions.”

Janet Hyde (2005)

Hyde, J. (2005). *The Gender Similarities Hypothesis*.

Theoretical contribution:

Hyde demonstrates across large meta-analytic datasets that males and females show substantial overlap on most psychological and behavioral variables, despite reliable mean differences on some dimensions.

Relevance to claim:

Direct empirical grounding for the rejection of categorical sex types in favor of population distributions with overlap.

Marco Del Giudice, Tom Booth & Paul Irwing (2012)

Del Giudice, M., Booth, T., & Irwing, P. (2012). *The distance between Mars and Venus: Measuring global sex differences in personality.*

Theoretical contribution:

Shows that while individual traits overlap considerably, multivariate aggregation reveals structured probabilistic differentiation between male and female populations.

Relevance to claim:

Supports the distributional model: differentiation exists statistically without producing discrete behavioral classes.

Ethan Zell, Zlatan Krizan & Sabrina Teeter (2015)

Zell, E., Krizan, Z., & Teeter, S. (2015). *Evaluating gender similarities and differences using meta-synthesis.*

Theoretical contribution:

Quantifies distributional overlap across psychological traits, reinforcing that most sex differences are dimensional rather than categorical.

Relevance to claim:

Provides statistical confirmation that behavioral outcomes form overlapping distributions rather than binary partitions.

Paul Costa & Robert McCrae (1992)

Costa, P. & McCrae, R. (1992). *Revised NEO Personality Inventory (NEO-PI-R).*

Theoretical contribution:

Large-scale personality research identifying consistent mean sex differences within shared trait continua.

Relevance to claim:

Demonstrates empirically that sex differentiation operates within common trait architectures rather than producing separate psychological types.

Integrative Note:

Across evolutionary psychology, personality research, and meta-analytic synthesis, the convergent finding is that sex differentiation alters probability distributions, not category membership.

CLAIM 7

“Before society and before history, these asymmetries did not exist as hierarchy.”

David Geary (1998)

Geary, D. (1998). *Male, Female: The Evolution of Human Sex Differences*.

Theoretical contribution:

Geary distinguishes reproductive asymmetry from socially constructed dominance structures. Sex differences emerge from reproductive strategy, parental investment, and developmental specialization rather than intrinsic rank ordering.

Relevance to claim:

Supports the distinction between biological differentiation and social hierarchy. Asymmetry originates as functional complementarity within reproductive ecology, not dominance relations.

Robert Boyd & Peter Richerson (1985)

Boyd, R. & Richerson, P. (1985). *Culture and the Evolutionary Process*.

Theoretical contribution:

Demonstrates that hierarchical organization arises through cultural evolution operating on interacting individuals, rather than being directly specified by biological differentiation itself.

Relevance to claim:

Provides grounding for the transition from biological asymmetry to socially mediated structure: hierarchy is a cultural-organizational development, not a primitive biological condition.

Integrative Note:

This claim establishes a structural boundary condition central to Section 1:

- Sex asymmetry precedes social organization.
- Hierarchy emerges only after collective coordination and cultural scaling.

The biological substrate introduces differentiated roles; hierarchy is a later emergent property of social systems, not an

intrinsic feature of sexual differentiation.

CLAIM 8

“They operate before language, before self-concept, and before cultural meaning. Socialization acts upon these biases; it does not generate them.”

John Tooby & Leda Cosmides (1992)

Tooby, J. & Cosmides, L. (1992). *The Psychological Foundations of Culture*.

Theoretical contribution:

Introduces the distinction between evoked culture and transmitted culture. Human cognitive and behavioral tendencies arise from evolved developmental architectures that are activated by environmental input rather than constructed de novo through learning.

Relevance to claim:

Directly grounds the assertion that developmental biases precede symbolic learning. Socialization modifies expression of pre-existing psychological organization rather than creating behavioral structure itself.

Robert Boyd & Peter Richerson (1985)

Boyd, R. & Richerson, P. (1985). *Culture and the Evolutionary Process*.

Theoretical contribution:

Gene–culture coevolution models demonstrate that cultural

systems operate by acting upon biologically evolved learning mechanisms and predispositions.

Relevance to claim:

Supports the layered relationship articulated in the manuscript: biological predisposition → cultural modulation → social expression.

Integrative Note:

This claim formalizes the ordering principle established across Section 1:

- Developmental biases emerge prior to symbolic cognition.
 - Culture and socialization function as modifiers, not generators.
 - Behavioral tuning is therefore developmentally primary, culturally elaborated.
-

CLAIM 9

“The framework separates substrate, tuning, tendency, and meaning.”

Nikolaas Tinbergen (1963)

Tinbergen, N. (1963). *On Aims and Methods of Ethology*.

Theoretical contribution:

Tinbergen’s four explanatory domains — mechanism,

development, function, and evolution — establish that biological and behavioral phenomena must be analyzed across distinct but complementary explanatory levels.

Relevance to claim:

Provides the conceptual precedent for analytically separating underlying structure from observed behavioral outcome. The manuscript's distinction between substrate, tuning, tendency, and meaning follows directly from multi-level biological explanation rather than single-level interpretation.

David Marr (1982)

Marr, D. (1982). *Vision: A Computational Investigation into the Human Representation and Processing of Visual Information.*

Theoretical contribution:

Marr formalized analysis across implementation, algorithmic, and computational levels, demonstrating that complex systems cannot be understood without distinguishing physical substrate from functional process and representational outcome.

Relevance to claim:

Grounds the manuscript's structural separation:

- **Substrate** → implementation level
- **Tuning / tendency** → process organization
- **Meaning** → interpreted or computational level

The claim therefore situates HBP explicitly within established multi-level explanatory science.

Integrative Note:

This claim functions as a schema declaration for the entire framework. It legitimizes later arguments by preventing category collapse between biology, development, behavior, and social interpretation.

Section 2 — Relationship Organization

Section 2.1 — Dyadic Interaction

CLAIM 1

“Human beings classify one another by sex with extraordinary speed and accuracy. This occurs preconsciously, often within fractions of a second, using posture, movement, voice, gaze, and spatial orientation.”

Nalini Ambady (2010) — *The Thin Slice: How to Use Intuition to Predict Outcomes*

Theoretical contribution:

Ambady’s research demonstrates that observers extract socially meaningful judgments from extremely brief behavioral exposure, with evaluations occurring automatically prior to conscious reasoning.

Relevance to claim:

Ambady provides empirical grounding for rapid interpersonal classification, supporting the claim that sex recognition operates through immediate perceptual integration rather than deliberative analysis.

Kerri L. Johnson et al. (2007) — *Sex Recognition from Minimal Motion and Form Cues*

Theoretical contribution:

Experimental findings show that observers reliably identify sex

using minimal biological motion or degraded perceptual information such as gait, posture, or movement alone.

Relevance to Claim:

Johnson directly substantiates the claim that sex classification depends upon distributed embodied cues and remains accurate even under informational constraint.

Erving Goffman (1959) — *The Presentation of Self in Everyday Life*

Theoretical contribution:

Goffman describes social interaction as structured presentation in which individuals continuously emit and interpret behavioral signals that organize interpersonal understanding.

Relevance to Claim:

Goffman provides the interactional framework explaining how rapidly perceived perceptual cues become socially actionable classifications within dyadic encounters.

Integrative Note:

Taken together, these works establish that sex classification emerges from rapid perceptual processing embedded within interaction itself rather than from explicit categorical reasoning. Empirical evidence for thin-slice judgment and minimal-cue recognition converges with interactional theory to show that classification occurs as an automatic feature of social perception, forming the entry point for subsequent dyadic organization.

CLAIM 2

“In male–male dyads, interaction tends to be shaped by implicit status calibration.”

Allan Mazur (1985) — Status Signaling and Dominance Hierarchies

Theoretical contribution:

Mazur’s biosocial status theory proposes that dominance relationships emerge through signaling processes rather than overt conflict. Individuals continuously exchange cues—posture, gaze, interruption patterns, and spatial positioning—that regulate hierarchical position without explicit negotiation.

Relevance to claim:

Mazur grounds the claim by demonstrating that male–male interaction commonly involves ongoing, implicit calibration of relative status through signaling rather than formal declaration or confrontation.

Robert Sapolsky (2004) — *Why Zebras Don’t Get Ulcers*

Theoretical contribution:

Sapolsky synthesizes primate and human research showing that social rank produces measurable behavioral and physiological consequences and is maintained through repeated interactional assessment rather than continuous aggression.

Relevance to claim:

Sapolsky provides biological validation that hierarchical regulation operates persistently and implicitly within social systems, supporting the manuscript’s characterization of male

dyadic interaction as structured around status calibration.

Integrative Note:

Together, these works demonstrate that hierarchy within male–male interaction emerges through continuous signaling and assessment rather than explicit contest. Biosocial signaling theory and primate behavioral evidence converge to show that relative position is dynamically negotiated within interaction itself, producing stable hierarchy without overt enforcement.

CLAIM 3

“Female–female dyads, by contrast, more often prioritize relational calibration.”

Deborah Tannen (1990) — *You Just Don’t Understand: Women and Men in Conversation*

Theoretical contribution:

Tannen’s sociolinguistic analysis identifies systematic differences in conversational goals and interactional style, with female conversational patterns more frequently emphasizing connection, affiliation, reciprocity, and maintenance of relational equilibrium rather than status differentiation.

Relevance to claim:

Tannen grounds the claim by demonstrating that interaction within female–female dyads commonly functions to maintain relational alignment, with conversational exchange operating as calibration of connection and mutual positioning rather than

hierarchical negotiation.

Alice Eagly & Wendy Wood (1999) — Social Role Theory

Theoretical contribution:

Eagly and Wood propose that behavioral tendencies emerge from recurrent divisions of labor interacting with biological constraints, promoting cooperative coordination, social sensitivity, and relationship maintenance across societies.

Relevance to claim:

Social role theory provides macro-level grounding for relational calibration by explaining how developmentally and socially shaped tendencies are expressed interactionally as affiliation management rather than dominance signaling.

Integrative Note:

Taken together, these works show that relational coordination within female–female interaction reflects both interactional practice and broader developmental and social organization. Sociolinguistic evidence and social role theory converge in demonstrating that affiliation maintenance functions as a stabilizing mechanism within dyadic interaction rather than a derivative cultural convention.

CLAIM 4

“Male–female dyads activate a different regime entirely.”

Steven Gangestad & Jeffrey Simpson (2000) — Strategic Pluralism Theory

Theoretical contribution:

Strategic pluralism theory demonstrates that male–female interaction dynamically shifts according to mating context, reproductive strategy, and environmental conditions. Behavioral signaling, attention, affiliation, competition, and risk tolerance reorganize when opposite-sex interaction introduces reproductive relevance.

Relevance to claim:

Gangestad and Simpson ground the claim by showing that cross-sex interaction constitutes a distinct interactional regime rather than a simple blending of same-sex interactional styles, as reproductive strategy becomes implicitly active within the dyad.

Robert Trivers (1972) — Parental Investment and Sexual Selection

Theoretical contribution:

Trivers' parental investment theory establishes that asymmetric reproductive costs between males and females generate predictable differences in mating strategy, selectivity, signaling behavior, and competition.

Relevance to claim:

Trivers provides the evolutionary foundation explaining why male–female interaction operates under different constraints, with sexually differentiated strategic pressures shaping interactional behavior.

Integrative Note:

Together, these works establish that cross-sex interaction activates behavioral organization linked to reproductive asymmetry rather than merely modifying existing social interaction patterns. Evolutionary theory and strategic behavioral models converge to show that male–female dyads operate under distinct coordination pressures arising from mating-relevant dynamics.

CLAIM 5

“The interaction is modulated by sexual salience, even when no conscious sexual intent is present.”

Steven Gangestad & Jeffry Simpson (2000) — Strategic Pluralism Theory

Theoretical contribution:

Strategic pluralism research shows that mating-relevant cognition and behavior operate conditionally and often outside conscious awareness. Environmental and interpersonal cues automatically shift attention, signaling behavior, competitiveness, and affiliative posture even in interactions not consciously framed as sexual.

Relevance to claim:

This grounding supports the claim that sexual salience functions as an implicit regulatory variable within male–female interaction. Behavioral modulation occurs prior to intention or awareness, consistent with evolved conditional response

systems.

David Geary (1998) — *Male, Female: The Evolution of Human Sex Differences*

Theoretical contribution:

Geary synthesizes evolutionary, developmental, and behavioral evidence demonstrating that sex-differentiated social behavior emerges from reproductive strategy pressures that influence perception, motivation, and interaction across the lifespan.

Relevance to claim:

Geary provides the broader developmental framework explaining why sexual salience remains active even outside explicit mating contexts. Cross-sex interaction carries persistent background modulation because underlying reproductive asymmetries remain part of human social cognition.

Integrative Note:

Taken together, these works establish that sexual salience operates as an implicit regulatory condition within male–female interaction rather than as a consciously initiated state. Evolutionary and developmental accounts converge in showing that mating-relevant behavioral modulation emerges automatically from underlying reproductive organization, influencing interaction even in the absence of explicit intent.

CLAIM 6

“Crucially, this modulation is not driven solely by how one appears. It is also driven by how one inhabits oneself.”

Erving Goffman (1959) — Interaction order / Presentation of Self in Everyday Life

Theoretical contribution:

Goffman’s interactional framework distinguishes between surface presentation and the enacted organization of the self within social encounters. Social meaning emerges not only from visible appearance but from coherence among posture, timing, responsiveness, confidence, and behavioral alignment within interactional space.

Relevance to Claim:

Goffman grounds the claim’s distinction between appearance and inhabitation by demonstrating that interpersonal interpretation depends on how individuals enact roles through embodied participation in interaction. Social classification responds to lived performance rather than static visual form alone.

Deborah Tannen (1990) — Conversational style and gender

Theoretical contribution:

Tannen’s sociolinguistic analysis shows that interactional meaning is conveyed through patterned participation styles — pacing, interruption tolerance, affiliative signaling, conversational alignment, and responsiveness — which communicate stance and relational positioning beyond overt presentation.

Relevance to claim:

Tannen provides grounding for the claim that interpersonal modulation depends on how individuals occupy interactional roles through behavioral style. “Inhabiting oneself” corresponds to patterned engagement that shapes how signals are received independent of outward appearance.

Integrative Note:

Taken together, these works establish that interpersonal interpretation depends not solely on outward appearance but on how individuals enact participation within interaction. Interactional meaning emerges from coherence of behavioral alignment and engagement style, such that social modulation responds to lived enactment rather than visual form alone.

CLAIM 7

“When one’s own sense of sex becomes coherent and confidently inhabited, others begin responding as if that classification were already in place—even in the absence of dramatic visual change.”

Erving Goffman (1959) — Interaction framing / Presentation of Self in Everyday Life**Theoretical contribution:**

Goffman’s theory of interaction framing proposes that social encounters stabilize around mutually recognized definitions of the situation. Participants continuously interpret behavioral

consistency, confidence, and role enactment to determine how interaction should proceed.

Relevance to claim:

Goffman grounds the mechanism by which confidently inhabited identity alters interactional response. Once behavioral presentation achieves internal coherence, observers adopt a corresponding interactional frame, treating the classification as socially established even prior to visual confirmation.

Allan Mazur (1985) — Status signaling and dominance hierarchies

Theoretical contribution:

Mazur's biosocial status theory demonstrates that social responses are regulated through signaling loops in which perceived confidence, behavioral stability, and self-assured positioning influence how others allocate status and recognition.

Relevance to claim:

Mazur provides grounding for the reciprocal mechanism described in the claim: internally stabilized signaling alters external response patterns. Others adjust behavior in accordance with perceived certainty and alignment, producing interactional confirmation independent of overt physical change.

Integrative Note:

Together, these works establish that stable behavioral coherence alters interactional framing through reciprocal signaling processes. Consistent enactment of position

produces corresponding adjustments in observer response, such that social classification becomes operationally recognized prior to substantial visual change.

CLAIM 8

“It is about participating in the interactional grammar associated with that classification.”

Erving Goffman (1959) — Interaction order / Presentation of Self in Everyday Life

Theoretical contribution:

Goffman conceptualizes social interaction as governed by tacit organizational rules that structure participation, expectation, turn-taking, role recognition, and behavioral alignment. These rules operate as an implicit order guiding how individuals enact socially intelligible identities.

Relation to claim::

Goffman grounds the claim’s notion of “interactional grammar” by demonstrating that social classifications function through patterned participation rather than declaration. Individuals are recognized through competent engagement with the interactional rules attached to a given social position.

Robert Boyd & Peter Richerson (1985) — Culture and the Evolutionary Process / Cultural transmission theory

Theoretical contribution:

Boyd and Richerson’s cultural transmission framework explains

how behavioral norms, role expectations, and social practices propagate through learning, imitation, and reinforcement across generations, producing stable shared behavioral systems.

Relevance to claim:

Boyd and Richerson provide population-level grounding for interactional grammar as a culturally transmitted structure. The behaviors associated with sex classification persist because participation rules are socially learned and collectively maintained rather than individually invented.

Integrative Note:

Taken together, these works establish that social classification operates through participation in shared interactional structures rather than explicit declaration. Interactional order defines the behavioral grammar through which identities become intelligible, while cultural transmission explains how these participation rules persist and remain collectively recognizable across populations.

CLAIM 9

“These dyadic patterns are not cultural scripts imposed from above. They are the smallest social expressions of developmental tuning.”

Melissa Hines (2004) — Brain Gender

Theoretical contribution:

Hines synthesizes developmental neuroendocrine research

demonstrating that prenatal and early hormonal influences contribute to sex-differentiated behavioral tendencies, preferences, and interactional styles observable across development.

Relevance to claim:

Hines grounds the claim by linking observable interactional tendencies to developmental processes shaping behavioral organization prior to cultural instruction. Dyadic patterns can therefore emerge as expressions of biologically influenced developmental tuning rather than externally prescribed scripts.

Phoenix, Goy, Gerall & Young (1959) — Organizational-activational hypothesis

Theoretical contribution:

The organizational-activational framework establishes that early hormonal exposure organizes neural systems during development, creating enduring behavioral dispositions later activated under appropriate physiological or social conditions.

Relevance to claim:

This work provides foundational grounding for developmental tuning as an organizing process. The claim's characterization of dyadic behavior as a small-scale expression of developmental organization follows directly from the principle that early biological structuring shapes later social behavior.

John Tooby & Leda Cosmides (1992) — The Psychological Foundations of Culture

Theoretical contribution:

Tooby and Cosmides argue that cultural patterns arise from evolved psychological mechanisms interacting with environmental inputs rather than from arbitrary social imposition. Culture reflects coordinated outputs of shared cognitive architectures.

Relevance to claim:

Tooby and Cosmides ground the claim's rejection of top-down cultural scripting by demonstrating how recurrent social patterns emerge from underlying psychological design. Dyadic interaction thus represents local expression of developmentally tuned cognitive systems rather than externally imposed norms.

Integrative Note:

Together, these works locate dyadic patterns as emergent expressions of developmentally organized behavioral dispositions. Early biological organization establishes enduring interactional tendencies (Hines; Phoenix et al.), while shared psychological architectures allow recurrent social patterns to arise through interaction rather than cultural imposition (Tooby & Cosmides). Dyadic interaction therefore represents the smallest social stabilization of developmental tuning, where biologically shaped dispositions first organize relational behavior.

CLAIM 10

“Dyadic interaction is therefore the first place where biological development becomes socially visible.”

Nikolaas Tinbergen (1963) — On Aims and Methods of Ethology

Theoretical contribution:

Tinbergen's framework establishes that behavior must be explained across multiple complementary levels — mechanism, development (ontogeny), function, and evolutionary history. Observable behavior serves as the point at which biological organization becomes empirically accessible.

Relevance to claim:

Tinbergen grounds the claim by locating social behavior as the observable expression of underlying biological development. Dyadic interaction represents the behavioral level at which developmental processes transition from internal organization to externally measurable social phenomena.

David Marr (1982) — Vision

Theoretical contribution:

Marr's computational framework distinguishes levels of analysis linking physical implementation, representational processes, and observable output. Complex systems become interpretable through structured mappings between internal organization and externally detectable behavior.

Relevance to claim:

Marr provides cross-domain grounding for the claim's biological-to-social transition. Dyadic interaction functions as the output layer through which internally organized developmental structures become perceptible within social systems, preserving continuity across explanatory levels.

Integrative Note:

Together, these frameworks identify behavior as the level at which underlying biological organization becomes empirically accessible. Tinbergen locates observable behavior as the necessary interface for understanding developmental processes, while Marr demonstrates how internally organized systems become interpretable through structured output. Dyadic interaction therefore constitutes the point at which biological development becomes socially visible, functioning as the observable output layer of human social organization.

Section 2.2 — Bonded Pairs

CLAIM 1

“In a species with prolonged dependency, slow maturation, and high parental investment, reproduction cannot be reduced to mating. It requires durable coordination across time.”

Robert Trivers (1972) — Parental Investment and Sexual Selection

Theoretical contribution:

Trivers’ parental investment theory demonstrates that when offspring survival requires substantial investment, reproductive strategy extends beyond fertilization to include mate selection, cooperative behavior, and sustained parental coordination.

Relation to claim:

Trivers directly grounds the claim by establishing that high parental investment transforms reproduction into an extended cooperative process. Under such conditions, mating alone is insufficient; reproductive success depends upon ongoing coordination between caregivers.

Hillard Kaplan et al. (2000) — Human Life History Evolution

Theoretical contribution:

Kaplan and colleagues describe humans as characterized by unusually prolonged juvenile dependency, delayed maturation,

and extended learning periods requiring sustained provisioning and social support.

Relation to claim:

Kaplan provides species-specific grounding for the claim's life history premises. Human reproductive success depends on long-duration cooperative investment, making durable interpersonal coordination a structural requirement rather than a cultural preference.

David Geary (1998) — Male, Female: The Evolution of Human Sex Differences

Theoretical contribution:

Geary integrates evolutionary and developmental evidence showing that human mating systems and parental behaviors reflect adaptations to offspring dependency and differential reproductive costs.

Relation to claim:

Geary grounds the transition from biological investment demands to behavioral coordination within bonded pairs. The need for sustained cooperation emerges from reproductive asymmetries interacting with prolonged developmental dependency.

Integrative Note:

Together, these works establish that under conditions of prolonged offspring dependency, reproduction extends beyond mating into sustained cooperative coordination. Human life history intensifies these demands, and sex-differentiated

investment patterns organize bonded pairs toward enduring behavioral cooperation. Durable coordination therefore emerges as a structural requirement of human reproduction rather than a cultural preference.

CLAIM 2

“A bonded pair is not merely a sexual dyad; it is a cooperative unit formed to stabilize risk, provision offspring, and maintain continuity under uncertainty.”

Helen Fisher (2004) — Why We Love

Theoretical contribution:

Fisher synthesizes neurobiological and evolutionary evidence distinguishing lust, attraction, and attachment systems, proposing that long-term pair bonding evolved to support cooperative parenting and sustained reproductive partnership.

Relation to claim:

Fisher grounds the claim by demonstrating that bonded relationships constitute biologically supported cooperative systems extending beyond sexual interaction. Pair bonding functions to maintain partnership stability across reproductive and environmental demands.

Cindy Hazan & Phillip Shaver (1987) — Attachment in Adult Relationships

Theoretical contribution:

Hazan and Shaver extend attachment theory to adult romantic

relationships, showing that enduring pair bonds regulate security, proximity maintenance, and mutual support under conditions of stress and uncertainty.

Relation to claim:

Attachment theory provides psychological grounding for bonded pairs as stabilizing cooperative units. Adult attachment mechanisms support coordination, risk buffering, and continuity necessary for long-term cooperative functioning.

Sarah Blaffer Hrdy (2009) — Mothers and Others

Theoretical contribution:

Hrdy's cooperative breeding model argues that human offspring survival depends on coordinated caregiving networks, with pair bonds serving as central organizing units within broader cooperative systems.

Relation to claim:

Hrdy grounds the claim's emphasis on provisioning and continuity by situating bonded pairs within the cooperative demands imposed by human childrearing. Pair formation contributes to stabilizing reproductive investment under ecological uncertainty.

Integrative Note:

Together, these frameworks locate bonded pairs as cooperative systems organized to sustain reproductive partnership across uncertainty. Biological attachment mechanisms support enduring bonds, psychological attachment stabilizes coordination under stress, and cooperative childrearing

demands situate pair bonds as central units maintaining provisioning and continuity over time.

CLAIM 3

“The attributes outlined in Section 1 do not simply diverge between sexes; many form complementary gradients that enable division of labor without explicit negotiation:”

Robert Trivers (1972) — Parental Investment and Sexual Selection

Theoretical contribution:

Trivers’ theory demonstrates that asymmetries in reproductive investment generate predictable differences in mating strategy, selectivity, risk tolerance, and caregiving behavior between sexes.

Relation to claim:

Trivers grounds the emergence of differentiated behavioral tendencies that need not function as opposition but can organize cooperative reproductive roles. Investment asymmetry provides the evolutionary basis for complementary specialization.

David Geary (1998) — Male, Female: The Evolution of Human Sex Differences

Theoretical contribution:

Geary synthesizes evidence showing that sex-differentiated cognitive and behavioral tendencies align with recurrent

reproductive and parental demands, contributing to patterned divisions of labor across human societies.

Relation to claim:

Geary provides direct grounding for complementary gradients by demonstrating how differentiated tendencies facilitate coordinated task allocation within reproductive partnerships without requiring explicit negotiation.

Wendy Wood & Alice Eagly (1999) — Social Role Theory

Theoretical contribution:

Wood and Eagly argue that behavioral regularities emerge through interaction between biological predispositions and historically recurrent social roles shaped by ecological and economic constraints.

Relation to claim:

Social role theory grounds how complementary tendencies become socially stabilized divisions of labor. The claim's emphasis on gradient complementarity aligns with role emergence through repeated coordination rather than imposed prescription.

Integrative Note:

Together, these works indicate that asymmetries in reproductive investment generate differentiated behavioral tendencies that recurrently organize cooperative roles. These tendencies become stabilized through repeated social coordination, producing complementary divisions of labor that emerge implicitly rather than through explicit negotiation or imposed

structure.

CLAIM 4

“They are tendencies that, when aligned, reduce friction and increase resilience.”

John Tooby & Leda Cosmides (1992) — The Psychological Foundations of Culture / Functional specialization

Theoretical contribution:

Tooby and Cosmides propose that evolved psychological mechanisms are functionally specialized to solve recurrent adaptive problems. Coordination efficiency emerges when complementary mechanisms operate within environments matching their design conditions.

Relation to claim:

Tooby and Cosmides ground the claim by explaining how differentiated tendencies can produce reduced conflict when aligned with adaptive roles. Functional specialization allows coordinated behavior to emerge without continuous negotiation, lowering interactional friction.

David Geary (1998) — Male, Female: The Evolution of Human Sex Differences

Theoretical contribution:

Geary describes how sex-differentiated behavioral tendencies contribute to adaptive coordination in mating, parenting, and

resource management contexts shaped by reproductive pressures.

Relation to claim:

Geary provides organismal-level grounding for resilience emerging from coordinated specialization. Alignment of complementary tendencies supports stability and persistence of bonded partnerships under environmental and developmental stress.

Integrative Note:

Together, these works indicate that differentiated behavioral tendencies can operate as coordinated specializations whose alignment reduces interactional conflict and supports stability under stress. When complementary dispositions engage within cooperative partnership, coordination efficiency increases and relational resilience emerges without continuous negotiation.

CLAIM 5

“Bonded pairs are therefore not neutral aggregates of individuals. They are functional systems shaped by complementary gradients.”

John Tooby & Leda Cosmides (1992) — The Psychological Foundations of Culture / Cooperative systems

Theoretical contribution:

Tooby and Cosmides describe human social organization as emerging from coordinated interaction among evolved

psychological mechanisms designed for cooperation, reciprocity, and joint problem-solving rather than from incidental aggregation.

Relation to claim:

Tooby and Cosmides ground the claim by framing social units as functionally organized systems produced through coordinated specialization. Bonded pairs operate as integrated cooperative structures rather than independent individuals acting in parallel.

Sarah Blaffer Hrdy (2009) — Mothers and Others

Theoretical contribution:

Hrdy's cooperative breeding framework demonstrates that human reproductive success depends upon stable cooperative arrangements supporting offspring survival, provisioning, and protection across extended developmental periods.

Relation to claim:

Hrdy provides evolutionary grounding for bonded pairs as system-level reproductive units. Complementary caregiving and provisioning roles organize individuals into functional cooperative systems embedded within broader caregiving networks.

Integrative Note:

Together, these frameworks locate bonded pairs as functionally organized cooperative systems rather than aggregations of independent individuals. Coordinated psychological mechanisms and cooperative childrearing demands integrate partners into enduring units structured around complementary

contributions to provisioning, protection, and developmental continuity.

CLAIM 6

“Importantly, this complementarity is probabilistic, not guaranteed.”

Janet Shibley Hyde (2005) — The Gender Similarities Hypothesis

Theoretical contribution:

Hyde’s meta-analytic work demonstrates that many psychological sex differences show substantial overlap between male and female distributions, with differences typically expressed as statistical tendencies rather than categorical separation.

Relation to claim:

Hyde grounds the probabilistic nature of complementarity by showing that sex-linked traits exist as overlapping distributions. Cooperative alignment therefore emerges from tendencies within populations rather than deterministic individual outcomes.

Marco Del Giudice, Paul Booth & Irwing (2012) — Multivariate Sex Differences

Theoretical contribution:

Del Giudice and colleagues demonstrate that while individual traits may overlap considerably, multivariate analysis reveals

patterned statistical differentiation across constellations of traits between sexes.

Relation to claim:

This work grounds the claim’s probabilistic framing by showing how complementary gradients arise from distributional tendencies across multiple dimensions rather than guaranteed trait expression in any given pair.

Integrative Note:

Together, these findings demonstrate that sex-differentiated traits are expressed as overlapping population distributions rather than categorical divisions. Complementary gradients therefore arise probabilistically through patterned tendencies across individuals, making cooperative alignment possible but not assured within any given pair.

CLAIM 7

“Bonded pairs thus represent the first social structure in which sex-differentiated developmental tuning becomes architectural.”

Hillard Kaplan et al. (2000) — Human Life History Evolution

Theoretical contribution:

Kaplan and colleagues describe human social organization as shaped by prolonged dependency, delayed maturation, and cooperative provisioning requirements that necessitate stable reproductive partnerships.

Relation to claim:

Kaplan grounds the transition from developmental differentiation to structured social organization. Bonded pairs emerge as enduring arrangements required to coordinate investment across extended developmental timelines.

Sarah Blaffer Hrdy (2009) — Mothers and Others**Theoretical contribution:**

Hrdy's cooperative breeding model demonstrates that human reproductive success depends upon organized caregiving systems in which coordinated adult relationships stabilize offspring survival.

Relation to claim:

Hrdy provides grounding for bonded pairs as structurally organized cooperative units. Developmentally tuned behavioral tendencies become embedded within durable caregiving arrangements, giving social form to reproductive coordination.

Nikolaas Tinbergen (1963) — On Aims and Methods of Ethology**Theoretical contribution:**

Tinbergen's levels-of-explanation framework links developmental processes to observable behavioral organization, emphasizing how biological mechanisms manifest within structured patterns of behavior.

Relation to claim:

Tinbergen grounds the claim's architectural framing by situating bonded pairs as the behavioral level at which developmental

differentiation becomes organized into stable social structure, bridging ontogeny and social system formation.

Integrative Note:

Together, these frameworks locate bonded pairs as the first enduring social arrangements through which developmentally differentiated tendencies become organized into stable cooperative structure. Life-history demands generate sustained partnership, cooperative caregiving embeds coordination across time, and behavioral organization renders these developmental processes architecturally visible within human social systems.

Section 2.3 — Family Units

CLAIM 1

“It is where bonded pairs become custodians of dependency, vulnerability, and time.”

Hillard Kaplan et al. (2000) — Human Life History Evolution

Theoretical contribution:

Kaplan and colleagues demonstrate that human offspring require prolonged provisioning, protection, and skill transmission across extended developmental periods, creating intergenerational dependency uncommon among mammals.

Relation to claim:

Kaplan grounds the claim by establishing that bonded pairs assume sustained responsibility for dependent offspring across long developmental timelines. Reproductive partnership therefore transitions into custodial management of developmental vulnerability.

Sarah Blaffer Hrdy (2009) — Mothers and Others

Theoretical contribution:

Hrdy’s cooperative breeding framework emphasizes that human childrearing involves sustained caregiving coordination structured around vulnerable, slow-developing offspring requiring long-term social investment.

Relation to claim:

Hrdy provides grounding for bonded pairs functioning as custodians rather than merely reproducers. Family organization emerges as the mechanism through which vulnerability and dependency are stabilized across generations.

Integrative Note:

Together, these frameworks indicate that prolonged human developmental dependency transforms reproductive partnerships into enduring custodial systems. Bonded pairs assume sustained responsibility for managing vulnerability, provisioning, and developmental continuity across extended time horizons.

CLAIM 2

“The complementary gradients that stabilize bonded pairs are now recruited into a system that must sustain prolonged dependency, buffer maternal vulnerability, distribute labor across internal and external domains, regulate risk across generations, and maintain continuity under scarcity.”

Robert Trivers (1972) — Parental Investment and Sexual Selection**Theoretical contribution:**

Trivers demonstrates that asymmetric reproductive investment generates cooperative pressures surrounding offspring protection, maternal support, and coordinated parental effort extending beyond mating itself.

Relation to claim:

Trivers grounds the recruitment of complementary tendencies into sustained reproductive systems. Maternal vulnerability and offspring dependency create adaptive pressures requiring coordinated labor distribution and long-term cooperative risk management.

David Geary (1998) — Male, Female: The Evolution of Human Sex Differences**Theoretical contribution:**

Geary synthesizes evidence that sex-differentiated behavioral tendencies contribute to coordinated provisioning, protection, and caregiving strategies shaped by reproductive demands.

Relation to claim:

Geary provides grounding for complementary gradients functioning operationally within family systems. Differentiated tendencies are recruited into structured divisions of labor supporting offspring survival and household stability.

Hillard Kaplan et al. (2000) — Human Life History Evolution**Theoretical contribution:**

Kaplan and colleagues describe human families as adaptive provisioning systems organized around prolonged juvenile dependency, ecological uncertainty, and intergenerational investment.

Relation to claim:

Kaplan grounds the claim's emphasis on continuity under scarcity by demonstrating that family organization functions to

stabilize resource flow, distribute risk, and maintain developmental support across extended time horizons.

Integrative Note:

Together, these works indicate that complementary behavioral tendencies are recruited into organized family systems structured to manage prolonged dependency and reproductive risk. Distributed labor, maternal support, and intergenerational provisioning emerge as coordinated responses to ecological uncertainty, allowing families to stabilize development and continuity across time.

CLAIM 3

“Cultures may vary how families are organized—extended kin networks, nuclear households, communal structures—but they cannot remove the underlying functional requirements without cost.”

Robert Boyd & Peter Richerson (1985) — Culture and the Evolutionary Process

Theoretical contribution:

Boyd and Richerson demonstrate that cultural systems evolve through transmission and adaptation but remain constrained by ecological pressures and underlying human psychological architecture. Cultural variation occurs within adaptive limits rather than independently of them.

Relation to claim:

Boyd and Richerson ground the claim by explaining how family organization may differ culturally while still fulfilling recurrent adaptive functions related to provisioning, cooperation, and dependency management. Structural variation does not eliminate functional necessity.

John Tooby & Leda Cosmides (1992) — The Psychological Foundations of Culture**Theoretical contribution:**

Tooby and Cosmides argue that cultural institutions arise from evolved psychological mechanisms designed to solve recurrent adaptive problems. Cultural forms therefore express constrained solutions rather than arbitrary constructions.

Relation to claim:

Tooby and Cosmides provide grounding for the claim's constraint principle: cultural arrangements cannot remove underlying functional requirements because those requirements originate in species-typical developmental and reproductive pressures.

Integrative Note:

Together, these frameworks indicate that cultural variation in family organization operates within adaptive constraints imposed by human developmental and reproductive requirements. While cultural forms may differ, underlying functions of dependency management, cooperation, and provisioning persist, such that their removal imposes social and

developmental costs.

CLAIM 4

“This is why large-scale social interventions into family structure have disproportionate effects.”

Robert Boyd & Peter Richerson (1985) — Gene–Culture Coevolution / Culture and the Evolutionary Process

Theoretical contribution:

Boyd and Richerson’s gene–culture coevolution framework demonstrates that cultural institutions interact dynamically with evolved psychological and demographic systems. Interventions altering socially transmitted structures can produce cascading population-level effects when they disrupt adaptive equilibria.

Relation to claim:

Boyd and Richerson ground the claim by explaining why externally imposed structural changes may propagate non-linear consequences. Because family organization participates in coevolved biological–cultural systems, large-scale intervention alters multiple interdependent processes simultaneously.

Hillard Kaplan et al. (2000) — Human Life History Evolution

Theoretical contribution:

Kaplan and colleagues describe reproductive decision-making and family organization as embedded within life history trade-

offs involving investment, fertility timing, resource allocation, and long-term developmental outcomes.

Relation to claim:

Kaplan grounds the disproportionate impact referenced in the claim by demonstrating that modifications to family structure affect interconnected life-history variables. Interventions therefore produce downstream demographic and developmental consequences beyond their immediate targets.

Integrative Note:

Together, these works indicate that family organization operates within interdependent biological and cultural systems shaped by life-history tradeoffs. Structural interventions therefore propagate beyond their immediate targets, producing disproportionate and non-linear consequences across developmental, demographic, and social processes.

CLAIM 5

“Human developmental systems evolved under conditions where: survival was uncertain, labor was embodied, kin networks were indispensable, and reproduction was embedded in daily life.”

Hillard Kaplan et al. (2000) — Human Life History Evolution

Theoretical contribution:

Kaplan and colleagues describe ancestral human environments as characterized by ecological uncertainty, high mortality risk,

intensive embodied labor demands, and prolonged developmental dependency requiring cooperative provisioning.

Relation to claim:

Kaplan grounds the claim by situating human developmental systems within environments where survival and reproduction depended upon sustained physical labor, coordinated resource acquisition, and long-term investment in offspring under uncertain conditions.

Sarah Blaffer Hrdy (2009) — Mothers and Others

Theoretical contribution:

Hrdy's cooperative breeding ecology emphasizes that human offspring survival historically depended upon dense kin networks and shared caregiving systems embedded within everyday subsistence activity.

Relation to claim:

Hrdy provides grounding for the indispensability of kin networks and the embedding of reproduction within daily social life. Developmental systems evolved within cooperative ecological contexts rather than isolated nuclear arrangements.

Integrative Note:

Together, these frameworks locate human developmental systems within ecologies characterized by uncertainty, embodied labor, and sustained cooperative interdependence. Survival and reproduction were embedded within daily social activity supported by kin networks, situating development within continuous collective provisioning rather than isolated

household arrangements.

CLAIM 6

“High-technology societies invert these conditions.”

Robert Boyd & Peter Richerson (1985) — Culture and the Evolutionary Process / Environmental shift and cultural evolution

Theoretical contribution:

Boyd and Richerson demonstrate that cultural evolution can rapidly alter environmental conditions relative to those under which psychological and developmental systems evolved. Technological and institutional change may reorganize resource acquisition, social dependency, and reproductive behavior faster than biological adaptation.

Relation to claim:

Boyd and Richerson ground the claim by explaining how technological and cultural transformation can reverse ecological and social pressures characteristic of ancestral environments. High-technology societies modify uncertainty, labor demands, kin dependence, and reproductive embedding, producing conditions divergent from those shaping human developmental systems.

Integrative Note:

This framework indicates that rapid technological and institutional change can reorganize ecological and social

conditions faster than human developmental systems adapt, producing environments that diverge from those under which family organization evolved.

CLAIM 7

“They cannot redesign the developmental systems that support it.”

John Tooby & Leda Cosmides (1992) — The Psychological Foundations of Culture / Developmental architecture

Theoretical contribution:

Tooby and Cosmides argue that human psychological and developmental systems consist of evolved architectures shaped by recurrent adaptive problems. These systems constrain behavioral flexibility because underlying design features cannot be rapidly altered through cultural change alone.

Relation to claim:

Tooby and Cosmides ground the claim by establishing that developmental organization reflects evolved architecture rather than socially redesignable structure. Environmental or institutional change may alter expression conditions but does not reengineer underlying developmental systems.

Robert Boyd & Peter Richerson (1985) — Gene–Culture Coevolution

Theoretical contribution:

Boyd and Richerson demonstrate that cultural evolution can

modify environments and behavioral practices far more rapidly than genetic or developmental evolution, producing mismatches between inherited systems and contemporary conditions.

Relation to claim:

Boyd and Richerson provide grounding for the constraint described in the claim: cultural and technological systems may transform social environments, but developmental mechanisms adapt only across evolutionary timescales, limiting redesign through social intervention.

Integrative Note:

Together, these works indicate that human developmental systems reflect evolved architectures that constrain rapid social redesign. Cultural and institutional change may alter conditions of expression, but underlying developmental organization remains structured by evolutionary timescales rather than short-term intervention.

CLAIM 8

“They do not primarily learn behavior from instruction; they learn it from observation.”

Albert Bandura (1977) — Social Learning Theory

Theoretical contribution:

Bandura demonstrates that human learning frequently occurs through observational modeling, imitation, and reinforcement

rather than direct instruction. Behavioral acquisition depends on attention to and replication of socially observed actions.

Relation to claim:

Bandura directly grounds the claim by establishing observation as a primary mechanism of behavioral learning. Developmental transmission occurs through exposure to enacted behavior rather than explicit teaching alone.

Lev Vygotsky (1978) — Mind in Society

Theoretical contribution:

Vygotsky proposes that cognitive and behavioral development emerges through participation in socially structured activity, where learning occurs through guided interaction and internalization of observed practices.

Relation to claim:

Vygotsky grounds the social embedding of observational learning, showing how developmental acquisition arises through engagement with ongoing social behavior rather than abstract instruction detached from interaction.

Michael Tomasello (1999) — The Cultural Origins of Human Cognition

Theoretical contribution:

Tomasello argues that human cultural learning depends upon imitation, shared attention, and participation in socially mediated practices that allow transmission of behavioral norms across generations.

Relation to claim:

Tomasello provides evolutionary-developmental grounding for observational transmission as a species-typical learning mechanism through which social behaviors and roles are reproduced over time.

Integrative Note:

Together, these frameworks indicate that human behavioral development occurs primarily through observational participation in ongoing social activity. Social roles, norms, and cooperative patterns are therefore transmitted across generations through enacted interaction rather than explicit instruction alone.

Section 2.4 — Small Communities of Family Units

CLAIM 1

“At no scale does a social structure act except through embodied individuals.”

David Marr (1982) — Vision

Theoretical contribution:

Marr’s levels-of-analysis framework demonstrates that complex systems operate through implementation layers in which higher-order organization becomes effective only through lower-level instantiated processes.

Relation to claim:

Marr grounds the claim by establishing that abstract system organization produces effects only through concrete implementation. Social structures therefore operate through the behavioral outputs of individual agents rather than independently of them.

Nikolaas Tinbergen (1963) — On Aims and Methods of Ethology

Theoretical contribution:

Tinbergen’s framework links biological explanation across levels, emphasizing that population or social phenomena are expressed through observable behavior enacted by organisms.

Relation to claim:

Tinbergen grounds the claim by situating collective organization as emergent from individual behavioral expression. Social structure becomes observable and operative only through embodied action.

Erving Goffman (1959) — The Presentation of Self in Everyday Life**Theoretical contribution:**

Goffman describes social order as continuously produced through interactional performances enacted by individuals within shared situational frameworks.

Relation to claim:

Goffman provides interactional grounding for embodied recursion by demonstrating that institutional and social structures persist only through ongoing participation by individuals who enact roles within encounters.

Integrative Note:

Together, these works indicate that institutional and social structures operate only through embodied individuals whose enacted behaviors and roles instantiate collective organization within ongoing interaction.

CLAIM 2

“Small human groups do not tolerate unbounded individual dominance.”

Christopher Boehm (1999) — Hierarchy in the Forest

Theoretical contribution:

Boehm documents egalitarian dynamics in small-scale human societies, demonstrating that groups actively suppress excessive dominance through coalition formation, ridicule, sanction, or exclusion. Leadership may exist, but unchecked hierarchy is socially constrained.

Relation to claim:

Boehm directly grounds the claim by showing that small human communities regulate dominance variance to preserve group cohesion. Collective mechanisms function to prevent individuals from accumulating destabilizing levels of power.

Robert Sapolsky (2004) — Why Zebras Don't Get Ulcers

Theoretical contribution:

Sapolsky synthesizes primate research demonstrating that hierarchical systems produce physiological and behavioral consequences, with stable groups maintaining mechanisms that limit chronic dominance stress and social destabilization.

Relation to claim:

Sapolsky provides biological grounding for dominance regulation by illustrating how unmanaged hierarchy generates systemic stress costs. Social systems therefore stabilize through mechanisms that constrain excessive dominance expression.

Integrative Note:

Together, these works indicate that small human groups maintain stability by regulating dominance expression, as unchecked hierarchy generates physiological and social costs that threaten cohesion. Collective constraint mechanisms therefore function to stabilize power distribution within cooperative communities.

CLAIM 3

“Sex-differentiated developmental tendencies do not disappear at this level. They are recruited, constrained, and redirected.”

David Geary (1998) — *Male, Female: The Evolution of Human Sex Differences*

Theoretical contribution:

Geary synthesizes evolutionary and developmental evidence demonstrating that sex-differentiated behavioral tendencies persist across contexts and contribute to patterned social organization beyond mating or parenting domains.

Relation to claim:

Geary grounds the persistence component of the claim: developmental tendencies remain active as individuals participate in broader social structures rather than terminating at the family level.

Wendy Wood & Alice Eagly (1999) — *Social Role Theory*

Theoretical contribution:

Wood and Eagly propose that behavioral tendencies interact with ecological and social demands to produce differentiated but flexible role distributions within societies.

Relation to claim:

Social role theory grounds the constraint and redirection components of the claim. Community organization channels existing tendencies into socially stabilized functions rather than eliminating underlying differences.

John Tooby & Leda Cosmides (1992) — *The Psychological Foundations of Culture***Theoretical contribution:**

Tooby and Cosmides argue that cultural systems organize outputs of evolved psychological mechanisms, shaping expression through institutional and cooperative structures.

Relation to claim:

Tooby and Cosmides provide grounding for recruitment: cultural organization reallocates evolved tendencies toward collective coordination tasks, producing structured social roles while preserving underlying developmental architecture.

Integrative Note:

Together, these frameworks indicate that sex-differentiated developmental tendencies persist within larger social organization, where cultural and institutional structures recruit and channel them into stabilized social roles. Social coordination therefore redirects behavioral expression while

preserving underlying developmental architecture.

CLAIM 4

“Tradition becomes the medium through which developmental tuning is shaped into social form.”

Pierre Bourdieu (1977) — *Outline of a Theory of Practice*

Theoretical contribution:

Bourdieu introduces the concept of *habitus*, describing how durable dispositions are formed through repeated participation in socially structured practices and become embodied patterns guiding perception and behavior.

Relation to claim:

Bourdieu grounds the claim by demonstrating how socially inherited practices translate underlying dispositions into stable behavioral forms. Tradition operates as the mechanism through which developmental tendencies become socially organized and reproduced.

Jean Lave & Etienne Wenger (1991) — *Situated Learning*

Theoretical contribution:

Lave and Wenger propose that learning occurs through participation in communities of practice, where individuals acquire behavioral norms and competencies through engagement in ongoing social activity.

Relation to claim:

Situated learning grounds tradition as an active medium of

transmission. Developmental tuning becomes socially expressed through participation in established practices rather than formal instruction.

Robert Boyd & Peter Richerson (1985) — Cultural Inheritance

Theoretical contribution:

Boyd and Richerson describe cultural inheritance as the intergenerational transmission of behaviors, norms, and practices through imitation, teaching, and social reinforcement.

Relation to claim:

Boyd and Richerson provide population-level grounding for tradition as a stabilizing mechanism through which behavioral patterns persist across generations, shaping developmental tendencies into enduring social structures.

Integrative Note:

Together, these works indicate that tradition functions as the participatory medium through which developmentally formed dispositions are organized, transmitted, and stabilized as social practice. Through repeated participation rather than formal instruction, underlying tendencies become embodied within enduring cultural structures.

CLAIM 5

“This is the bridge between biology and civilization.”

Nikolaas Tinbergen (1963) — *On Aims and Methods of Ethology*

Theoretical contribution:

Tinbergen's framework establishes that biological phenomena must be understood across linked explanatory levels, connecting developmental mechanisms, behavioral expression, adaptive function, and evolutionary history.

Relation to claim:

Tinbergen grounds the claim by situating social organization as the observable continuation of biological processes across levels of explanation. Cultural structure represents a higher-order manifestation of underlying developmental systems.

Robert Boyd & Peter Richerson (1985) — *Gene–Culture Coevolution*

Theoretical contribution:

Boyd and Richerson demonstrate that cultural systems and biological evolution interact reciprocally, with socially transmitted practices shaping environments that influence developmental and evolutionary outcomes.

Relation to claim:

Boyd and Richerson provide grounding for the biological–civilizational bridge by showing how cultural inheritance mechanisms extend biological adaptation into large-scale social organization without severing developmental continuity.

Integrative Note:

Together, these frameworks indicate that cultural organization extends biological adaptation into large-scale social systems, linking developmental processes to civilizational structure without severing continuity with underlying human architecture.

Section 2.5 — Larger Communities of Small Communities

CLAIM 1

“When small communities exceed the limits of personal knowledge and kin-saturated memory, a qualitative shift occurs.”

Robin Dunbar (1992) — Neocortex Size and Group Size in Primates

Theoretical contribution:

Dunbar demonstrates a correlation between neocortex size and stable social group size, proposing cognitive limits on the number of individuals with whom humans can maintain stable, personally known relationships.

Relation to claim:

Dunbar grounds the claim by identifying cognitive constraints on kin-based and familiarity-based social organization. When group size exceeds these limits, interpersonal regulation through direct knowledge becomes insufficient, necessitating structural change.

Elman Service (1962) — *Primitive Social Organization*

Theoretical contribution:

Service describes transitions from bands and tribes to more complex social formations, showing that increasing population

scale produces new organizational forms requiring leadership differentiation and institutional coordination.

Relation to claim:

Service provides anthropological grounding for the qualitative shift referenced in the claim. Expansion beyond kin-saturated communities produces new modes of social integration not dependent on personal familiarity.

Integrative Note:

Together, these works indicate that interpersonal regulation based on kinship and personal familiarity operates within cognitive limits. When communities exceed these limits, direct social knowledge can no longer sustain coordination, producing a qualitative transition toward impersonal organizational structures.

CLAIM 2

“At this scale, communities relate to one another in ways that mirror dyadic interaction.”

Erving Goffman (1959) — *The Presentation of Self in Everyday Life*

Theoretical contribution:

Goffman describes interaction order as governed by patterned signaling, role positioning, and mutual interpretation that structure encounters between individuals.

Relation to claim:

Goffman grounds the claim by providing the interactional framework through which relational dynamics—alignment, signaling, positioning, and boundary negotiation—operate. These mechanisms can scale beyond individuals to collective actors engaging in structured interaction.

Allan Mazur (1985) — Status Signaling and Dominance Hierarchies**Theoretical contribution:**

Mazur’s biosocial status theory demonstrates that hierarchical relationships emerge through signaling exchanges regulating relative position without continuous conflict.

Relation to claim:

Mazur provides grounding for the recurrence of status calibration mechanisms at larger social scales. Communities, like individuals, engage in signaling processes that establish relative standing and stabilize interactional relations.

Integrative Note:

Together, these works indicate that interactional mechanisms governing alignment, signaling, and status calibration persist across scale, allowing communities to relate through patterned exchanges analogous to dyadic interaction. Collective actors therefore stabilize relations using behavioral processes continuous with interpersonal coordination.

CLAIM 3

“Nothing fundamental changes in the behavioral grammar. What changes is the referent.”

Nikolaas Tinbergen (1963) — *On Aims and Methods of Ethology*

Theoretical contribution:

Tinbergen’s levels-of-explanation framework demonstrates that behavioral mechanisms remain consistent even as their functional expression varies across contexts and organizational scales.

Relation to claim:

Tinbergen grounds the claim by supporting continuity of underlying behavioral organization despite shifts in level of application. Interactional mechanisms persist while the object toward which behavior is directed changes.

Robert Boyd & Peter Richerson (1985) — *Culture and the Evolutionary Process*

Theoretical contribution:

Boyd and Richerson describe cultural inheritance as allowing stable behavioral patterns to propagate across increasingly complex social arrangements while adapting to new collective referents.

Relation to claim:

Boyd and Richerson provide grounding for referential change without mechanistic replacement. Cultural systems extend existing behavioral grammars to new social units rather than

generating entirely novel interactional structures.

Integrative Note:

Together, these frameworks indicate that underlying behavioral organization remains continuous as social scale expands, with cultural systems extending existing interactional grammars to new collective referents rather than replacing them. Changes in scale therefore alter the object of coordination without transforming its fundamental behavioral structure.

CLAIM 4

“...communities now enact the same dimensions in scaled form.”

Joseph Henrich (2016) — *The Secret of Our Success / Cultural Evolution at Scale*

Theoretical contribution:

Henrich demonstrates that cumulative cultural evolution enables human societies to scale cooperative behavior, norms, and coordination mechanisms beyond small-group interaction while preserving underlying learning and behavioral processes.

Relation to claim:

Henrich grounds the claim by showing how behavioral dimensions present in small-scale interaction are reproduced and stabilized in larger collective systems through cultural evolution, allowing coordination mechanisms to operate at

expanded social scale.

Peter Turchin (2006) — *War and Peace and War*

Theoretical contribution:

Turchin analyzes historical cycles of social integration and competition, showing how mechanisms of cooperation, cohesion, and intergroup competition scale from local groups to large political entities.

Relation to claim:

Turchin provides grounding for scaled enactment by demonstrating that collective actors reproduce interactional dynamics—cooperation, competition, alliance formation—at higher organizational levels without altering underlying behavioral principles.

Integrative Note:

Together, these works indicate that interactional dynamics present in small-scale communities are reproduced at larger social scales through cultural evolution, allowing collective actors to coordinate using behavioral principles continuous with those governing interpersonal interaction.

CLAIM 5

“What was once enacted in posture and tone is now enacted in emissaries, rituals, symbols, and agreements.”

Erving Goffman (1959) — *The Presentation of Self in Everyday Life* / Representation and Framing

Theoretical contribution:

Goffman describes social interaction as structured through representational acts in which individuals communicate position, intent, and relational stance via performative signaling within shared interpretive frames.

Relation to claim:

Goffman grounds the continuity between embodied signaling and its mediated extensions. Interactional signaling mechanisms persist as representation shifts from individual bodily expression to formally enacted social representation.

Robert Boyd & Peter Richerson (1985) — *Culture and the Evolutionary Process / Cultural Transmission***Theoretical contribution:**

Boyd and Richerson demonstrate that cultural transmission enables behavioral coordination through shared symbols, norms, and institutionalized practices that stabilize interaction beyond direct personal contact.

Relation to claim:

Boyd and Richerson provide grounding for mediated signaling by explaining how culturally transmitted symbols and agreements function as scalable extensions of interpersonal communication systems.

Integrative Note:

Together, these works indicate that as interaction scales beyond direct encounter, representational systems—symbols, rituals, and agreements—function as mediated extensions of embodied

signaling, preserving continuity in coordination and relational communication.

CLAIM 6

“Institutions do not replace developmental tuning; they channel it.”

Robert Boyd & Peter Richerson (1985) — Gene–Culture Coevolution

Theoretical contribution:

Boyd and Richerson demonstrate that cultural institutions evolve through interaction with inherited psychological and developmental systems, shaping behavioral expression without altering underlying evolved mechanisms.

Relation to claim:

Boyd and Richerson ground the claim by showing that institutional structures organize and regulate behavioral outputs generated by developmental systems rather than replacing those systems themselves.

Joseph Henrich (2016) — Cultural Norm Systems

Theoretical contribution:

Henrich describes institutions and norm systems as culturally evolved mechanisms that stabilize cooperation by directing behavior through shared expectations, enforcement structures, and socially transmitted rules.

Relation to claim:

Henrich provides grounding for institutional channeling by demonstrating how norm systems guide and constrain behavior arising from human developmental predispositions, enabling coordination at large social scales.

Integrative Note:

Together, these works indicate that institutions organize and constrain behavioral expression generated by developmental systems rather than replacing them, channeling human predispositions into coordinated action at large social scales.

CLAIM 7

“It must be embedded in roles, offices, rites, and narratives.”

Jean Lave & Etienne Wenger (1991) — *Situated Learning*

Theoretical contribution:

Lave and Wenger demonstrate that social knowledge and behavioral competence are sustained through participation in structured roles within communities of practice, where learning occurs through engagement in established social positions.

Relation to claim:

Situated learning grounds the claim by showing how behavioral patterns persist when embedded within socially recognized roles and participatory structures that organize ongoing practice.

Pierre Bourdieu (1977) — *Outline of a Theory of Practice* / Habitus

Theoretical contribution:

Bourdieu's concept of habitus describes how durable social dispositions become stabilized through institutionalized practices, rituals, and symbolic systems reproduced across generations.

Relation to claim:

Bourdieu provides grounding for institutional embedding by explaining how developmental tendencies become socially durable when incorporated into offices, rites, and shared narratives that structure behavior and expectation.

Integrative Note:

Together, these works indicate that behavioral patterns persist across scale when embedded within socially recognized roles, offices, rites, and narratives. Institutional participation stabilizes interpersonal tendencies by incorporating them into enduring structures that organize expectation and practice across generations.

CLAIM 8

“Just as dyads cannot tolerate unbounded dominance, communities cannot tolerate unchecked expansion by internal subgroups.”

Christopher Boehm (1999) — *Hierarchy in the Forest / Coalitionary Suppression*

Theoretical contribution:

Boehm documents how human groups maintain social stability through coalitionary mechanisms that suppress excessive dominance or power accumulation by individuals or factions.

Relation to claim:

Boehm grounds the continuity between dyadic and community regulation by demonstrating that collective actors actively constrain dominance variance. Suppression mechanisms extend from interpersonal hierarchy control to regulation of subgroup power within larger communities.

Elinor Ostrom (1990) — *Governing the Commons*

Theoretical contribution:

Ostrom shows that stable communities managing shared resources develop governance rules that limit overreach, prevent monopolization, and regulate subgroup behavior to preserve collective sustainability.

Relation to claim:

Ostrom provides institutional grounding for variance regulation at scale. Communities establish constraints preventing internal actors from expanding influence or resource control in ways that destabilize cooperative systems.

Integrative Note:

Together, these works indicate that mechanisms limiting dominance variance operate across social scale, with

communities constraining the expansion of internal subgroups in ways analogous to interpersonal regulation within dyads. Stability is maintained through collective suppression of destabilizing power accumulation.

CLAIM 9

“The community is now the “person” in the next dyad.”

Nikolaas Tinbergen (1963) — *On Aims and Methods of Ethology* / Multi-level continuity

Theoretical contribution:

Tinbergen’s framework demonstrates continuity across levels of biological and behavioral organization, where similar interactional principles operate as explanatory focus shifts from individuals to larger collective units.

Relation to claim:

Tinbergen grounds the claim by supporting continuity of interactional structure across organizational scales. Collective entities can function as behavioral units within higher-order relational systems without altering underlying mechanisms.

Peter Turchin (2006) — *War and Peace and War* / Group-Level Dynamics

Theoretical contribution:

Turchin analyzes historical dynamics in which cohesive groups behave as coordinated actors engaging in competition, alliance formation, and cooperation with other groups.

Relation to claim:

Turchin provides grounding for communities operating as unified interactional agents. At larger scales, groups assume roles analogous to individuals within dyadic relations among collective actors.

Integrative Note:

Together, these works indicate that interactional organization remains continuous across levels of social scale, such that cohesive communities function as unified actors within higher-order relational systems. The behavioral grammar of dyadic interaction persists as the referent shifts from individuals to collective entities.

Section 2.6 — Regions and Societies

CLAIM 1

“At this scale, asymmetry becomes structural and history becomes irreversible.”

Douglass North (1990) — *Institutions, Institutional Change and Economic Performance*

Theoretical contribution:

North demonstrates that institutional systems generate path dependence, whereby prior structural arrangements constrain future developmental trajectories and make reversal increasingly costly or impractical.

Relation to claim:

North grounds the claim’s irreversibility component by showing how institutional accumulation embeds historical outcomes into durable structural constraints shaping subsequent social development.

Michael Mann (1986) — *The Sources of Social Power*

Theoretical contribution:

Mann analyzes how power becomes organized through institutional networks—economic, military, political, and ideological—producing durable asymmetries across regions and societies.

Relation to claim:

Mann provides grounding for structural asymmetry by demonstrating how large-scale social organization distributes power unevenly through institutionalized systems rather than temporary interpersonal differences.

Peter Turchin (2006) — *War and Peace and War***Theoretical contribution:**

Turchin's historical analysis shows that large societies evolve through competitive dynamics that generate durable inequalities in cohesion, capacity, and expansion potential.

Relation to claim:

Turchin grounds the interaction between asymmetry and historical persistence, illustrating how accumulated structural advantages produce long-term divergence among societies.

Integrative Note:

Together, these works indicate that as social organization scales, institutional accumulation produces durable asymmetries that constrain future development. Historical outcomes become embedded within structural arrangements, generating path-dependent divergence that is increasingly resistant to reversal.

CLAIM 2

“What changes is not the grammar, but the medium through which it operates.”

Joseph Henrich (2016) — *The Secret of Our Success*

Theoretical contribution:

Henrich demonstrates that human societies achieve large-scale coordination through culturally evolved systems—institutions, norms, technologies, and symbolic practices—that extend cooperation beyond face-to-face interaction.

Relation to claim:

Henrich grounds the claim by showing that expanding social scale alters the mechanisms of coordination transmission while preserving underlying behavioral processes. Cultural complexity modifies operational medium rather than replacing foundational interactional structures.

Robert Boyd & Peter Richerson (1985) — *Culture and the Evolutionary Process*

Theoretical contribution:

Boyd and Richerson describe cultural evolution as enabling behavioral systems to operate through socially transmitted norms and institutions that scale beyond direct interpersonal interaction.

Relation to claim:

Boyd and Richerson provide grounding for medium transformation by demonstrating how inherited behavioral grammars persist while cultural transmission mechanisms shift the channels through which coordination occurs.

Integrative Note:

Together, these works indicate that expanding social scale transforms the cultural and institutional media through which coordination operates while preserving the underlying behavioral grammar organizing interaction..

CLAIM 3

“The dyadic grammar scales.”

Erving Goffman (1959) — *The Presentation of Self in Everyday Life / Interaction Order*

Theoretical contribution:

Goffman describes social interaction as governed by recurring relational structures involving signaling, role positioning, and mutual interpretation within encounters between actors.

Relation to claim:

Goffman grounds the persistence of dyadic interactional grammar by establishing the foundational relational mechanisms from which higher-order social coordination emerges.

Peter Turchin (2006) — *War and Peace and War / Group-Level Scaling Dynamics*

Theoretical contribution:

Turchin demonstrates that collective entities engage in cooperation, competition, and alliance behavior analogous to interactions observed among individuals, enabling coordinated action at expanding social scales.

Relation to claim:

Turchin provides grounding for the scaling property referenced in the claim, showing that interactional dynamics recur as organizational units increase in size and complexity.

Integrative Note:

Together, these works indicate that the interactional grammar governing dyadic relations—cooperation, competition, and alliance formation—persists as organizational units expand, allowing coordinated behavior to scale without altering underlying relational structure.

CLAIM 4

“What does change at this level is that complementarity becomes structurally difficult.”

Jared Diamond (1997) — *Guns, Germs, and Steel*

Theoretical contribution:

Diamond demonstrates how geographic, ecological, and technological asymmetries produce large-scale societal divergence, generating persistent inequalities in development, resource access, and expansion capacity.

Relation to claim:

Diamond grounds the claim by showing how structural conditions external to local cooperation complicate reciprocal complementarity between large societies operating under

unequal constraints.

Immanuel Wallerstein (1974) — *The Modern World-System*

Theoretical contribution:

Wallerstein describes global social organization as an open system structured by core–periphery economic relations that institutionalize unequal exchange and dependency across regions.

Relation to claim:

Wallerstein provides grounding for structural difficulty in complementarity by demonstrating how systemic interdependence produces asymmetric relationships resistant to balanced cooperation.

Michael Mann (1986) — *The Sources of Social Power / Power Networks*

Theoretical contribution:

Mann analyzes how overlapping political, economic, military, and ideological networks generate durable power differentials within and between societies.

Relation to claim:

Mann grounds the claim by showing that large-scale institutional power networks introduce constraints that complicate cooperative alignment across social systems.

Integrative Note:

Together, these works indicate that large-scale social systems operate under ecological, economic, and institutional asymmetries that constrain reciprocal alignment. As structural inequalities accumulate, complementarity between societies becomes increasingly difficult to sustain despite continuity in underlying interactional grammar.

CLAIM 5

“Regions and societies exist in open systems shaped by geography, resources, and historical momentum.”

Jared Diamond (1997) — *Guns, Germs, and Steel* / Ecological Constraint

Theoretical contribution:

Diamond demonstrates how geographic conditions, resource distributions, and environmental variability shape long-term societal development and differential historical outcomes.

Relation to claim:

Diamond grounds the claim by showing that societies operate within ecological constraints external to social intention, producing divergent developmental trajectories rooted in environmental structure.

Peter Turchin (2006) — *War and Peace and War* / Structural-Demographic Dynamics

Theoretical contribution:

Turchin analyzes how population pressures, resource

competition, and internal social dynamics interact across time to influence societal stability and expansion.

Relation to claim:

Turchin provides grounding for open-system dynamics by demonstrating how demographic and material pressures continuously interact with social organization, preventing closed-system equilibrium.

Douglass North (1990) — *Institutions, Institutional Change and Economic Performance* / Institutional Persistence

Theoretical contribution:

North shows that institutional arrangements accumulate historically and constrain future adaptation, embedding prior conditions into ongoing societal development.

Relation to claim:

North grounds the role of historical momentum by explaining how institutional persistence carries past structural decisions forward, shaping present system behavior.

Integrative Note:

Together, these works indicate that societies operate within open systems shaped by environmental constraints, demographic pressures, and institutional inheritance. Continuous interaction among these forces generates path-dependent development and prevents stable equilibrium across regions and historical periods.

CLAIM 6

“From dyad to species, the structure is continuous.”

Nikolaas Tinbergen (1963) — *On Aims and Methods of Ethology / Levels of Explanation*

Theoretical contribution:

Tinbergen’s framework establishes continuity across biological and behavioral levels, linking individual mechanisms, developmental processes, functional organization, and evolutionary outcomes within a unified explanatory structure.

Relation to claim:

Tinbergen grounds the claim by supporting continuity across organizational scales. Behavioral and social structures remain linked across levels rather than replaced as complexity increases.

Robert Boyd & Peter Richerson (1985) — *Gene–Culture Coevolution*

Theoretical contribution:

Boyd and Richerson demonstrate that cultural evolution extends biological adaptation through socially transmitted systems while preserving continuity with underlying developmental and psychological architecture.

Relation to claim:

Boyd and Richerson provide grounding for species-level continuity by showing how cultural organization scales biological and developmental processes without severing ancestral mechanisms.

Integrative Note:

Together, these works indicate that societies operate within open systems shaped by environmental constraints, demographic pressures, and institutional inheritance. Continuous interaction among these forces generates path-dependent development and prevents stable equilibrium across regions and historical periods.

CLAIM 7

“Human civilization is not a departure from human behavior.”

Joseph Henrich (2016) — *The Secret of Our Success / Cultural Evolution at Scale*

Theoretical contribution:

Henrich demonstrates that large-scale human societies emerge through cumulative cultural evolution built upon species-typical learning, cooperation, and social cognition rather than through behavioral transformation into fundamentally new systems.

Relation to claim:

Henrich grounds the claim by showing that civilizational complexity represents amplification and coordination of existing human behavioral capacities rather than departure from them.

Robert Boyd & Peter Richerson (1985) — *Culture and the Evolutionary Process / Cultural Inheritance*

Theoretical contribution:

Boyd and Richerson describe cultural inheritance as extending behavioral organization across generations and populations while maintaining continuity with evolved psychological mechanisms.

Relation to claim:

Boyd and Richerson provide grounding for civilizational continuity by demonstrating that institutions and large-scale social systems arise from transmission and scaling of preexisting behavioral structures.

Integrative Note:

Together, these works indicate that civilizational institutions and large-scale social structures arise through the amplification and coordination of species-typical human behavioral capacities, representing continuity with—rather than departure from—underlying developmental and social organization.

Section 2.7 — Heterogeneity and the Limits of Fractal Stabilization

CLAIM 1

“The recursive structure described in prior sections presumes a shared frame of meaning.”

Robert Boyd & Peter Richerson (1985) — *Culture and the Evolutionary Process*

Theoretical contribution:

Boyd and Richerson demonstrate that cultural coordination depends upon shared norms, transmitted expectations, and common interpretive frameworks enabling collective behavioral alignment.

Relation to claim:

Boyd and Richerson ground the claim by showing that stable large-scale coordination requires shared symbolic systems through which behavior becomes mutually interpretable across individuals and groups.

Michael Tomasello (1999) — *The Cultural Origins of Human Cognition*

Theoretical contribution:

Tomasello argues that human social cognition depends upon shared intentionality and jointly understood symbolic reference

systems that allow coordinated action and cultural transmission.

Relation to claim:

Tomasello provides grounding for the shared frame requirement by demonstrating that cooperative social structures depend upon common meaning systems enabling participants to interpret actions within the same cognitive framework.

Integrative Note:

Together, these works indicate that large-scale social coordination depends upon shared symbolic and interpretive frameworks through which actions remain mutually intelligible. Recursive social organization therefore presumes alignment within a common cognitive frame of meaning.

CLAIM 2

“This condition is not guaranteed.”

Henri Tajfel & John Turner (1979) — Social Identity Theory

Theoretical contribution:

Tajfel and Turner demonstrate that individuals organize social perception through group categorization processes that generate differentiation between in-groups and out-groups, often producing divergent interpretive frameworks.

Relation to claim:

Social identity theory grounds the claim by showing that shared meaning systems are inherently unstable across group

boundaries. Collective identification processes can fragment interpretive alignment rather than sustain it.

Marilynn Brewer (1999) — In-Group Bias

Theoretical contribution:

Brewer's work shows that human social cognition favors in-group cohesion while maintaining psychological distance from out-groups, reinforcing boundary formation within social systems.

Relation to claim:

Brewer provides grounding for the non-guaranteed nature of shared frames by demonstrating how in-group bias produces differentiation in norms, trust, and meaning across populations.

Integrative Note:

Together, these works indicate that processes of collective identification can fragment shared interpretive frameworks, as in-group and out-group differentiation generate divergent systems of meaning that limit stable coordination across social boundaries.

CLAIM 3

“When this occurs, the fractal does not break, but it changes phase.”

Thomas Schelling (1978) — *Micromotives and Macrobehavior*

Theoretical contribution:

Schelling demonstrates how small-scale individual preferences and interactions can produce large-scale pattern shifts without alteration of underlying behavioral rules, generating emergent systemic reorganization.

Relation to claim:

Schelling grounds the claim by showing that macro-level structural change may arise from accumulation of local interactions while foundational mechanisms remain intact. System behavior reorganizes rather than collapses.

Murray Gell-Mann (1994) — *The Quark and the Jaguar***Theoretical contribution:**

Gell-Mann explores complex adaptive systems in which continuity of underlying rules coexists with qualitative transitions between organizational states as system conditions change.

Relation to claim:

Gell-Mann provides grounding for phase transition as a change in system organization without loss of generative structure. The fractal persists while operating under altered systemic conditions.

Integrative Note:

Together, these works indicate that accumulated local interactions can produce qualitative reorganization of large-scale systems without altering underlying behavioral mechanisms. Social structure therefore undergoes phase

transition rather than collapse, preserving the generative fractal while shifting its systemic configuration.

CLAIM 4

“It reverts to a pre-pair state.”

Muzafer Sherif (1966) — Realistic Conflict Theory

Theoretical contribution:

Sherif demonstrates that intergroup competition emerging under perceived resource conflict rapidly produces hostility, boundary reinforcement, and breakdown of cooperative coordination between groups.

Relation to claim:

Sherif grounds the claim by showing how cooperative structures can regress toward competitive organization when shared frameworks dissolve, producing interaction patterns characteristic of earlier, less stabilized social states.

Henri Tajfel (1970) — Minimal Group Paradigm

Theoretical contribution:

Tajfel’s experiments show that even minimal and arbitrary group distinctions generate preferential treatment of in-group members and differentiation from out-groups absent prior conflict or history.

Relation to claim:

Tajfel provides grounding for regression to pre-pair organization by demonstrating how social interaction defaults to categorical

group differentiation when stabilizing cooperative structures weaken.

Integrative Note:

Together, these works indicate that when stabilizing cooperative frameworks dissolve, social interaction reverts toward categorical group differentiation and competitive organization characteristic of earlier, less coordinated relational states.

CLAIM 5

“It is structural uncertainty.”

David Lewis (1969) — *Convention*

Theoretical contribution:

Lewis analyzes social conventions as coordination equilibria sustained through shared expectations about behavior. Stability depends upon mutually recognized signaling frameworks enabling predictable interaction.

Relation to claim:

Lewis grounds the concept of structural uncertainty by demonstrating that coordination fails when shared conventions are absent or unstable. Without common symbolic anchors, participants cannot reliably align expectations or behavior.

Brian Skyrms (1996) — *Evolution of the Social Contract*

Theoretical contribution:

Skyrms models the emergence and breakdown of cooperative equilibria through evolutionary game dynamics, showing how coordination systems depend upon stable signaling and shared strategic expectations.

Relation to claim:

Skyrms provides grounding for coordination instability by explaining how cooperative structures degrade under uncertainty regarding shared norms or commitments, producing unstable interactional environments.

Integrative Note:

Together, these works indicate that when shared conventions become uncertain, coordination equilibria destabilize, producing structural uncertainty in which expectations cannot reliably align behavior or sustain cooperation.

CLAIM 6

“This dynamic appears at every heterogeneous boundary...”

- **between individuals whose embodied experience diverges**
 - **between families with incompatible traditions**
 - **between communities without historical linkage**
 - **between regions without symbolic overlap**
 - **between societies with distinct civilizational grammars**
-

Claude Lévi-Strauss (1963) — *Structural Anthropology*

Theoretical contribution:

Lévi-Strauss demonstrates that human societies organize meaning through underlying structural systems that vary across cultures, producing divergent symbolic classifications and interpretive frameworks.

Relation to claim:

Lévi-Strauss grounds the recurrence of structural uncertainty at heterogeneous boundaries by showing how differing symbolic systems generate discontinuities in interpretation across social groups.

Laura Bohannan (1966) — Cross-Cultural Misinterpretation (“Shakespeare in the Bush”)**Theoretical contribution:**

Bohannan illustrates how shared narratives and meanings fail to transfer across cultures lacking common interpretive assumptions, leading to systematic reinterpretation rather than mutual understanding.

Relation to claim:

Bohannan provides empirical grounding for boundary-level breakdown in shared meaning, demonstrating how absence of symbolic overlap produces coordination instability across cultural interfaces.

David Graeber & David Wengrow (2021) — *The Dawn of Everything* / Early Intergroup Dynamics**Theoretical contribution:**

Graeber and Wengrow analyze early human societies as

interacting systems characterized by diversity in social organization, governance forms, and symbolic structures across neighboring populations.

Relation to claim:

Graeber and Wengrow ground scale continuity under heterogeneity by showing that interactional tension and reinterpretation recur wherever socially distinct groups encounter one another across historical and cultural boundaries.

Integrative Note:

Together, these works indicate that heterogeneous cultural and historical boundaries generate discontinuities in shared meaning, producing recurrent coordination instability wherever distinct symbolic systems encounter one another.

CLAIM 7

“Heterogeneity inserts an intermediate stage.”

Thomas Schelling (1978) — *Micromotives and Macrobehavior* / **Coordination Under Partial Information**

Theoretical contribution:

Schelling demonstrates that coordination among agents operating with incomplete or asymmetric information often requires transitional adjustment periods before stable collective patterns emerge.

Relation to claim:

Schelling grounds the claim by showing how heterogeneity in expectations or information introduces intermediate coordination phases prior to equilibrium formation.

David Lewis (1969) — *Convention / Convention Formation***Theoretical contribution:**

Lewis analyzes how shared conventions emerge gradually as participants converge on mutually recognized coordination strategies through repeated interaction.

Relation to claim:

Lewis provides grounding for the intermediate stage described in the claim, demonstrating that stable coordination requires time and iterative alignment when shared conventions are initially absent.

Integrative Note:

Together, these works indicate that heterogeneity introduces transitional coordination phases in which shared expectations must emerge through iterative interaction. Stable cooperation therefore develops gradually rather than immediately when common frameworks are absent.

CLAIM 8

“Because the underlying behavioral architecture is shared, certain dimensions remain legible even without shared

meaning:”

Allan Mazur (1985) — Status Signaling and Dominance Hierarchies

Theoretical contribution:

Mazur demonstrates that status-related signaling operates through broadly recognizable behavioral cues—posture, confidence display, spatial positioning—that are interpreted reliably across social contexts.

Relation to claim:

Mazur grounds the persistence of legibility by showing that certain interactional signals derive from shared behavioral architecture and remain interpretable even when cultural alignment is incomplete.

Erving Goffman (1959) — *The Presentation of Self in Everyday Life* / Interaction Order

Theoretical contribution:

Goffman describes interactional order as dependent upon recognizable behavioral cues that allow participants to orient themselves within encounters despite variability in background or intent.

Relation to claim:

Goffman provides grounding for residual legibility by demonstrating that basic interactional signaling permits partial coordination even in the absence of fully shared symbolic frameworks.

Integrative Note:

Together, these works indicate that shared interactional architecture preserves residual legibility across social contexts, allowing partial coordination through broadly recognizable behavioral cues even when symbolic alignment remains incomplete.

CLAIM 9

“This is why heterogeneous encounters do not collapse into chaos. The fractal grammar still operates at the level of posture, pattern, and power.”

Erving Goffman (1959) — *The Presentation of Self in Everyday Life* / Interaction Order

Theoretical contribution:

Goffman demonstrates that social encounters remain organized through recognizable interactional cues governing positioning, signaling, and mutual orientation even among unfamiliar participants.

Relation to claim:

Goffman grounds the persistence described in the claim by showing that interactional order operates through embodied behavioral patterns that[condition] maintain intelligibility despite absence of shared cultural meaning.

Christopher Boehm (1999) — *Hierarchy in the Forest* / Coalitionary Regulation

Theoretical contribution:

Boehm documents how human groups regulate dominance and cooperation through broadly shared behavioral responses to power dynamics, independent of specific cultural systems.

Relation to claim:

Boehm provides grounding for grammar persistence at the level of power regulation, demonstrating that dominance recognition and coalitionary response remain operative across heterogeneous social encounters.

Integrative Note:

Together, these works indicate that recognizable patterns of positioning, signaling, and power regulation remain operative across heterogeneous encounters, allowing interactional order to persist even in the absence of shared cultural meaning.

CLAIM 10

“Where it does not, the dyadic phase persists.”

Henri Tajfel & John Turner (1979) — Social Identity Theory / In-Group–Out-Group Dynamics**Theoretical contribution:**

Tajfel and Turner demonstrate that when broader shared identities fail, individuals default to smaller, salient group categorizations that organize cooperation and opposition along simplified relational boundaries.

Relation to claim:

Social identity theory grounds dyadic fallback by showing how interaction reorganizes into bounded in-group versus out-group relations when larger shared frameworks do not stabilize coordination.

Muzafer Sherif (1966) — Intergroup Conflict / Realistic Conflict Theory**Theoretical contribution:**

Sherif demonstrates that breakdown of cooperative superordinate structures leads groups to revert to competitive interaction patterns structured around direct opposition and alliance formation.

Relation to claim:

Sherif provides grounding for persistence of dyadic organization under failed stabilization conditions, where interaction reduces to simplified competitive or coalitional pairings between groups.

Integrative Note:

Together, these works indicate that when broader cooperative frameworks fail to stabilize interaction, social organization contracts toward smaller bounded identities, reducing coordination to simplified dyadic opposition between groups.

CLAIM 11

“This dynamic explains why heterogeneity is experienced as tension even in the absence of hostility.”

Marilynn Brewer (1999) — Social Identity and Boundary Maintenance

Theoretical contribution:

Brewer demonstrates that social identity processes generate psychological boundary awareness and differentiation even without antagonism, as individuals balance needs for inclusion and distinctiveness.

Relation to claim:

Brewer grounds the experience of tension by showing that group differentiation produces cognitive and social strain independent of overt conflict or hostility.

Gordon Allport (1954) — *The Nature of Prejudice*

Theoretical contribution:

Allport analyzes how categorization and unfamiliarity generate discomfort and vigilance prior to the emergence of prejudice or antagonistic behavior.

Relation to claim:

Allport provides grounding for tension arising from heterogeneity itself, demonstrating that perceived difference can produce psychological unease without necessitating hostility or animus.

Integrative Note:

Together, these works indicate that processes of social categorization generate boundary awareness that produces cognitive and social tension even in the absence of hostility, as differentiation itself introduces uncertainty in coordination and expectation.

CLAIM 12

“Heterogeneity does not negate recursion. It delays its stabilization.”

Robert Boyd & Peter Richerson (1985) — *Culture and the Evolutionary Process / Cultural Transmission and Convergence*

Theoretical contribution:

Boyd and Richerson demonstrate that culturally transmitted behaviors may initially diverge across populations but can converge over time through interaction, imitation, and adaptive coordination processes.

Relation to claim:

Boyd and Richerson ground the claim by showing that heterogeneity slows coordination but does not eliminate the underlying mechanisms through which shared behavioral systems eventually stabilize.

Joseph Henrich (2016) — *The Secret of Our Success / Norm Integration at Scale*

Theoretical contribution:

Henrich describes how large societies integrate diverse populations through gradual adoption and alignment of norms, allowing cooperative systems to emerge despite initial variation.

Relation to claim:

Henrich provides grounding for delayed stabilization by demonstrating that norm integration occurs progressively as heterogeneous groups achieve coordination through shared institutional and cultural frameworks.

Integrative Note:

Together, these works indicate that heterogeneity slows the emergence of shared institutional and cultural alignment but does not eliminate the underlying behavioral mechanisms through which recursive social coordination eventually stabilizes.

Section 3 — Dominance, Proficiency, and Consistency

CLAIM 1

“The behaviors described in prior sections are not static traits. They are expressed with varying form, magnitude, and distribution.”

William Fleeson (2001) — Density Distributions of Personality States

Theoretical contribution:

Fleeson demonstrates that personality characteristics are best understood as distributions of behavioral states varying across situations rather than fixed trait expressions.

Relation to claim:

Fleeson grounds the claim by showing that behavioral tendencies manifest with variable frequency and intensity across contexts, supporting the manuscript’s framing of behavior as dynamically expressed rather than statically possessed.

Paul Costa & Robert McCrae (1992) — Trait Stability and Variability

Theoretical contribution:

Costa and McCrae show that personality traits exhibit long-term structural stability while allowing substantial situational variability in behavioral expression.

Relation to claim:

Costa and McCrae provide grounding for variability within stability, demonstrating how enduring dispositions produce differing forms and magnitudes of behavioral expression across individuals and contexts.

Integrative Note:

Together, these works indicate that stable behavioral tendencies are expressed as variable distributions across contexts, differing in form, frequency, and intensity rather than existing as fixed behavioral traits.

CLAIM 2

“Dominance, as used here, refers to hierarchical position within an interaction.”

Allan Mazur (1985) — Status Signaling and Testosterone**Theoretical contribution:**

Mazur’s biosocial model defines dominance as an emergent relational property arising from signaling exchanges that establish relative hierarchical position between interacting individuals.

Relation to claim:

Mazur grounds the claim by situating dominance within interactional processes rather than fixed personal traits, aligning directly with the manuscript’s relational definition.

Robert Sapolsky (2004) — *Why Zebras Don't Get Ulcers*

Theoretical contribution:

Sapolsky synthesizes primate and human research demonstrating that dominance rank reflects position within social hierarchies maintained through ongoing interaction rather than inherent individual superiority.

Relation to claim:

Sapolsky provides biological grounding for dominance as context-dependent hierarchical placement emerging from social interaction dynamics.

Integrative Note:

Together, these works situate dominance as an interactional property emerging from signaling processes that establish hierarchical position within ongoing social relations rather than as a fixed individual trait.

CLAIM 3

“Every social system contains hierarchy. Even egalitarian groups enforce rank by suppressing would-be alphas.”

Christopher Boehm (1999) — *Hierarchy in the Forest*

Theoretical contribution:

Boehm demonstrates that small-scale egalitarian societies actively regulate hierarchy through collective suppression of individuals attempting to accumulate excessive dominance.

Relation to claim:

Boehm directly grounds the claim by showing that egalitarian systems do not eliminate hierarchy but maintain it through reverse-dominance mechanisms that constrain aspiring alphas

Robert Sapolsky (2004) — *Why Zebras Don't Get Ulcers***Theoretical contribution:**

Sapolsky synthesizes primate research showing that hierarchical organization persists across social systems, with group stability depending upon regulation of dominance relationships.

Relation to claim:

Sapolsky provides biological grounding for hierarchy as a persistent feature of social organization, even when overt dominance expression is minimized.

Allan Mazur (1985) — Status Signaling and Dominance**Theoretical contribution:**

Mazur's biosocial theory explains hierarchy as emerging through signaling interactions that continuously establish and maintain relative rank.

Relation to claim:

Mazur grounds the interactional mechanism by which hierarchy remains present across social systems through ongoing status calibration processes.

Integrative Note:

Together, these works indicate that hierarchy persists as an ongoing process of status calibration within social systems. Egalitarian groups maintain stability not by eliminating rank but by collectively suppressing excessive dominance expression.

CLAIM 4

“Dominance is not a trait; it is a relational position.”

Jerry Wiggins (1979) — Interpersonal Circumplex

Theoretical contribution:

Wiggins’ interpersonal circumplex model conceptualizes social behavior along relational dimensions—such as dominance–submission and affiliation—defined through interactional positioning rather than fixed personality attributes.

Relation to claim:

Wiggins grounds the claim by framing dominance as an interpersonal coordinate emerging within relational exchange rather than as an intrinsic individual characteristic.

Allan Mazur (1985) — Status Signaling and Dominance

Theoretical contribution:

Mazur’s biosocial model describes dominance as a dynamically negotiated outcome of signaling interactions that establish hierarchical position between participants.

Relation to claim:

Mazur provides grounding for dominance as a positional outcome produced through interactional processes rather than

a stable dispositional trait.

Integrative Note:

Together, these works establish dominance as an emergent relational position produced through interactional processes rather than as an intrinsic personal trait.

CLAIM 5

“Observers infer intent from form.”

Fritz Heider (1958) — Attribution Theory

Theoretical contribution:

Heider’s attribution theory demonstrates that individuals interpret observable behavior by inferring underlying intentions, dispositions, and causes from external action and presentation.

Relation to claim:

Heider grounds the claim by establishing that social perception routinely converts behavioral form into inferred intent, allowing observers to interpret motives from minimal observable cues.

Nalini Ambady & Robert Rosenthal (1992) — Thin-Slice Social Inference

Theoretical contribution:

Ambady and Rosenthal show that observers form reliable judgments about intentions, competence, and interpersonal qualities based on brief exposures to behavioral expression.

Relation to claim:

Ambady and Rosenthal provide empirical grounding for rapid inference processes through which intent is attributed from limited behavioral form.

Integrative Note:

Together, these works demonstrate that observers routinely infer intent and disposition from limited behavioral form, converting minimal cues into attributed motives.

CLAIM 6

“Between males and females, these signals are often negotiated implicitly.”

Deborah Tannen (1990) — *You Just Don't Understand***Theoretical contribution:**

Tannen's sociolinguistic analysis demonstrates that male-female interaction frequently relies on indirect signaling, conversational alignment, and implicit negotiation of status and affiliation rather than explicit declaration.

Relation to claim:

Tannen grounds the claim by showing how interactional meaning between sexes is commonly coordinated through implicit communicative patterns rather than overt negotiation.

Alice Eagly & Wendy Wood (1999) — *Social Role Modulation*

Theoretical contribution:

Eagly and Wood argue that behavioral expression reflects interaction between sex-linked tendencies and socially structured role expectations, shaping how dominance and affiliation signals are expressed across contexts.

Relation to claim:

Eagly and Wood provide grounding for implicit negotiation by demonstrating how cross-sex interaction modulates signaling through learned expectations and coordinated role behavior.

Integrative Note:

Together, these works indicate that cross-sex interaction frequently involves implicit negotiation of status and affiliation through patterned communicative cues shaped by role expectations.

CLAIM 7

“The behavior does not change; the frame does.”

Erving Goffman (1974) — *Frame Analysis***Theoretical contribution:**

Goffman introduces framing as the interpretive structures through which individuals organize perception and assign meaning to otherwise identical behavior across contexts.

Relation to claim:

Goffman grounds the claim by demonstrating that shifts in interpretive frame alter social meaning without requiring

behavioral change.

Susan Fiske & Shelley Taylor (1991) — Social Cognition

Theoretical contribution:

Fiske and Taylor describe how perception and judgment depend upon cognitive schemas that mediate interpretation of observed behavior.

Relation to claim:

Fiske and Taylor provide grounding for perceptual mediation by showing that observers interpret behavior through context-dependent cognitive frameworks rather than direct behavioral alteration.

Integrative Note:

Together, these works indicate that changes in interpretive frame alter the social meaning assigned to behavior without requiring any change in the behavior itself.

CLAIM 8

“Dominance is therefore not what one does, but what one occupies in relation.”

Allan Mazur (1985) — Status Signaling

Theoretical contribution:

Mazur’s biosocial theory explains dominance as an emergent

outcome of signaling exchanges that establish relative hierarchical position within interactional systems.

Relation to claim:

Mazur grounds the claim by demonstrating that dominance reflects negotiated relational placement rather than discrete behavioral acts.

Robert Sapolsky (2004) — *Why Zebras Don't Get Ulcers / Rank Stress Physiology*

Theoretical contribution:

Sapolsky shows that physiological and behavioral consequences track social rank position rather than specific actions, emphasizing dominance as a sustained relational state within hierarchy.

Relation to claim:

Sapolsky provides biological grounding for dominance as positional occupancy, where effects arise from relative placement in social structure rather than individual behaviors alone.

Integrative Note:

Together, these works indicate that dominance arises from relational placement within social structure rather than from discrete behavioral acts alone.

CLAIM 9

“Proficiency describes how fluently a behavior is executed.”

Paul Fitts & Michael Posner (1967) — Stages of Skill Acquisition

Theoretical contribution:

Fitts and Posner describe skill learning as progressing through cognitive, associative, and autonomous stages, with increasing fluency, efficiency, and reduced conscious effort in performance.

Relation to claim:

Fitts and Posner ground the claim by defining proficiency in terms of executional fluency emerging through practice and skill consolidation.

Hubert Dreyfus & Stuart Dreyfus (1986) — *Mind Over Machine*

Theoretical contribution:

The Dreyfus model outlines progression from novice to expert performance, emphasizing intuitive, fluid action as expertise develops beyond rule-based execution.

Relation to claim:

Dreyfus and Dreyfus provide grounding for proficiency as the degree to which behavior is performed smoothly and competently through embodied skill rather than deliberative control.

Integrative Note:

Together, these works indicate that proficiency reflects increasing behavioral fluency achieved through practice and skill consolidation, reducing reliance on deliberate, rule-based control.

CLAIM 10

“The distinction is not categorical ability. It is developmental fluency.”

John Anderson (1982) — ACT-R and Proceduralization

Theoretical contribution:

Anderson’s cognitive architecture describes how declarative knowledge becomes proceduralized through practice, allowing performance to shift from effortful processing to automatic execution.

Relation to claim:

Anderson grounds the claim by demonstrating that performance differences emerge from developmental procedural fluency rather than fixed categorical ability.

Paul Fitts & Michael Posner (1967) — Stages of Skill Acquisition

Theoretical contribution:

Fitts and Posner show that behavioral competence develops progressively through learning stages characterized by increasing efficiency and reduced cognitive load.

Relation to claim:

Fitts and Posner provide grounding for fluency as a developmental continuum rather than a binary distinction in ability.

Daniel Kahneman (2011) — *Thinking, Fast and Slow***Theoretical contribution:**

Kahneman distinguishes between effortful, controlled processing and rapid, automatic processing that emerges through familiarity and learned competence.

Relation to claim:

Kahneman grounds the clarification by linking fluent performance to automatic processing developed through experience rather than innate categorical skill differences.

Integrative Note:

Together, these works indicate that differences in performance reflect degrees of developmental fluency along a continuum of skill consolidation rather than categorical distinctions in innate ability.

CLAIM 11

“A behavior arising from central developmental tuning tends to be expressed with economy and fine calibration; when acquired secondarily, it is more effortful and more prone to overshoot or undershoot.”

K. Anders Ericsson (1993) — Deliberate Practice

Theoretical contribution:

Ericsson demonstrates that skills acquired through effortful learning require sustained conscious regulation and typically show variability, inefficiency, and performance instability prior to extensive automatization.

Relation to claim:

Ericsson grounds the distinction between effortful acquisition and calibrated execution by showing that learned behaviors initially demand active control and frequently display overcorrection or inconsistency relative to expert fluency.

Melissa Hines (2004) — *Brain Gender*

Theoretical contribution:

Hines synthesizes evidence that early hormonal influences organize neural development in ways that shape later behavioral tendencies, preferences, and patterns of expression prior to social learning.

Relation to claim:

Hines provides grounding for centrally organized developmental tuning, supporting the claim that certain behavioral expressions arise from early neurodevelopmental organization rather than later social acquisition.

Phoenix, Goy, Gerall & Young (1959) — Organizational-Activational Hypothesis

Theoretical contribution:

The organizational-activational framework establishes that early

hormonal organization produces enduring neural structures that later guide behavior with relative stability and efficiency when activated.

Relation to claim:

Phoenix et al. ground the claim's calibration distinction by explaining how developmentally organized systems produce behavior that operates with intrinsic coordination, contrasting with behaviors assembled through later compensatory learning.

Integrative Note:

Together, these works indicate that behaviors arising from early developmental organization tend to operate with relative efficiency and calibration when activated, whereas behaviors acquired later through deliberate learning often require sustained regulation and may initially display variability or instability before consolidation.

CLAIM 12

“These misreads are not moral failures. They are interface mismatches between tuning and expectation.”

Fritz Heider (1958) — Attribution Theory

Theoretical contribution:

Heider demonstrates that observers interpret behavior by inferring internal causes from external actions, frequently attributing intent or disposition where situational or structural factors are operative.

Relation to claim:

Heider grounds the claim by explaining how perceptual interpretation converts behavioral mismatch into inferred personal fault rather than recognizing differences in underlying organization.

Lee Ross (1977) — Attribution Bias**Theoretical contribution:**

Ross identifies the fundamental attribution error, showing that observers systematically overattribute behavior to internal character while underweighting contextual or systemic influences.

Relation to claim:

Ross provides grounding for perceptual mismatch by demonstrating how expectation-driven interpretation produces misreads when behavioral expression diverges from anticipated norms.

Integrative Note:

Together, these works indicate that observers often interpret mismatches between expectation and behavior as personal or moral failure, rather than recognizing differences in underlying developmental organization or contextual fit.

CLAIM 13

“Consistency describes how broadly a behavior appears across domains and time.”

Paul Costa & Robert McCrae (1992) — Trait Stability

Theoretical contribution:

Costa and McCrae demonstrate that personality characteristics show measurable stability across time and situations while allowing contextual variation in expression.

Relation to claim:

Costa and McCrae ground the claim by linking consistency to cross-situational and longitudinal recurrence of behavioral patterns rather than isolated instances.

Gordon Allport (1937) — *Personality: A Psychological Interpretation*

Theoretical contribution:

Allport conceptualizes personality as enduring patterns of behavior observable across multiple contexts and sustained over time.

Relation to claim:

Allport provides foundational grounding for consistency as distributional breadth, emphasizing recurrence across domains as a defining feature of stable behavioral organization.

Integrative Note:

Together, these works indicate that consistency refers to the recurrence of behavioral patterns across domains and over

time, with distributional breadth serving as a feature of stable organization.

CLAIM 14

“Observers routinely compress limited data into stable character.”

Fritz Heider (1958) — Attribution Theory

Theoretical contribution:

Heider demonstrates that individuals infer enduring dispositions from observed behavior, transforming limited behavioral evidence into assumptions about stable personal characteristics.

Relation to claim:

Heider grounds the claim by establishing the cognitive tendency to interpret sparse observations as indicators of consistent underlying character.

Lee Ross (1977) — Fundamental Attribution Error

Theoretical contribution:

Ross shows that observers systematically overattribute behavior to internal traits while underestimating situational influences.

Relation to claim:

Ross provides grounding for perceptual compression by demonstrating how limited behavioral data becomes generalized into stable dispositional judgments.

Susan Fiske & Shelley Taylor (1991) — Social Cognition

Theoretical contribution:

Fiske and Taylor describe cognitive processing strategies that rely on schemas and heuristics to simplify social perception under informational constraints.

Relation to claim:

Fiske and Taylor ground the compression mechanism by explaining how observers construct stable character impressions from incomplete information to reduce cognitive complexity.

Integrative Note:

Together, these works indicate that observers compress limited behavioral information into generalized character judgments, using cognitive heuristics to stabilize perception and reduce interpretive complexity.

CLAIM 15

“Consistency, like dominance and proficiency, is morally neutral.”

Gordon Allport (1937) — *Personality: A Psychological Interpretation* / Trait Description vs. Evaluation

Theoretical contribution:

Allport distinguishes descriptive personality traits from moral or evaluative judgments, emphasizing that psychological characterization need not imply ethical valuation.

Relation to claim:

Allport grounds the claim by establishing that behavioral regularities may be described analytically without assigning moral worth.

Walter Mischel (1968) — Person–Situation Interaction**Theoretical contribution:**

Mischel demonstrates that behavior reflects interaction between individual tendencies and situational context, challenging moralized interpretations of consistency as fixed virtue or flaw.

Relation to claim:

Mischel provides grounding for neutrality by showing that consistent behavior reflects patterned interaction rather than inherent moral quality.

Integrative Note:

Together, these works indicate that behavioral consistency can be described as a patterned feature of developmental and situational interaction without implying inherent moral valuation.

CLAIM 16

“Dominance, proficiency, and consistency converge in perception. These interpretations are not intrinsic to the behavior. They are assigned by observers who must infer

intent from incomplete data.”

Nalini Ambady & Robert Rosenthal (1992) — Thin Slicing

Theoretical contribution:

Ambady and Rosenthal demonstrate that observers rapidly form integrated judgments about individuals from minimal behavioral exposure, combining multiple perceived traits into unified impressions.

Relation to claim:

Ambady and Rosenthal ground perceptual convergence by showing how separate behavioral dimensions are synthesized into coherent social judgments under limited informational conditions.

Susan Fiske & Shelley Taylor (1991) — Social Inference

Theoretical contribution:

Fiske and Taylor describe social perception as an inferential process in which observers rely on cognitive schemas and heuristics to interpret behavior efficiently despite incomplete information.

Relation to claim:

Fiske and Taylor provide grounding for observer assignment of meaning, demonstrating how inferred intent arises from interpretive processing rather than intrinsic behavioral properties.

Erving Goffman (1959) — *The Presentation of Self in Everyday Life* / Interaction Order

Theoretical contribution:

Goffman shows that interaction depends upon participants interpreting behavioral presentation to establish social understanding within encounters.

Relation to claim:

Goffman grounds the interactional context in which dominance, proficiency, and consistency become perceptually unified through ongoing social interpretation.

Integrative Note:

Together, these works indicate that observers synthesize limited behavioral cues into unified judgments, inferring intent and character through ongoing social interpretation rather than from intrinsic properties of the acts themselves.

CLAIM 17

“The system does not ask what the actor meant. It asks what the act resembles within the observer’s frame.”

Erving Goffman (1974) — *Frame Analysis***Theoretical contribution:**

Goffman demonstrates that individuals interpret events through organizing frames that determine how actions are understood within social interaction, independent of actor intention.

Relation to claim:

Goffman grounds the claim by showing that social interpretation depends upon frame alignment, whereby behavior is classified

according to recognizable patterns rather than inferred subjective intent.

Daniel Kahneman (2011) — *Thinking, Fast and Slow* / Heuristic Judgment

Theoretical contribution:

Kahneman describes heuristic processing in which judgments are made through pattern recognition and similarity matching under conditions of limited information.

Relation to claim:

Kahneman provides grounding for interpretive assignment by demonstrating how observers evaluate actions based on resemblance to familiar categories rather than deliberate reconstruction of intent.

Integrative Note:

Together, these works indicate that social interpretation relies on recognizable patterns and categorical resemblance, with observers classifying behavior within familiar frames rather than reconstructing actor intent from first principles

CLAIM 18

“Dominance, proficiency, and consistency are how developmental tuning becomes legible.”

Robert Boyd & Peter Richerson (1985) — *Culture and the Evolutionary Process* / Cultural Interpretation Systems

Theoretical contribution:

Boyd and Richerson describe cultural systems as interpretive frameworks through which behavioral variation becomes intelligible and socially meaningful within populations.

Relation to claim:

Boyd and Richerson ground the claim by showing how socially shared interpretive systems render underlying behavioral organization observable and classifiable.

John Tooby & Leda Cosmides (1992) — *The Psychological Foundations of Culture / Evoked Cognition***Theoretical contribution:**

Tooby and Cosmides propose that evolved cognitive mechanisms interpret environmental and social inputs through structured inference systems that render behavior meaningful within adaptive contexts.

Relation to claim:

Tooby and Cosmides provide grounding for legibility by demonstrating how developmental organization becomes perceptually accessible through cognitive systems evolved to detect patterned behavioral signals.

Integrative Note:

Together, these works indicate that culturally shared interpretive systems and evolved cognitive mechanisms render patterned behavioral variation intelligible, allowing dimensions such as dominance, proficiency, and consistency to become socially

legible.

CLAIM 19

“Dominance, proficiency, and consistency are the axes along which developmental tuning enters social meaning.”

Nikolaas Tinbergen (1963) — *On Aims and Methods of Ethology* / Proximate–Ultimate Linkage

Theoretical contribution:

Tinbergen’s framework connects proximate behavioral mechanisms with ultimate functional outcomes, demonstrating how biological organization becomes observable through behavior within ecological and social contexts.

Relation to claim:

Tinbergen grounds the transition described in the claim by linking developmental mechanisms to socially interpretable behavioral expression, enabling biological organization to enter observable meaning systems.

Robert Boyd & Peter Richerson (1985) — *Culture and the Evolutionary Process* / Cultural Transmission

Theoretical contribution:

Boyd and Richerson describe how behavioral patterns acquire shared meaning through transmission and interpretation within cultural systems.

Relation to claim:

Boyd and Richerson provide grounding for meaning integration

by showing how culturally mediated interpretation converts behavioral expression into socially recognized significance.

Integrative Note:

Together, these works indicate that developmental organization becomes socially meaningful through behavioral expression, with cultural systems providing the interpretive frameworks that render such patterns intelligible.

CLAIM 20

“Behavior is not only what is done. It is what is seen.”

Erving Goffman (1959) — *The Presentation of Self in Everyday Life*

Theoretical contribution:

Goffman demonstrates that social behavior functions within interaction as presentation, where meaning emerges through how actions are perceived and interpreted by observers.

Relation to claim:

Goffman grounds the claim by showing that behavior acquires social significance through observation and interpretation within interactional contexts, not solely through enacted conduct.

Fritz Heider (1958) — Attribution Processes

Theoretical contribution:

Heider’s attribution theory explains how observers construct

understanding of behavior by inferring causes, intentions, and dispositions from perceived action.

Relation to claim:

Heider provides grounding for interpretive closure by demonstrating that behavior becomes socially real through observer inference rather than objective action alone.

Integrative Note:

Together, these works indicate that behavior acquires social meaning through observation and interpretive processing within interaction, such that its significance arises not solely from enactment but from how it is perceived and attributed.

Section 4 — Environment, Culture, and the Persistence of Sex-Differentiated Patterns

CLAIM 1

“Human societies differ radically. Yet across these differences, one fact persists: males and females remain recognizably male and female.”

David Buss (1989) — Cross-Cultural Mate Preference

Theoretical contribution:

Buss’s cross-cultural research demonstrates recurrent sex-differentiated mating preferences across diverse societies, indicating patterned behavioral differences that persist despite substantial cultural variation.

Relation to claim:

Buss grounds the claim by providing empirical evidence that sex-differentiated behavioral patterns remain recognizable across widely differing cultural environments.

George P. Murdock (1967) — *Ethnographic Atlas*

Theoretical contribution:

Murdock’s comparative ethnographic database documents social organization, kinship systems, labor divisions, and family structures across hundreds of societies worldwide.

Relation to claim:

Murdock provides anthropological grounding for cross-cultural

persistence by demonstrating recurring recognition of male and female social categories across diverse ecological and cultural contexts.

Integrative Note:

Together, these works demonstrate cross-cultural persistence of male and female social categorization and recurrent sex-differentiated behavioral patterns despite substantial ecological and institutional variation.

CLAIM 2

“The expression of these tendencies varies. Their existence does not.”

Alice Eagly & Wendy Wood (1999) — Social Role Theory (Modulation)

Theoretical contribution:

Eagly and Wood demonstrate that behavioral differences between sexes are shaped in expression by social roles and environmental conditions while interacting with underlying predispositions.

Relation to claim:

Eagly and Wood ground the claim by showing how cultural and ecological variation modulates behavioral expression without eliminating recurrent sex-differentiated tendencies.

David Geary (1998) — *Male, Female: The Evolution of Human Sex Differences*

Theoretical contribution:

Geary synthesizes evolutionary and developmental evidence indicating persistent sex-differentiated behavioral patterns emerging from reproductive and developmental pressures across human populations.

Relation to claim:

Geary provides grounding for persistence by demonstrating continuity of sex-differentiated tendencies despite variability in cultural manifestation.

Integrative Note:

Together, these works indicate that cultural and ecological conditions modulate the expression of sex-differentiated tendencies without eliminating their cross-population recurrence.

CLAIM 3

“Roles did not invent these patterns; they crystallized them.”

John Tooby & Leda Cosmides (1992) — *The Psychological Foundations of Culture / Evoked Culture*

Theoretical contribution:

Tooby and Cosmides propose that cultural variation often reflects environmental activation of underlying psychological

mechanisms rather than invention of entirely new behavioral patterns.

Relation to claim:

Tooby and Cosmides ground the claim by showing that social roles organize and stabilize preexisting behavioral tendencies that emerge from evolved psychological architecture.

Robert Boyd & Peter Richerson (1985) — Gene–Culture Coevolution

Theoretical contribution:

Boyd and Richerson demonstrate that cultural institutions evolve through interaction with inherited behavioral predispositions, reinforcing and formalizing recurring patterns of behavior.

Relation to claim:

Boyd and Richerson provide grounding for crystallization by explaining how cultural roles consolidate and transmit behavioral regularities rather than generating them de novo.

Integrative Note:

Together, these works indicate that social roles organize, stabilize, and transmit recurrent behavioral tendencies emerging from underlying psychological architecture rather than generating those patterns independently.

CLAIM 4

“Infants respond to sex-differentiated behavior long before they understand categories.”

Melissa Hines (2004) — *Brain Gender / Prenatal Hormone Research*

Theoretical contribution:

Hines synthesizes developmental research showing that prenatal hormonal influences affect behavioral preferences and responses observable early in life, prior to explicit social understanding.

Relation to claim:

Hines grounds the claim by demonstrating that behavioral responsiveness related to sex differentiation emerges early in development, preceding categorical knowledge or social labeling.

Sheri Berenbaum & Adriene Beltz (2011) — *Sexual Differentiation Research*

Theoretical contribution:

Berenbaum and Beltz review evidence linking biological developmental processes to early behavioral differences observable in infancy and childhood before formal gender categorization is established.

Relation to claim:

Berenbaum and Beltz provide grounding for early bias by showing that infants display differential behavioral responses associated with sex-linked developmental influences

independent of learned categories.

Integrative Note:

Together, these works indicate that sex-differentiated behavioral tendencies emerge early in development, prior to explicit gender categorization or social labeling.

CLAIM 5

“Societies exert enormous influence. They can amplify, suppress, redirect, or moralize behavior. But they cannot erase the underlying architecture.”

Robert Boyd & Peter Richerson (1985) — Gene–Culture Coevolution

Theoretical contribution:

Boyd and Richerson demonstrate that cultural systems strongly shape behavioral expression while remaining constrained by evolved psychological and biological mechanisms.

Relation to claim:

Boyd and Richerson ground the claim by showing that cultural environments regulate behavioral outcomes without fundamentally redesigning underlying developmental architecture.

Carole Hooven (2021) — *T: The Story of Testosterone*

Theoretical contribution:

Hooven synthesizes endocrinological and behavioral research illustrating how hormonal systems influence behavioral tendencies while interacting with environmental and cultural conditions.

Relation to claim:

Hooven provides grounding for persistence of underlying architecture by demonstrating that biological regulatory systems continue to shape behavioral predispositions even under substantial social modulation.

Integrative Note:

Together, these works indicate culture can regulate behavior without redesigning the underlying developmental structures. The persistence of the underlying architecture continues to shape behavioral tendencies despite substantial social moderation.

CLAIM 6

“Prenatal hormonal environments bias perception, temperament, interest, and response.”

Phoenix, Goy, Gerall & Young (1959) — Organizational Effects**Theoretical contribution:**

The organizational–activational hypothesis establishes that prenatal hormonal exposure organizes neural development, producing enduring influences on later behavioral expression.

Relation to claim:

Phoenix et al. ground the claim by demonstrating how early hormonal environments shape behavioral predispositions prior to postnatal social experience.

Melissa Hines (2004) — *Brain Gender / Prenatal Androgen Effects***Theoretical contribution:**

Hines synthesizes evidence linking prenatal androgen exposure to variation in behavioral preferences, activity patterns, and cognitive tendencies observable across development.

Relation to claim:

Hines provides grounding for bias across perceptual and temperamental domains influenced by early hormonal organization.

Sheri Berenbaum & Adriene Beltz (2011) — *Brain Differentiation***Theoretical contribution:**

Berenbaum and Beltz review research demonstrating biological contributions to sex-differentiated neural and behavioral development arising from early endocrine influences.

Relation to claim:

Berenbaum and Beltz ground the claim's multidomain scope by showing how prenatal differentiation affects perception, motivation, and behavioral responsiveness.

Integrative Note:

Together, these works indicate that prenatal hormonal organization contributes to enduring differences in behavioral predispositions across perceptual, motivational, and temperamental domains observable early in development.

CLAIM 7

“These biases are probabilistic, not deterministic.”

Janet Shibley Hyde (2005) — Gender Similarities Hypothesis / Distribution Overlap

Theoretical contribution:

Hyde’s meta-analytic work demonstrates substantial overlap between male and female distributions across many psychological traits, indicating statistical tendencies rather than categorical separation.

Relation to claim:

Hyde grounds the probabilistic framing by showing that sex-differentiated behavioral tendencies emerge as population-level distributions rather than deterministic individual outcomes.

Marco Del Giudice, Paul Booth & Irwing (2012) — Multivariate Sex Differences

Theoretical contribution:

Del Giudice and colleagues demonstrate that while individual traits may overlap considerably, multivariate patterns reveal structured statistical differentiation across sexes.

Relation to claim:

Del Giudice et al. provide grounding for probabilistic bias by showing how patterned differentiation arises across trait constellations without implying determinism at the individual level.

Integrative Note:

Together, the works indicate multiple sex-differentiated behavioral tendencies overlap considerably without implying determinism at the individual level. Population level distributions, rather than individual outcomes, are indicative of patterned differentiation across traits.

CLAIM 8

“Sex-differentiated behavior is robust because it is rooted in developmental processes.”

Carole Hooven (2021) — *T: The Story of Testosterone*

Theoretical contribution:

Hooven synthesizes endocrinological and behavioral research demonstrating how hormonal systems influence behavioral tendencies across development, contributing to stable patterns of sex-differentiated expression.

Relation to claim:

Hooven grounds the claim by showing how biologically mediated developmental processes produce enduring

behavioral tendencies resilient to environmental variation.

David Geary (1998) — *Male, Female: The Evolution of Human Sex Differences / Developmental Differentiation*

Theoretical contribution:

Geary integrates evolutionary and developmental evidence showing that sex-differentiated behavioral patterns emerge through developmental pathways shaped by reproductive and adaptive pressures.

Relation to claim:

Geary provides grounding for developmental robustness by linking persistence of sex-differentiated behavior to organized developmental processes rather than transient social influence.

Integrative Note:

Together, these works indicate that hormonal and developmental processes contribute to stable sex-differentiated behavioral tendencies that persist across development rather than arising solely from transient social influences.

CLAIM 9

“Plasticity itself is biologically constrained.”

Bruce Ellis et al. (2011) — Developmental Plasticity

Theoretical contribution:

Ellis and colleagues describe developmental plasticity as

adaptive responsiveness to environmental conditions operating within biologically specified ranges shaped by evolutionary pressures.

Relation to claim:

Ellis et al. ground the claim by demonstrating that developmental flexibility functions within evolved limits rather than permitting unrestricted behavioral modification.

Hillard Kaplan et al. (2000) — Human Life History Evolution / Life History Constraints

Theoretical contribution:

Kaplan and colleagues show that human developmental strategies reflect trade-offs imposed by energetic, ecological, and reproductive constraints that structure possible developmental outcomes.

Relation to claim:

Kaplan provides grounding for constraint boundaries by linking developmental variation to life-history limitations governing growth, investment, and behavioral adaptation.

Integrative Note:

Together, these works indicate that developmental variation reflects adaptive responsiveness operating within ecological and reproductive constraints, with life-history structure limiting the range of possible developmental outcomes.

Section 5 — Constraint, Redirection, and Fractal Persistence

CLAIM 1

“Biological systems do not extinguish core functions when blocked. They reroute them.”

Kurt Lewin (1936) — Field Theory

Theoretical contribution:

Lewin’s field theory conceptualizes behavior as movement within dynamic psychological systems in which barriers alter pathways of expression rather than eliminating underlying motivational forces.

Relation to claim:

Lewin grounds the claim by demonstrating that constraint within a system redirects behavioral expression along alternative available pathways instead of terminating underlying drives.

Neal Miller (1941) — Displacement of Drive

Theoretical contribution:

Miller’s work on drive theory shows that when direct satisfaction of motivation is obstructed, behavioral expression is displaced toward substitute targets or channels.

Relation to claim:

Miller provides grounding for systems redirection by illustrating how blocked biological or motivational processes persist

through altered forms of expression.

Integrative Note:

Together, these works indicate that constraints within a system redirect behavioral expression rather than terminating underlying motivational processes, with blocked tendencies persisting through alternative pathways of action.

CLAIM 2

“Human systems are no different.”

Murray Gell-Mann (1994) — *The Quark and the Jaguar*

Theoretical contribution:

Gell-Mann describes complex adaptive systems as operating through shared organizational principles across biological, cognitive, and social domains, where constraints alter system expression without eliminating underlying processes.

Relation to claim:

Gell-Mann grounds the claim by demonstrating continuity between biological and human systems within complexity theory, supporting the extension of redirection dynamics to social organization.

Integrative Note:

Gell-Mann grounds the claim by describing complex adaptive systems as operating through shared organizational principles

across biological and social domains, allowing constraint-driven redirection dynamics to extend to human systems.

CLAIM 3

“Because sex-differentiated behavior is developmentally grounded, it is not optional.”

Phoenix, Goy, Gerall & Young (1959) — Organizational Effects

Theoretical contribution:

The organizational–activational hypothesis demonstrates that early hormonal organization produces enduring neural structures influencing later behavioral expression.

Relation to claim:

Phoenix et al. ground the claim by showing that developmentally organized behavioral systems arise prior to conscious choice and therefore persist independently of voluntary selection

David Geary (1998) — *Male, Female: The Evolution of Human Sex Differences / Developmental Strategy*

Theoretical contribution:

Geary integrates evolutionary and developmental evidence showing that sex-differentiated behavioral tendencies emerge from adaptive developmental strategies shaped by reproductive pressures.

Relation to claim:

Geary provides grounding for structural inevitability by demonstrating that these behavioral patterns reflect organized

developmental pathways rather than optional cultural adoption.

Integrative Note:

Together, these works indicate that sex-differentiated behavioral tendencies arise through organized developmental processes that precede conscious choice, reflecting structured developmental pathways rather than voluntary adoption.

CLAIM 4

“When the ordinary channels through which a tendency would express are blocked—by environment, by social structure, or by sustained misalignment—expression does not cease. It changes form.”

John Dollard et al. (1939) — Frustration–Aggression Hypothesis

Theoretical contribution:

Dollard and colleagues propose that obstruction of goal-directed behavior generates persistent motivational activation that seeks alternative outlets rather than disappearing.

Relation to claim:

Dollard et al. ground the claim by demonstrating that blocked behavioral expression results in displacement or transformation of response rather than elimination of underlying drive.

Leonard Berkowitz (1989) — Reformulation of Frustration Theory

Theoretical contribution:

Berkowitz refines frustration theory by showing that blocked goals produce affective activation that may manifest through varied behavioral pathways depending on contextual conditions.

Relation to claim:

Berkowitz provides grounding for redirected expression by explaining how constraint alters behavioral form while preserving underlying motivational activation.

Integrative Note:

Together, these works indicate that when environmental or structural constraints block direct behavioral expression, underlying motivational activation persists and is redirected into alternative forms of response. Rather than eliminating the underlying drive, constraint alters the behavioral form.

CLAIM 5

“The forms differ. The grammar remains.”

Konrad Lorenz (1966) — Redirected Aggression**Theoretical contribution:**

Lorenz describes how instinctive behavioral systems persist under constraint, with blocked expression redirected toward alternative targets while underlying behavioral organization remains intact.

Relation to claim:

Lorenz grounds the claim by demonstrating that behavioral

expression may change form under constraint without alteration of the governing behavioral structure.

Frans de Waal (1982) — Coalition and Tension in Primate Societies

Theoretical contribution:

de Waal documents how primate social systems maintain stable interactional rules even as conflict, alliance formation, and tension expression shift across contexts.

Relation to claim:

de Waal provides grounding for structural persistence by showing that social grammar regulating interaction survives changes in behavioral manifestation.

Integrative Note:

Together, these works indicate that constraints may alter the form of behavioral expression while the underlying interactional structure governing behavior remains intact. Social grammar that regulates interactions persists during behavioral change.

CLAIM 6

“Developmental tuning produces tendencies. Interaction organizes them. Culture channels them. Constraint redirects them.”

Robert Boyd & Peter Richerson (1985) — Norm Systems

Theoretical contribution:

Boyd and Richerson demonstrate how culturally transmitted norms regulate behavioral expression by stabilizing coordination within populations.

Relation to claim:

Boyd and Richerson ground the cultural channeling component by showing how social systems organize and constrain behavioral tendencies through shared norms.

Peter Turchin (2006) — Structural Stress**Theoretical contribution:**

Turchin analyzes how social systems respond dynamically to internal and external pressures, producing reorganization rather than system extinction under constraint.

Relation to claim:

Turchin provides grounding for constraint-driven redirection, illustrating how pressures reshape expression within persistent structural systems.

Murray Gell-Mann (1994) — *The Quark and the Jaguar* / Complex Adaptive Systems**Summary of Theoretical contribution:**

Gell-Mann describes adaptive systems as maintaining underlying generative rules while altering observable behavior in response to environmental conditions.

Annotation:

Gell-Mann grounds the integrated process model by supporting

continuity between production, organization, and adaptive redirection within complex systems.

Erving Goffman (1959) — *The Presentation of Self in Everyday Life*

Theoretical contribution:

Goffman demonstrates how interactional contexts organize behavioral presentation through socially structured encounters.

Relation to claim:

Goffman grounds the interactional organization component by showing how tendencies become structured through ongoing social engagement.

Integrative Note:

Together, these works indicate that behavioral tendencies emerging from development are organized through interaction, channeled by cultural norms, and redirected under constraint while underlying system structure persists. Within persistent structures, social pressures redirect the expression of behavioral tendencies.

CLAIM 7

“The same pattern recurs at every scale because the same organism is present at every scale.”

Nikolaas Tinbergen (1963) — *On Aims and Methods of Ethology* / Multi-Level Continuity

Theoretical contribution:

Tinbergen's framework establishes continuity of behavioral organization across explanatory levels, linking individual mechanisms to broader functional and evolutionary structures.

Relation to claim:

Tinbergen grounds recurrence across scales by demonstrating that higher-order social organization remains rooted in organism-level behavioral systems.

Robert Boyd & Peter Richerson (1985) — *Recursive Inheritance*

Theoretical contribution:

Boyd and Richerson describe cultural inheritance as a recursive process in which behavioral patterns propagate across generations and expanding social structures through transmission mechanisms grounded in human cognition.

Relation to claim:

Boyd and Richerson provide grounding for fractal consolidation by showing how inherited behavioral organization persists as social systems scale outward from individuals to populations.

Integrative Note:

Together, these works indicate organism-level behavioral organization persists as higher-order social systems scale

outward from individuals to populations.

CLAIM 8

“Where expression is integrated, it stabilizes; when it is denied, it fractures; when it is misunderstood, it polarizes.”

Peter Turchin (2006) — *War and Peace and War / Structural Instability*

Theoretical contribution:

Turchin demonstrates how social systems move toward stability or instability depending on alignment between structural pressures and institutional integration.

Relation to claim:

Turchin grounds stabilization and fracture outcomes by showing how unresolved structural pressures generate systemic fragmentation and conflict dynamics.

Jack Brehm (1966) — *Psychological Reactance*

Theoretical contribution:

Brehm’s reactance theory shows that restriction or denial of behavioral expression produces motivational resistance and oppositional response.

Relation to claim:

Brehm provides grounding for polarization by demonstrating how perceived denial or misunderstanding of expression amplifies counter-reaction and social division.

Integrative Note:

Together, these works indicate that social systems stabilize when structural pressures are integrated within institutional arrangements, while unresolved constraints produce fragmentation and conflict. Perceived denial of expression amplifies oppositional response and social polarization.