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Chiasmus: A Phenomenon of Language, Body and Perception

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Abstract

The term *chiasmus* and all its many variants describe a phenomenon of language, body and perception. As a syntactic-rhetorical device, the usage of which is culturally diffuse, chiasmus involves a re-ordering of elements in a sentence to produce an A-B-B-A pattern. An example of this is the well-known saying falsely attributed to Hippocrates: “Let thy food be thy medicine and medicine be thy food.” As a symbol, chiasmus describes a pattern with intersecting lines, the most simplistic form of which is the ***X***. *Chiasm,* in the work of Maurice Merleau-Ponty, refers to a phenomenon of body and mind. Insofar as it is used in the latter part of this work, *chiasm* refers to how the body and brain negotiate motor function, touch and perception: the right hemisphere of the brain corresponds with movement and function in the left side of the body, and the left hemisphere of the brain corresponds to movement and function in the right side of the body. All chiastic forms involve an intersection or crossing of the elements—whether syntactical or anatomical.

The first chapter of the thesis is a literature review entitled, “Chiastic Studies and Typology,” which gives an overview of a few in-depth studies on chiasmus and of chiastic types that have been identified in semiotics and at the syntactical level. The second chapter of the thesis, “Chiastic Forms and Figures: Truths, Logic and Cross-Linguistic Usage” examines chiasmus as a semiotic and syntactic phenomenon. Part of the discussion considers whether and how chiasmus as a semiotic phenomenon is not only a symbol of self, but also a symbol of the person’s truthfulness or trustworthiness. Proceeding on, this section transitions into a broader reflection on how chiasmus overlaps with truth-functional logic and is an aspect of systematicity in language.

Focusing specifically on a sub-type of chiasmus, antimetabole, this section highlights 80 different examples, in 28 different languages and family groups. Antimetabole is characterized by precise reversals of the sentence elements: “Let thy food be thy medicine and medicine be thy food” entails a repetition and reversal of the elements *medicine* and *food*. This phrase would still be chiastic if a synonym for food was used, but it would not be an example of antimetabole. The identified examples of antimetabole fit into eight types:

1) Equalization: AB equates to or is the same as BA
2) Part-whole: A is part of B, and B is part of A
3) Exclusion: A excludes B, and B excludes A
4) Dissociation: A dissociates from B, B dissociates from A
5) Combination: A and B, B and A; the elements are grouped together
6) Comparison: A and B are better than B and A; or A and B are worse than B and A

7) One Way Effects: A affects B, but B does not affect A; or A does not affect B, but B affects A
8) Multiple Effects: A affects B, and B affects A; or A affects B and B affects A;
can also include more elaborate reversals with repeating C, D, E elements

The third chapter of the work, “Merleau-Ponty’s Chiasm: a Theory of Perception” concerns Maurice Merleau-Ponty’s text *The Visible and the Invisible,* in which he develops chiasm as a concept. This is an interpretation of his text that argues that the chiasm is a five-fold bodily relation, referring to:

1) Its role in connecting the visible with the invisible – or the perceptual with mental phenomena
2) The way the two eyes work together to produce one perceptual experience
3) The experience of touch other things and touching oneself
4) A linguistic and meaning-making process, in which meaning is constantly in flux
5) The social dynamic, or interactivity between One and Other

The fourth chapter, “Models of the Brain: Metaphors, Architectures and Chiastic Applications” argues that the chiasm has usefulness in describing perception and activities of the brain. Beginning with a criticism of metaphors of the brain which have been influential in defining approaches to artificial intelligence, this chapter reveals the shortcomings of calling the brain a *hierarchy,* and the related notion that the brain is either a top-down or bottom-up architecture. It also challenges presently held views on how information is stored in a brain. Each sub-section accomplishes this by examining a different approach, including:

1) Representational Theory of Mind and its corresponding logic-based efforts to produce an artificially intelligent computer
2) Connectionism and one of its promising descendants in deep learning, specifically the convolutional neural network underlying SPAUN (Semantic Pointer Architecture Unified Network); and
3) Bayesian approaches to mind, which found momentum alongside linear predictive coding, and Hidden Markov models.

To complete this analysis is a more intensive argument that the architecture of the biological human brain is chiastic, rather than strictly top-down or bottom-up. The final part of this chapter draws on the philosophy of Maurice Merleau-Ponty, along with a body of research on the brain and bodily hemispheres. It demonstrates why scholars and engineers in artificial intelligence would be remiss to overlook the chiasm—both in developing

theories of perception, and when it comes to making practical design choices in building more humanlike artificial intelligence.

The last chapter in the thesis “Embodied X Figures and Forms of Thought” is intended to be a companion piece or footnote to the first. It is a review of Pelkey’s 2017 book, *The Semiotics of X: Chiasmus, Cognition, and Extreme Body Memory.* This review was previously published in *Semiotica* and is included here to provide further useful background.

Lay Summary

Chiasmus is a syntactic pattern, most frequently an A-B-B-A pattern, though the patterns may be more elaborate and include more elements. Before the main chapters, there is a literature review chapter, “Chiasmus Studies and Typology,” which introduces different types of chiasmus identified to date. The second chapter of the thesis “Chiastic Forms and Figures” concerns chiasmus as an aspect of language, but also of semiotics. Where it describes symbols, chiasmus refers to X — two lines that cross. I probe Pelkey’s (2017) thesis that X represents a spread posture of the human form, while also exploring X as a symbol of a “truth,” via its correlates in Western culture. The paper “Chiastic Forms and Figures” examines chiasmus as a tool with some similarities to truth-functional logic, and analyses 80 examples of chiasmus from 28 different language families and groups, in an effort to show some common cross-linguistic types.

The third chapter, “Merleau-Ponty’s Chiasm: A Theory of Perception” is an interpretation of *The Visible and the Invisible* by Maurice Merleau-Ponty, in which chiasm the structure that both links and separates the individual from the World and all other instances of ‘flesh’, a primal element which pre-exists the material world. The chiasm also describes the relation and interaction between individuals, who are themselves part of flesh. For Merleau-Ponty, chiasm includes the optic chiasma, which connects the eyes and allows normal perception to occur, and it also encompasses how a person engages in touch and the experience of touching oneself. The other chiastic relation Merleau-Ponty defines is a linguistic one, pertaining to the exchange between two speakers and how they engage in the meaning-making process. After closely examining these bodily relations, I propose a more robust theory of perception, social interaction and language in Merleau-Ponty’s text.

The fourth chapter of the thesis, “Models of the Brain: Metaphors, Architectures and Chiastic Applications” reinforces how Merleau-Ponty’s concept of chiasm is useful in describing human perceptual processing. The dominant view is that the brain is hierarchical, and that information is conveyed through it in “bottom up” or “top down” manner: through the eyes and visual areas and up to the higher order areas of the brain, or with the higher order areas of the brain generating predictive content that is then shared with the lower, visual areas. I establish reasons why it is limiting to metaphorize the brain as a hierarchy, and explore other metaphors related to how the brain stores information, which hold considerable influence in cognitive science and artificial intelligence. This chapter also draws on the work of Merleau-Ponty and neuroscientific research on the brain and bodily hemispheres to propose that the chiasm is an important aspect of brain-body architecture. Considering the roles of the hemispheres and how they complement each other in the perceptual process may be beneficial in augmenting theories about the brain, and building humanlike artificial intelligence.

The final chapter of the thesis “Embodied X Figures and Forms of Thought” provides some additioal information about Embodied X and chiasmus. This reviews Pelkey’s 2017 book, *The Semiotics of X: Chiasmus, Cognition, and Extreme Body Memory,* and the paper was previously published in *Semiotica*.

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Chiasmus: A Phenomenon of Language, Body and Perception

Introduction

As a phenomenon and concept, *chiasm* and its many derivatives have a little-recognized but widespread influence. The syntactic-rhetorical *chiasmus* involves reversing the elements in a sentence and rendering an A-B-B-A pattern. These pithy phrases are memorable and are present across languages from diverse families and groups. One such example is the oft repeated axiom: “Winners never quit and quitters never win.” The term *chiasm* associates not only with this linguistic relation between these two opposite and interacting conditions (i.e. a situation in which there are either losers or winners), but through the late critical inquiries of Maurice Merleau-Ponty, it also develops a more expansive meaning. Although there are differing perspectives on Merleau-Ponty’s chiasm, it is defined in a general regard as *reversibility*. Each of the chapters making up this thesis investigates the *chiasm* from a different angle. “Chiastic Forms and Figures: Truths, Logic and Cross-Linguistic Usage” chiefly focuses on the cross-linguistic prevalence of syntactic chiasmus, while “Merleau-Ponty’s Chiasm: A Theory of Perception” spotlights Merleau-Ponty’s contributions, and more thoroughly interprets the chiasm as a concept in his text *The Visible and the Invisible.* “Merleau-Ponty’s Chiasm” especially presents the case that *chiasm* is a bodily relation: it is linguistic, but it is also interpersonal, and bridges the gap between One and Other. In this interpretation of Merleau-Ponty’s work,

the chiasm is shown to be a five-fold relation between human bodies, and within the body of the individual: 1) it refers to the human agent's proprioceptive awareness and ability to touch his own body and to feel his touch. 2) The chiasm allows the human agent to experience a sense of wholeness and divergence from Other and world. 3) It is a part of the linguistic exchange between individuals and of how we engage in meaning-making processes. 4) Most significantly, the term chiasm describes perception, and finds a literal referent with the optic chiasma, which is a midbrain structure that extends to the eyes. 5) For Merleau-Ponty, the chiasm is the force that defines the entire conscious experience of humankind, and differentiates each Being from *flesh*, or the primal and pre-substantive element.[1] Drawing on this, the chapter of the thesis entitled, "Models of the Brain: Metaphors, Architectures and Chiastic Applications" examines an issue in artificial intelligence: how researchers conceptualize and metaphorize the human brain and perceptual processes. Applying Merleau-Ponty's concept of chiasm to the issue, "Models of the Brain" argues for its usefulness in better describing perception. All of the chapters emphasize a central point: that the chiasm is an important aspect of human linguistic, social and perceptual experience.

Before the first chapter there is a literature review, with a special concentration on researchers who have applied their studies of chiasmus to a broad range of topics. This literature review also includes an overview of

[1] For a fuller discussion of *flesh,* see Section entitled "Merleau-Ponty: a Theory of Perception."

chiastic typology and the researchers who have noted different chiastic types to date. After going in depth on each typology, I briefly present my own in preparation for the discussion in the first paper. The chapter “Chiastic Forms and Figures” specifically concentrates on identifying chiasmus across a range of different languages, then proceeds into a discussion of its argumentative function. Chiasmus often joins together two divergent statements. It bears some similarities to truth-functional logic: chiastic phrasing can feature a proposition and negation, a logical disjunction and other combinative effects. In all instances, it is a meeting point or intersection of two possibilities. Lissner (2007) posits that chiasmus is an ingrained aspect of embodiment, and Pelkey (2017) proposes that chiastic structures are derived from the foundations of the human form —with outstretched limbs and a spread posture that can create an embodied X. Beginning with a discussion of the attributes of the semiotic correlate X, “Chiastic Forms and Figures” considers how “chi” coincides with the concept of truth in Western culture. This segues into a deeper consideration of logic as a truth-finding method and how it relates to the syntactical structures of chiasmus. Examples of chiasmus from twenty-nine different languages are brought together in a typology, in part inspired by the semiotic typology of Pelkey (2017) and the syntactic typology of Paul (2014). The new typology which I offer differs from Paul’s in that it is limited to A-B-B-A syntactical arrangements, rather than more extended chiastic patterns, such as A-B-C-C-B-A reversals. Paul’s examples are also primarily from English texts, and

he recognizes only four types. With my strict focus on the A-B-B-A pattern, the sub-type commonly known as antimetabole, eight clear types emerge cross-linguistically. Notably, chiastic structures are systematic, in the sense in which Fodor defines *systematicity* – in that they are logical and readable permutations of elements in an organized system of language. The common example, “John loves Mary” and “Mary loves John” is chiastic, and yet a closer examination of the chiastic types will reveal a reason why it could be difficult to train an algorithm to recognize how semantics may drastically fluctuate even with such a restricted re-arrangement of sentence elements. The final remarks in “Chiastic Forms and Figures” focus on applications of the work for those in cognitive science and informatics, as the other two sections deal chiefly with those areas of interest.

The third chapter of the work “Merleau-Ponty’s Chiasm: A Theory of Perception” interprets Merleau-Ponty’s concept of the chiasm. As noted in the introduction above, Merleau-Ponty’s usage is deeply complex and layered, referring to five different bodily relations: the relation between Being and flesh, between the two eyes of the perceiver, and within the reflexive aspect of touch. The chiastic relation also occurs as a social and linguistic one, between individuals each in possession of bodies that co-exist in a world. Each subsection covers these bodily relations, with the first exploring the extant literature on the concept of flesh and clarifying its definition. Another section revolves around vision and perception in *The Visible and the Invisible*, and makes connections to Merleau-Ponty’s earlier work on

expression. Merleau-Ponty's notes for *The Visible and the Invisible* inform the diagram of the chiasm which I present in the third section of this chapter, which centers on the topic of touch and its relationship to language. The fourth section contends with the subjects of language and logic, and proposes that the chiasm is an alternative way of arriving at meaning — not through demanding restrictive categorization or definition, but through recognizing fluctuating circumstances and the connection between seemingly opposite conditions. Finally, the last section in "Merleau-Ponty's Chiasm" treats the social aspects of the chiasm, the Me-Other exchange that occurs as each person both expresses his individuality and finds confluence with another. Merleau-Ponty explains there is a "fundamental narcissism to all vision," not to assert a solipsistic attitude, but to point to the possibility that an individual can get caught up in his own reflection, at the risk of not only ignoring but also harming others.

Maurice Merleau-Ponty's philosophy and concept of the chiasm is also crucial to the fourth chapter, "Models of the Brain: Metaphors, Architectures and Chiastic Applications." The fourth chapter strives to develop a frame for understanding how using metaphors can affect how theoreticians might conceive of a process, and also transfer unwanted associations from the metaphor's source to the target. After reviewing how this occurs in a more general way, this chapter specifically investigates metaphors of the human brain that are influential in different theoretical spheres. In both neuroscience and artificial intelligence, the human brain is

viewed as a hierarchy with bottom-up and top-down processes, while the chiasmic, cross hemispheric or lateralized processes attract considerably less attention. Applying Merleau-Ponty's concept of the chiasm as it relates to both perception and touch, the intent here is to show how it can be an indispensable descriptor of what the human brain does. The paper first assesses the impact of mind and brain metaphors on Representational Theory of Mind, Connectionism, encoding methods, and Bayesianism, then considers how Merleau-Ponty's theories about the chiasm might augment or inform these approaches.

The final part of the thesis is a review article on the subject of chiasmus "Embodied X Figures and Forms of Thought," which is intended to be a helpful companion piece or footnote. In this article, which was published in *Semiotica* (Grausso 2018), I review in detail the recent book of Pelkey (2017). The article provides more details about Pelkey's theory that the upright human posture, or the embodied X, has contributed to chiasmus being firmly ingrained in culture. Covering Pelkey's chiastic semiotic typology more in depth, the article gives an overview of research important to the study of chiasmus as both a syntactical structure and symbol. According to Pelkey's book, the upright human posture, the ability to compare between the hemispheres of the body, and chiasmus might all relate to how humans first developed language.

While each of the chapters of the thesis branches in a different direction, every part of the thesis shares a common root: that chiasmus is a

cross-linguistic, perceptual and social phenomenon worthy of greater notice. Chiasmus coincides in many ways with truth functional logic, but the chiastic form also extends beyond it — by defining two opposite conditions, and in other respects revealing how to transcend the dichotomization it features. As it pertains to Merleau-Ponty, the chiasm is a much richer concept than presently recognized. The chiasm describes the crossing optic nerve fibers of the brain, and the way that the right side of the body most often corresponds to the left hemisphere of the brain, and in turn the left side of the body corresponds to the right hemisphere of the brain. Chiasmic structures are deeply ingrained both in the human body and in the constructs that human beings use to make sense of the world. As such, it would be remiss to ignore its features when it comes to designing every aspect of an artificially intelligent system intended to have humanlike capabilities.

Chiastic Studies and Typology

ABSTRACT: This is a brief review of some important literature on chiasmus to date, including the contributions of Strecker and Lissner, along with a guide to Paul's (2014) typology, Pelkey's typology (2017) and Harris' chiastic suite. These different tools are considered individually and then compared to the typology I introduce for the sake of showing their unique attributes and also how they can all intermesh to be used for future investigation of chiasmus cross-culturally.

Chiasmus is a ubiquitous literary and rhetorical device. At the sentence level, it consists of a reversal of elements and often assumes an ABBA form, as seen in the following example from Evelyn Beatrice Hall, who wrote *The Friends of Voltaire* (1907): "The instinct of a man is to **pursue (A)** everything that **flies (B)** from him, and to **fly (B)** from all that **pursues (A)** him." Antimetabole is a type of chiastic arrangement, in which the ABBA elements are repeated exactly, as in the quote from Alexandre Dumas' *The Three Musketeers, "*One for all and all for one*,"* originally an old Latinate phrase. Within texts such as novels and epic poems, chiasmus is also discussed as a type of *ring structure*, which is characterized by a symmetrical pattern of recurring themes or events in the plot. John D. Niles is one of many scholars to study the ring structure in *Beowulf,* and his diagrams outline the repetitive sequence of events, especially in the fight scenes – where the approach and rejoicing of the odious Grendel chiastically transitions into Beowulf's heroic rejoicing. James Joyce's novels stand as yet another example of works that are replete with chiastic patterns, especially

the novel *Ulysses*.[2] Mary Douglas also writes of ring structure in *Thinking in Circles: An Essay on Ring Composition.* At this level, the chiastic pattern can underscore the extreme differences between situations and how characters respond to those situations, or reinforce a similarity between situations and characters. In the case of many texts that feature a hero encountering an enemy, for example, chiasmus assists in drawing the distinction between the two opposing forces – or in bringing the text full circle, to a conclusion which complements the introduction but is distinct from it.

Beyond the narrative, the raison d'être and usefulness of chiasmus could derive from how embodied agents more generally conceptualize situations, people and the progression of events through space and time. Patricia Lissner (2007) provided the first treatment of embodied chiasmus, and coined the term "chi-thinking" to denote how humans form dichotomies in argumentation. Rodolphe Gasché (1987) defines *chiasmus* as "what allows oppositions to be bound into unity…. a form that makes it possible to determine differences with respect to an underlying totality." Gasché considers chiasmus the "originary form of thought" (1987: xvi). The phenomenologist Maurice Merleau-Ponty also develops "chiasm" as a concept in his late book *The Visible and the Invisible.* His working notes define "the chiasm" as "not only a me-other exchange (the messages he receives reach me, the messages I receive reach him), [but]…also an exchange between me and the world, between the phenomenal body and

[2] Soloman, Susan. 2016. Inverted Commas, Unreality and Chiasmus in "Aeolus." *James Joyce Quarterly,* 51(4). 613-630.

the "'objective' body, between the perceiving and the perceived: what begins as a thing ends as consciousness of the thing, what begins as a 'state of consciousness' ends as a thing" (215). Ivo Strecker's studies in ethnography consider chiasmus as a me-other relation between the ethnographer and the people he studies. More recently, Jamin Pelkey's publications propose the idea that our corporeal understanding of chiasmus entwines with our modalities for making meaning of the world (2017). Pelkey's chief claim is that the spread eagle posture (which forms the bodily "X") corresponds with extreme felt experiences, and that these experiences percolate through many aspects of our lives, including art and culture. His studies pertain to the field of semiotics, anthropology and cross-disciplinary research, and his recent work reports on four semiotics types of thematic chiasmus.

Pelkey's chiastic semiotic typology derives from Anthony Paul's four syntactic types. These four types, to be elaborated upon below, are evident in cross-cultural symbols and cross-linguistic texts. Randy Harris has also developed a typology called the *chiastic suite*, which characterizes chiasmus as a linguistic element with several different types. At several different conference proceedings and in publications, Harris explains how chiasmus entwines with a number of other rhetorical devices at the sentence level and touches upon the subject of logic.

The following section summarizes the available literature on chiasmus and culminates in a discussion of how my work can provide ways of unifying these theories. In general, chiasmus seems to transcend its function as a

literary flourish, and in its varying incarnations may reveal something more fundamental about languages and human cognition. Syntactically, the thematic and structural aspects of the device seem to be inseparable, in that structure seems to reinforce the theme of the chiastic phrase. This will be taken up in more detail after further exposition of what chiasmus is, how it appears in semiotics and syntax, and the types that have been noted to date.

Though examples of chiasmus can be found even in ancient texts across different civilizations (e.g. those of Asia, Ancient Egypt, Greece and Rome, to name a few), it is only within the last ten years that chiasmus studies have attracted greater interest. Before that, studies of chiasmus were often isolated to particular analyses of texts or authors (e.g. Niles' treatment of *Beowulf* and Norrman's study of Samuel Butler). Although this continues to be the trend, with much modern work on chiasmus centering on a structural analysis of a story, or an analysis of a particular person's work, there are increasing efforts to characterize chiasmus itself. There are five chief scholars who have contributed much to the literature, recognizing chiasmus as both an important device in language and much more. Each of these researchers has directed their studies of chiasmus towards a different primary topic, here listed in the order in which they are mentioned:

1. Strecker – Ethnography and Anthropology
2. Lissner – Embodied Cognition

3. Paul – Poetics and Literature

4. Pelkey – Semiotics and Embodied Cognition

5. Harris – Rhetoric and Logic

In almost every case, each of these researchers has also applied their studies of chiasmus to multiple other secondary areas of focus. For example, Pelkey also homes in on anthropology, linguistics, music and many other topics in his recent publications. Chiasmus is a phenomenon with wide-ranging applications and cultural impact.

Strecker uses chiasmus as a frame for understanding the relationship between ethnographers and the people they study. He asserts that there is a chiastic exchange in ethnography and anthropology, where “other becomes self, self other” (EC/Strecker 6). Applying this to the study of the Hamar people who live in Southwestern Ethiopia, Strecker describes several facets of their culture and his own experience of living among them for years as an ethnographer. His *Ethnography and Chiasmus* centers on his relationship with a man named Baldambe and Baldambe’s family. Through Baldambe and his family members, Strecker implements the tools of rhetorical analysis to examine several aspects of Hamar culture, including identity, family relationships, magic, gender relations and war. Strecker’s research concerns particular terms and concepts, along with extensive analysis of real conversations recorded from his time dwelling in Ethiopia. A few of these

important concepts and terms are *barjo* and *michere*. Barjo refers to "good fortune," but it also seems to represent the equanimity of the individual, as "the greater anyone's barjo is, the more that person will be harmonious, non-aggressive, non-competitive and non-problematic" (EC/Strecker 53). Honor and barjo are distinct but related concepts, according to Strecker's detailed considerations and overview. He highlights a few aspects of the persona in Hamar culture, which are featured in his chart below (EC/Strecker 63).

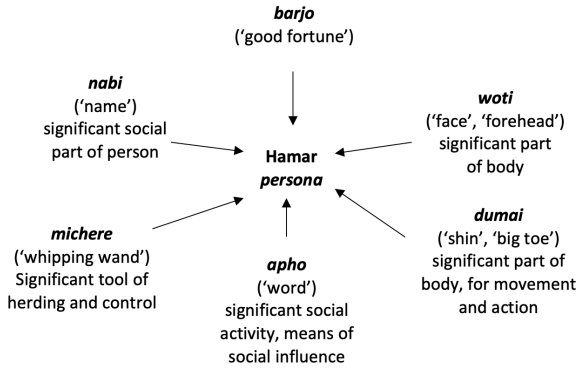


Figure 1. Elements of Hamar persona (EC/Strecker).

Each of these different aspects above deal with the body, action, socialization, and individual traits. Strecker's text introduces the Hamar through his first-person accounts and provides a chiastic bridge between his cultural concepts and the culture of the people in this Southwestern Ethiopian culture.

In this case study, Strecker looks not only at the chiastic exchanges between the ethnographer and the people he studies, but also chiastic exchanges between the people of Hamar culture. These take place in a variety of different cultural contexts, and Strecker includes a wide range of

examples by citing informal conversations, rites, adages and more. One Hamar proverb states, “The hyena – its son is a lion; the lion – its son is a hyena” (EC/Strecker 5). This chiastic saying speaks to intergenerational conflict, as “magnificent fathers who are like lions beget sons who are miserable like hyenas, and then—mysteriously—the hyenas again beget lions, and so on” (EC/Strecker 5). At the sentence level, Baldambe used this chiastic expression to divulge a general wisdom about family dynamics. Recounting his experiences with Baldambe, Strecker also mentions how Baldambe engaged in something he refers to as “tacit collusion” when speaking of ancestors called *bitta,* or ritual leaders. [3]At times, Baldambe would take on the role of the bitta and interact with others in a mimetic re-envisioning of the earlier conversations between the bitta and the people. Strecker characterizes this rhetorical act with reference to chiasmus, as it entails a situation “where interlocutors may safely say what they don’t mean, and mean what they don’t say” (EC Strecker/36).

Overall, for Strecker, chiasmus is both a rhetorical structure and also a frame for understanding complex interaction at several different social levels, both within and between different cultures. In his contribution to the text *Chiasmus and Culture,* Strecker also makes comparisons between metaphor and chiasmus. He views chiasmus as the opposite of metaphor, as primarily destabilizing in nature, whereas he considers metaphor as primarily stabilizing. Strecker considers chiasmus destabilizing, a structure that can be

[3] Strecker takes the term tacit collusion from the work of Denis Tedlock and Bruce Mannheim (1995), who were summarizing R.P. McDermott and Henry Tylbor (1995).

used to “oppose and invert” (CC/Strecker 87). He views chiasmus as something which emerges during an “ideological confrontation,” citing examples such as a quote attributed to Albert Einstein: “People were not created for the state, but the state for the people” (CC/Strecker 86). This presents a clear argument challenging particular forms of government in which the people are under close control of a central body, and Strecker points out that Einstein came up with this statement during a time when “totalitarian regimes ruled over most of Europe and parts of Asia” – although it can be certainly said this is true of current day and other similar phrases have popped up at many other points in history (CC/Strecker 86).

Patricia Lissner (2007) also explores chiasmus as a phenomenon with both destabilizing and stabilizing characteristics. Lissner’s text has two aims: 1) to show how thought or embodied conceptualization is in large part chiastic in nature and 2) to consider how this “chi-thinking,” as she calls it, involves spatiality (Lissner 5). Referring to the psychologist Jerome Bruner, known for his progressive ideals and his educational theories about the learning process, Lissner notes some overlaps between his theorization on cognition and her own. She cites *On Knowing,* in which Bruner asserts that every learner has *operational techniques* for synthesizing and representing information, and proposes that chi-thinking is one such technique (Lissner 10). According to Lissner, chi-thinking partly consists in recognizing “likeness and difference, partitioning and totality, duality and reciprocation” (12). Given the symmetry of chiasmus, it is a mirror phenomenon and allows for

comparisons to be drawn. Lissner shows the embeddedness of chiasmus across several different contexts, along with the prevalence of X (the semiotic equivalent of chiasmus) as a form. While Lissner seems to acknowledge the potential of chiasmus as a structure capable of showing balanced and imbalanced relationships between pairs of elements, and while she points out that the crisscross in the chiasm has a "hoard of Gestaltian riches" to offer, she also insists that "a chiasm will always be discriminatory." The chiastic structure, in other words, places demands on the perceiver to "pick and choose from its variety and profusion as needs be…according to present (contextual) requirements or wishes" (217).

Building upon Lissner's work on embodiment and chiasmus, Pelkey (2017) devotes a great deal of attention to semiotic X as a symbol of the human form. The human body strikes postures which can be both stabilizing and destabilizing, and Pelkey describes different X positions of the body. Pelkey's efforts also extend the research of Paul (2010) in developing a typology of chiasmus. While Paul's work revolves around chiasmus as a syntactical and rhetorical phenomenon, Pelkey shows that thematically, semiotic X accomplishes similar effects. The syntactic-rhetoric typology of Paul and the semiotic typology of Pelkey will be featured side-by-side in a chart to facilitate comparison, then discussed further below. The chart appears on the next page.

Pelkey's Typology (2017)	**Paul's Typology** (2014)
Type: X **Description:** In its most basic form, X represents the human figure, with both arms and legs outstretched. Pelkey describes this as a "spread-eagle leap." **Example:** Corporate logo for the organization One Laptop Per Child; the child is represented with an X symbol  (Pelkey 64).	**Type:** "Cross" **Description:** Paul describes chiasmus as "cross-shaped when it is a single coherent statement with no inner contradiction: the cross-chiasmus is associated with such qualities as reciprocation, balance and the orderly relation of things" (Paul 23). **Example:** "If a gift is given it can be received; when it is received it can be given" (Paul 23). It is not clear if this is a quote, or Paul's words.
Type: ⧖ Hourglass **Description:** The hourglass is a destabilizing figure, with a center that cannot hold. It is typified by an extreme and uncomfortable spread eagle posture. Pelkey describes this as "spread-eagle torture." **Example:** 127 Hours movie poster  (Pelkey 107).	**Type:** "Mirror" **Description:** The mirror type "combines formal symmetry with paradox or contradiction," "associated with mental-blockage" (Paul 23). **Example:** "Fair is foul, foul is fair" (Quote from Macbeth) (Paul 23).
Type: ◊ Diamond **Description:** It is formed by two X figures interlocking around the central, diamond shape – or a common ground of interest. **Example:** The logo for Dos Equis beer  (Pelkey 204).	**Type:** "Circle" **Description:** The circle type "invites the mind to follow a line of thought that returns it to the starting point" (Paul 24). **Example:** "I am tired of thinking how thinking of you never tires me (Petrarch)" (Paul 24).
Type: Argyle  **Description:** Argyle pattern involves repeating XXXXX patterns, interlocking and stacked with shared space between the figures. **Example:** Company logo for Doing Family Right  (Pelkey 202).	**Type:** "Spiral" **Description:** The spiral occurs "when formal symmetry sets up a more dynamic process of movement." **Example:** Although this type mostly applies to longer poetic chains with ABCCBA reversals, or longer reversals, Paul also provides a sentence-level example: "The inner world is formed by the outer and the outer by the inner" (Paul 24). It is not clear if this a quote from someone, or Paul's words.

Pelkey draws his examples from a database where he has collected over 200 exemplars to date (Pelkey 64). Paul does not comment as to how he gathered the examples for his typology, but most of them come from literary sources. Beginning with Paul's **cross** type, as one which involves reciprocation, it is easy to see how his first example satisfies those conditions: **"**If a gift is given it can be received; when it is received it can be given" (Paul 24). Giving and receiving is the essence of reciprocity. Another example Paul uses is a paraphrased biblical quote: "Man is made for woman and woman for man" (Paul 24). The reciprocal relation here is evident in the presumed intimate dynamics of the couple. Pelkey's **X type** corresponds to the "cross" of Paul's type, but his main focus is not on reciprocity. He deems the general mood of X to be satisfaction, and associates the X with the spread-eagle leap – and sports such as skiing and figure-skating, where the athlete must execute such moves with poise and precision (Pelkey 42). On its own, Pelkey shows how the X represents the human form and how it is used to convey a variety of messages about human body and the conditions it might be under.

For Paul, the next type is the **mirror**, which involves a projection of one meaning onto another. The quote "Fair is foul and foul is fair" expresses a contradiction that arises through this projection, because *fair* and *foul* are logical opposites. Pelkey (2017) mentions this line and associates it with

logical oppositions, the Greimas square,[4] and marked-unmarked relations (36). He devotes a chapter of his text to arguing how these models contain "embodied relations" from which we "derive basic structural awareness of opposition and contrast," and yet he also explains how these models can present "false dichotomies, impossible decisions, and double-binds" (Pelkey 36). This is certainly the case with the line "Fair is foul and foul is fair," because within the context of *Macbeth,* they prove to be two simultaneously held conditions for Lady Macbeth. She is fair of appearance, and foul on the inside as she secretly plots murder. Nevertheless, possessing these two traits did not serve Lady Macbeth well in the end, as she eventually goes mad.

Pelkey correlates Paul's mirror type and his own corresponding **hourglass** type with a tortured psyche, one in which there is a restrictedness that cannot be overcome unless the structure is dismantled (104). Visually, the hourglass has a narrow center which evokes a sense that the structure will collapse. Pelkey shows several examples of how the hourglass has appeared in logos, graphic art, art for exhibitions, and in advertisements to communicate this message. The poster for the movie *127 Hours* is one example, since the film itself is about Aron Ralston, who needed to remove his arm to survive getting trapped by a boulder while canyoneering. Ralston found himself in a position that his physical body could not sustain and the

[4] Algirdas Julien Greimas developed the Greimas or semiotic square to analyze signs and their logical opposites, such as right-left, night-day, fat-thin. To say it is both night and day would be a contradiction. Any pair of binaries which describe polar opposite conditions that cannot occur simultaneously could be mapped onto the Greimas square.

poster shows the precariousness of his situation. To Pelkey, the hourglass represents the tortured spread-eagle posture of the body, stretched beyond what it can endure.

Paul and Pelkey's third type accomplishes a much different effect, one that entails a communion or coming together. For Paul, the **circle** type involves "enlarged consciousness," "meditational ecstasy" or an out of body experience – a transcendence that takes the poet, speaker or writer beyond himself (Paul 36). Paul's main example of the circle type is "L'Infinito," a poem by Italian philosopher and poet Giacomo Leopardi. "L'Infinito" is an appropriate title that goes with Leopardi's theme of endless space and silences (Paul 35). Paul points out that, "Besides its closing chiasmus, the poem contains a number of chiastically arranged parallels and pairs, with the words 'm'è dolce' in the last line making a pair with 'caro mi fu' in the first line" (35). These Italian phrases can be glossed as

m'	è	dolce	caro	mi	fu
to me	is	sweet	dear	to me	was

Pelkey's corresponding type is the **diamond,** which a usually created wherever a double X occurs, because there is a shared middle space in between the two X figures. Noting the example of the logo for Dos Equis Beer, Pelkey explains how it could "represent contact between colonial powers German and Spain" (204). The German brewer Wilhelm Hasse moved to Mexico to establish the Moctezuma Brewery, and the Aztec leader

Moctezuma II is featured at the center of the two X figures. Dos Equis Beer emerges as a product from this combined cultural history. Pelkey's diamond type and Paul's circle type seem to both emphasize that which is beyond the individual.

This is also shared by Paul and Pelkey's final types, the **spiral** and **argyle** pattern, respectively. The spiral, unlike the circle, is "an open-ended movement, returning the point to a starting point that is now changed" (Paul 36). Paul explains that the Leopardi poem could be interpreted as an example of spiral chiasmus, although another example he gives is a quote from Lao Tzu's *Tao te Ching*, translated by D.C. Lau:

The world had a beginning
And this beginning could be the mother of the world.
When you know the mother
Go on to know the child.
After you have known the child,
Go back to holding fast to the mother,
And to the end of your days you will not meet with danger.

The obvious chiastic ABBA repetition in the above poem can be seen with the repeated terms mother /child /child / mother, and the poem continues with another clause after the repetition. For Pelkey's **argyle** type, the repeated patterns or lattices give a sense of ongoing connection – the link between multiple bodies or people. The Doing Family Right logo seen in

the Typology chart under Pelkey (2017) is one example, and presents the graphic idea of familial support, with each X representing a member of that family.

Paul and Pelkey's types focus on the **thematic** import of each chiastic structure, or the message that can be expressed either with the syntactic or semiotic forms. These types are beneficial in facilitating discussion about chiasmus as a phenomenon in language and art, and in Paul's case, his typology extends itself to analysis of longer texts and poems. Pelkey's types contribute a frame for understanding semiotic chiasmus and shows how the human body is conceptualized through X.

Randy Harris has also created a typology of chiasmus, which he called the **chiastic suite**. The chiastic suite distinguishes between chiasmus at different syntactic-rhetorical levels, placing five types on a continuum. One of Harris' important observations about chiasmus is its relatedness to other rhetorical devices, including epanalepsis, because both involve a repetition of elements. Epanalepsis is character by repetitions at the sentence level, at the beginning and end of a sentence, as in the example, "Boys will be boys" (Harris 2016).

Chiasmus can be phonological, involving a reversal of phonemes or units of sound rather than a reversal of terms. At all levels, there can also be a semantic reversal, in which a concept or theme is featured alongside an opposite concept or reversal of that theme. This can be the case in texts, poetry and at the syntactical level. Harris notes five main types:

antimetathesis or phonological chiasmus, morphological chiasmus, antimetabole, syntactic chiasmus and antimetalepsis or semantic chiasmus. He also explains two sub-types, what he calls pseudo antimetabole and implied antimetabole. Each of these types is explained below with Harris' (2016) featured examples:

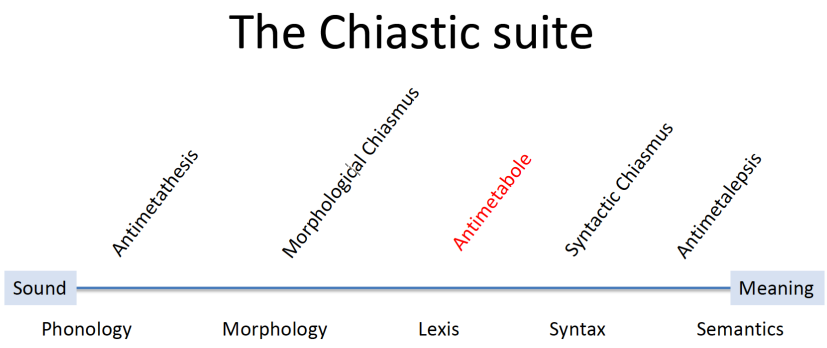


Figure 2. The chiastic suite from Randy Harris' (2016) presentation.

Phonological chiasmus entails a reversal or transposition of sound units in a sentence in a chiastic pattern. Harris refers to this with the rhetorical term **antimetathesis**. **Metathesis** refers to interchanging elements of sound or letters, and "antimeta" is a shortened referent for **antimetabole**. In his presentation, Harris cites Terry Sullivan's 1908 lyrics as an example of his antimetathesis type: "**Sh**e **s**ells **s**ea **sh**ells on the seashore." Another example he provides is a quote, variously attributed to the painter Francis Bacon and the musician Tom Waits: "**Champagne** for my real friends, real **pain** for my **sham** friends." Harris formalizes these reversals as

$F(p^A \ldots p^B \ldots p^A \ldots p^B)$[5] with "p" indicating phonology. For a further explanation of the formula, see the footnote below.

On the opposite end of the continuum, Harris places **antimetalepsis**, which pertains to semantic chiasmi. Metalepsis is another rhetorical device related to metaphor and metonymy, in which part of thing is removed from its context and used to refer to another thing in a new way. Under this category, Harris puts examples which include AB elements and BA elements that are semantically the same. The rhyme "**Old King Cole** was a **merry old soul** and a **merry old soul** was **he**" presents one idea: that Old King Cole is a merry soul. Another example Harris cites is, "You can know the **position** of an electron but you cannot know **where** it's going… Or you can know its **direction**, but cannot know its **position**." These are chiastic ABBA patterns, but Harris' formula for this type is an ABAB pattern: $F(\mathbf{I}^A \ldots \mathbf{I}^B \ldots \mathbf{I}^A \ldots \mathbf{I}^B)$ as it indicates an ideological repetition.

At the center of the continuum, Harris places three types: morphological chiasmus, antimetabole and syntactic chiasmus. In some cases, there can be overlaps between these types. All of Harris' chiastic examples are syntactical in nature, but his **syntactic chiasmus** type accounts for reversals that are conceptually comparative and do not include precise repetitions of terms. An example Harris cites is from Milton's *Paradise Lost*, "When Adam first of men, to first of women Eve." Another

[5] The presentation actually reads, $F(p^A \ldots p^B \ldots p^A \ldots p^B)$ but given Harris' examples, there are some that do double-duty, achieving both the traditional chiastic form , $F(p^A \ldots p^B \ldots p^B \ldots p^A)$ and this alternating repetition. The sentence "Light a fire, fight a liar" achieves both the ABAB repetition with **/ight /ire /ight /iar**, and the ABBA pattern with **/li /fi /fi /li.**

example he includes is: “Despised, if ugly; if she’s fair, betrayed” from the poem “Essay on Woman, An” by Mary Leapor. Harris’ formula for this type is: $F(\mathrm{XP}^{A} \ldots \mathrm{XP}^{B} \ldots \mathrm{XP}^{A} \ldots \mathrm{XP}^{B})$. In the Leapor example, Despised/betrayed are the A element, and ugly/fair are the B element. This chiastic example forms two different groups of women based on their appearances and how they are treated. The chiastic structure helps to make the comparison between them. On Harris’ continuum, syntactic chiasmus sits beside antimetabole.

Antimetabole is central in the chiastic suite. It involves precise repetitions of elements in a sentence, as in the example “Un pour tous, tous pour un” or in English, “One for all, all for one” from Alexandre Dumas’ novel *The Three Musketeers.* Harris cites this example in his presentation (2016). His formula for antimetabole is $F(\mathrm{W}^{A} \ldots \mathrm{W}^{B} \ldots \mathrm{W}^{B} \ldots \mathrm{W}^{A})$. A more elaborate discussion of antimetabole and Harris’ examples will be considered towards the end of the paper and explained alongside the typology I developed based on a cross-linguistic sampling. Related to antimetabole in the chiastic suite is what Harris calls **morphological chiasmus**. Morphological chiasmus is similar in that it involves an almost precise repetition. One of Harris’ examples is “**Qui**tters never **win** and **win**ners never **quit**” – an idiom in American culture, also often worded in the reverse as “Winners never quit and quitters never win.” The accompanying formula Harris uses is, $F(\mathrm{m}^{A} \ldots \mathrm{m}^{B} \ldots \mathrm{m}^{A} \ldots \mathrm{m}^{B})$.

Harris also describes two sub-types of antimetabole, including pseudo-antimetabole and implied antimetabole. I disagree with assigning the

term “pseudo” antimetabole to the examples Harris collocates in his presentation, only because there is a precise or a near repetition in the examples. The only difference between antimetabole and pseudo-antimetabole is that Harris’ examples of antimetabole seem to be mutually reinforcing, whereas pseudo-antimetabole seems to be making a clear comparison, offering up two options, or ranking the “AB” or “BA” as superior to the other. The referents of the “A” or “B” elements are also sometimes polysemous in this category. Some examples Harris shares are: “Women don’t want dates on their condoms; they want condoms on their dates.” In this case, the term *dates* is a polysemous element where it refers to both a day on the calendar and a romantic date. In my own typology, I classify such examples much differently. The other sub-type, implied antimetabole, alludes to a reversal without outright including it in the sentence. One of Harris’ examples is “The Wrath of Grapes,” which alludes to the Steinbeck novel *The Grapes of Wrath* and the “The Battle-Hymn of the Republic.” Another is “Time wounds all heels,” which is a reversal of the adage “Time heals all wounds.”

The next section of this review draws comparisons between my work and the research of Pelkey, Paul and Harris in order to highlight overlaps in our various systems of classification for chiasmus. This discussion will include a few select examples from my typology, best suited for the purposes here of illustrating important differences and similarities and explaining my criteria for including certain examples under these categories. More

examples will be available in the next section. To develop a typology of chiasmus, I searched for examples from all different language families and groups, collecting a sampling from 28 in total. I used a Glaserian grounded methodology, beginning with the process of data collection and then proceeding on to analyzing and organizing that data. The first goal of the research was to simply gather as many samples of chiasmus and antimetabole as possible from as many different language families and groups as possible. One of the key questions addressed was: how many different language families and groups contain examples of chiasmus? Due to the ambitious goal of performing cross-linguistic research, it was necessary to use multiple means of finding samples – including web-based research, referring to texts, and accessing examples through social media. More information on the methodology can be found in the following section, but from this wide-ranging search, I was able to identify 8 different types of chiasmus antimetabole (with precise or near-precise reversals) cross-linguistically. One main difference of the typology is that I do not draw all of the same distinctions that Randy Harris does between syntactic chiasmus, antimetabole and morphological chiasmus. As stated above, I do not separate antimetabole from what Harris refers to as “pseudo antimetabole” and I also do not separate morphological chiasmus from antimetabole in the same way that Harris does. Even with syntactic chiasmus, I would organize his examples differently under my scheme, based upon certain structural attributes but also their function.

Overall Harris provides a set of very useful types, but in my own scheme, morphological chiasmus (which features near-precise reversals of terms) is one of the antimetabole types, and not considered under another column as a different form of chiasmus. Within Harris' typology, there can be some examples that fit between categories, and in my own typology there are also some notable overlaps: some examples can be classed under two different types. My typology represents a first effort to better understand how chiasmus, and specifically antimetabole (or near-precise reversals) are used cross-linguistically – how form and function come together in this device. While this seems to be Harris' goal too, and he separates chiasmus by linguistic elements – e.g. phonology and morphology – my typology is instead devised with logic in mind, and the possible relationships that can exist between elements A and B.

It is my belief that a collaborative effort among all researchers of chiasmus would result in the most fruitful tool or typology of chiasmus. This is an area in need of further development, as chiasmus studies are still in their infancy. The typology I propose considers both the thematic nature and the structure of the antimetabole examples, broken down thus:

1) Equalization: AB equates to or is the same as BA; A and B are the same

2) Part-whole: A is part of B, and B is part of A

3) Exclusion: A excludes B, and B excludes A

4) Dissociation: A dissociates from B, B dissociates from A

5) Combination: A and B, B and A; the elements are grouped together, and in some cases one or more element is polysemous

6) Comparison: A and B are better than B and A; or A and B are worse than B and A

7) One Way Effects: A affects B, but B does not affect A; or A does not affect B, but B affects A. Includes phrasing in which the speaker or writer is encouraging the listener or reader to take one course of action over another

8) Multiple Effects: A affects B, and B affects A; or A affects B and B affects

My criteria for defining these 8 categories will be delineated below, as I give a few examples of each. My first category is **equalization**. The criteria for inclusion in this category is that the A and B elements are being defined synonymously using copular verbs, “is” or “are”, or otherwise treated as interchangeable. This is a very balancing structure as it can bring two unlike terms together. It is one of two types that is comparable to Pelkey’s “X” type and the “cross” type of Paul. An example in English is “Beauty is truth, truth beauty” from John Keats’ “Ode to a Grecian Urn” and an example in German

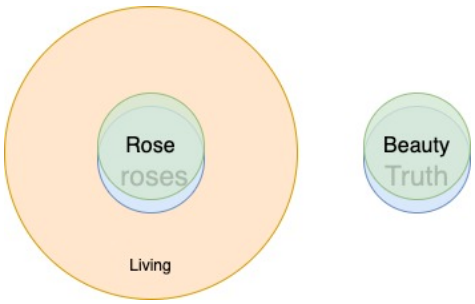
is “Was vernünftig ist, das ist Wirklich; und was wirklich ist, das ist vernünftig” from Hegel’s *Elements of the Philosophy of Right.* The English translation of the German example is, “What is reasonable is real; and what is real is reasonable.” Under this category, I also include examples of near-precise repetition (or what Harris terms “morphological chiasmus” as in the French example from François de Malherbe: “Et rose, elle a vécu ce que vivent les roses”, which translates to, “And Rose, she lived as live the roses.” In this last example, Rose and the roses are being described as living the same way – this is a balancing sentence, in which one “A” element is being used to better understand the second “A” element and they are equalized. One further definitional example comes from a Tibetan proverb,

ཀུན་མ་བཀུ་མཁས་ན་རྙེད་པར་འགྱོ །རྙེད་པ་རྙེད་ཅེས་ན་ཀུ་ལ་འགྱོ །

“It is a clever thief who keeps finding things, but finding things too often makes one a thief.”

Using logical expressions, it is possible to write these examples as:

p = q, q = p given the specific conditions defined in the sentence. For example: Beauty = truth. When describing how they lived, Rose = roses, or one who finds things = clever thief. These types can also be illustrated with a diagram:

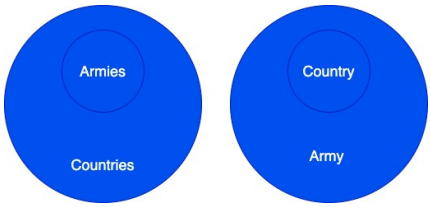


The next type is the **part whole** type, in which A is either part of B, or vice versa. Such sentences are balancing in that they show a connectivity of things rather than a disconnection or discordance between them. The criteria for inclusion in this type involves the use of key terms, like “on” or “in” or a more explicit reference to the connectivity of the elements, or the possession of one by the other. This not comparable to any one type of Harris’ – however, it aligns thematically with Pelkey’s X and Paul’s cross, due to how these syntactic examples show an overlapping relation or a joining of A to B. There is a sense that A belongs to B, or is contained within it, and vice versa. Two examples are as follows:

“Most countries have armies, but in Pakistan the army has a country.” – The Economist.com

Here I do not differentiate between what Harris calls morphological chiasmus and antimetabole – this is a near-reversal, not a precise one. Although the terms “countries” and “armies” have multiple referents where “army” and “country” have a particular referent, the part-whole relations stand.

An illustration might better demonstrate the relationships between the A and B elements:



Another example, this time with precise reversals:

“Le langage est une peau: je frotte mon langage contre l’autre. Comme si j’avais des mots en guise de doigts, ou des doigts au bout de mes mots. Mon langage tremble de désir” – Roland Barthes, from *Fragments d’un discours amoureux*

The English translation for this sentence is, “Language is a skin: I rub my language against the other. As if I had words instead of fingers, or fingers at the tips of my words. My language trembles with desire.”

Another example with a precise reversal is Russian theatre director and acting teacher Konstanin Stanislavski’s remark, “Любите искусство в себе, а не себя в искусстве” or “Love the art in yourself, not yourself in the art.”

Using the symbols of predicate calculus there are many mereological formulas that could be used to express the above—that “A” is part of “B” and vice versa. As there are disagreements in mereology as to what formula should be preferred for part-whole relations, I will avoid assigning a particular

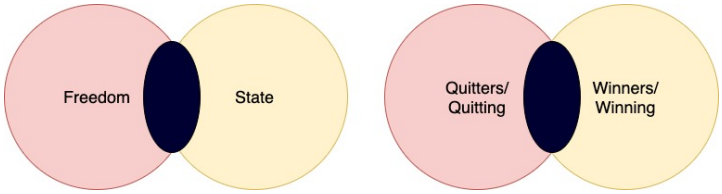
one, but what is important is that these phrases could be expressed with these symbols.

The next type is **exclusions**, where the A and B elements are considered along with a “never” condition, or qualifier deeming them entities that do not intersect or overlap in any way. This is similar to first order logic: where an exclusion condition is determined, there is no middle ground possible. Criteria for inclusion in this type requires a “never” condition to be stipulated or other qualifiers that exclude any overlap. These can all be expressed with logic as:

$p \oplus q$ or $p \vee \sim p = T$

In other words, “p” or “q” is logically possible – both cannot be simultaneously possible, and either “p” or “not p” is possible (which is one of Aristotle’s original Laws of Thought). For example, the sentence “Quitters never win, and winners never quit” aligns with this perfectly. If someone is “quitter” then he is not also a winner.

Another example is from Vladimir Lenin’s *The State and Revolution:* “ Пока есть государство, нет свободы. Когда будет свобода, не будет государства” or “So long as the state exists there is no freedom. When there is freedom, there will be no state.” These are defined as mutually exclusive conditions. The relationship between the elements in sentences of this type can also be illustrated as:

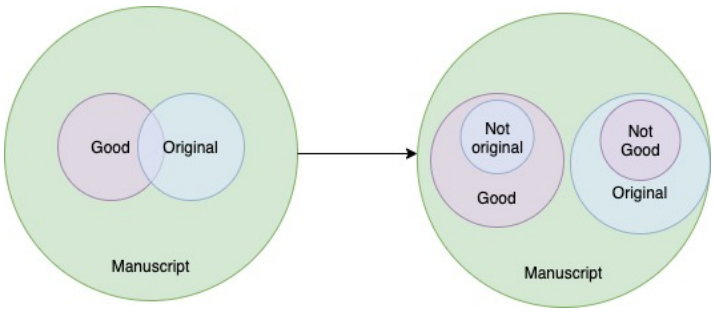


Harris' typology continues to be different from my own, but there are some thematic similarities between my **exclusion** type and Pelkey's hourglass type with its narrowed center. Exclusion conditions do not support a center, or middle ground between the two entities defined.

Paul's related "mirror" type does not match mine in this case, because of the specific examples he discusses. I would place Paul's example "Fair is foul and foul is fair" in my first category of **equalization**, because even though the terms "fair" and "foul" are logical opposites, they are not being considered as logical opposites in the context of the sentence; in fact their meanings are being conflated, and while this might be contradictory, it serves a purpose in the context of Shakespeare's *Macbeth* to define fair as foul and foul as fair – because in the character of Lady Macbeth, they are simultaneously held conditions. She is both fair as a beautiful woman and foul, because of what she is plotting. Nevertheless, when considering Paul's descriptions of the "mirror" type, it fits well with my **exclusion** type – in a mirror, only one image can be projected and not two. In a logical exclusion, only one condition can be upheld.

A similar but distinct type in my typology is **dissociation**. In these sentences, sometimes an association is constructed and then dismantled. This can best be illustrated with a diagram, using the following example:

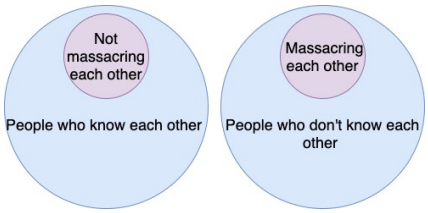
"Your manuscript is both good and original, but the part that is good is not original and the part that is original is not good" – *a quote misattributed to Dr. Samuel Johnson*



A quote from Paul Valéry is another such example:

"La guerre, c'est un massacre de gens qui ne se connaissent pas au profit de gens qui se connaissent, mais ne se massacrent pas" – *Paul Valéry*

The English translation is, "War is a massacre of people who do not know each other for the benefit of people who know each other, but do not massacre each other." The diagram below helps to illustrate the relationships at play between the A and B elements in the sentence, or the dissociation that is present:

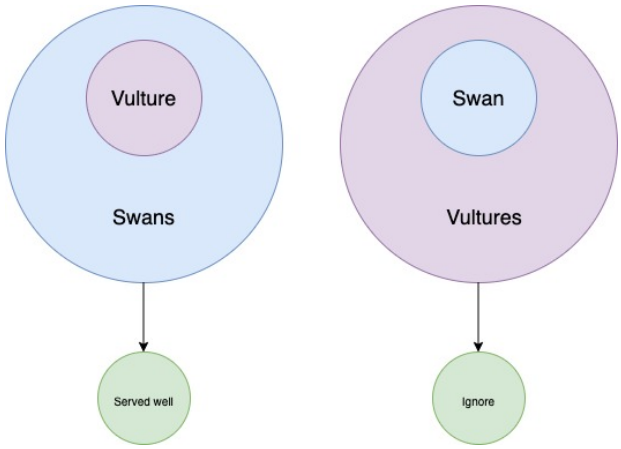


Another example can be found in Sanskrit, from the *Panchatantra* or *Pañcatantram* by Vishnu Sharma, Verse 325 from Mitra Bheda or the Loss of Friends. The Sanksrit below is from Dr. Naveen Kumar Jha's edition of the *Pañcatantram.*

गृध्राकारो ऽपि सेव्यः स्याद् धंसाकारैः सभासदैः ।
हंसाकारो ऽपि सन्त्याज्यो गृध्राकारैः स तैर् नृपः ॥ ३२५ ॥

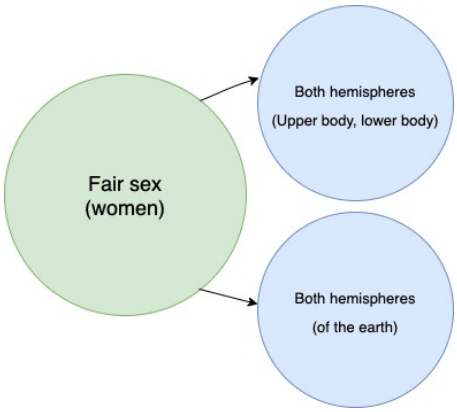
gṛdhrākāro 'pi sevyaḥ syād dhaṃsākāraiḥ sabhāsadaiḥ |
haṃsākāro 'pi santyājyo gṛdhrākāraiḥ sa tair nṛpaḥ || 325 ||

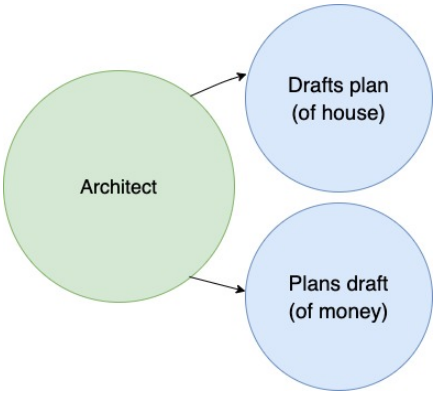
The common English translation of these lines is, "If the king is like a vulture but surrounded by swan-like courtiers, he must be served well; if a swan-like king is surrounded by people who act like vultures, then he should be ignored." In this case, nrpah signifies "king" and the ABBA symmetry can be seen with the terms *grdhrākāro* and *grdhrākāraih* (containing variants of vulture or vulture-eyed, "gRdhradRSTi") and *dhamsākāraih* and *hamsākāro* (containing "hamsa" or swan). Below there is another diagram to help illuminate the dissociation at work in the sentence:



The examples that fall into this category would come under different categories under Harris' typology – they would be classed variously as the syntactic chiasmus and the morphological chiasmus types. The dissociation type is also not comparable to any of Pelkey or Paul's types.

The next type I noted is **combination** – in which one of the elements A or B can have multiple referents or simply be joined with a conjunction such as the term "and," for example. This is seen in the humorous French example from Marquis de Bièvres, "Je lève mon verre au beau sexe des deux hémisphères, et aux deux hémisphères du beau sexe" which in English translates to, "I raise my glass to the fair sex of both hemispheres, and to both hemispheres of the fair sex." The criteria for inclusion in this type is that the sentence must either have a conjunction to bring together or group the terms A and B, or otherwise one of the elements is polysemous but a conjunction "and" is still present. Another example is Ambrose Bierce's line, "Architect, *n.* One who drafts a plan of your house, and plans a draft of your money." A diagram best elucidates the relationship between A and B in a **combination**:



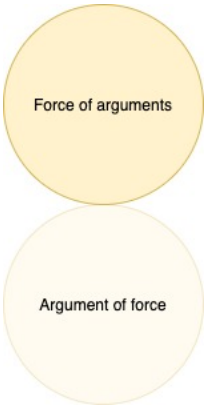


This type could again include several examples from a range of Harris' types, including morphological chiasmus, antimetabole, and syntactic chiasmus. There are not comparable types under Pelkey or Paul's typology.

Although all examples of chiasmus are in some way comparative, there are many examples in which an explicit **comparison** is made using terms like "better" or "worse" or through use of terms of frequency such as "more often" and/or a scale of time or ability. The criteria for inclusion in this group is the use of phrases or terms that rank the A and B elements, or directly compares between them like the terms listed above. There are no obvious thematic similarities between my comparative type and either Pelkey or Paul's types. Several of Harris' types may be categorizable under the comparative type, if they meet the criteria of explicitly comparing between the A and B elements and attempting to argue for the superiority of one over the other. The graphics below and their accompanying examples are a visual aid to convey the hierarchy apparent in such chiastic comparative examples. The comparative terms are bolded.

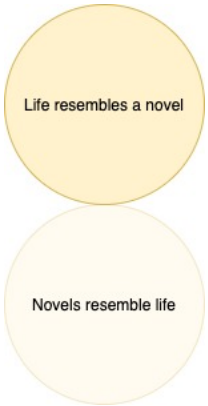
"Because the force of arguments is always **better** than the argument of force." – Donald Tusk, Address to the European Committee of the Regions,

October 10, 2017



“La vie ressemble plus souvent à un roman qu’un roman ne ressemble à la vie” – *George Sand, Metella, Chapter 1*

English translation: Life resembles a novel **more often** than a novel resembles life.

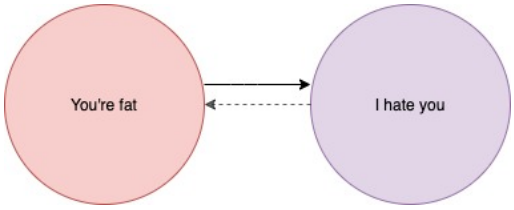


“是故勝兵先勝，而後求戰；敗兵先戰，而後求勝” – *Sun Tzu, Art of War*

English translation: Victorious warriors win **first** and then go to war, while defeated warriors go to war first and then seek to win.

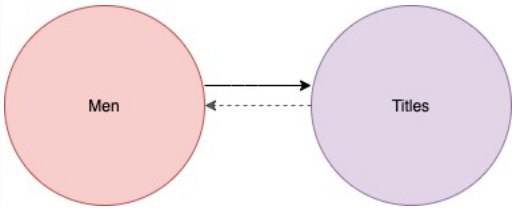
The final types in my typology involve a dynamic interactivity between elements A and B, usually showcasing a cause and effect relationship. The criteria for the inclusion of an example in the **One-way effects** category is that a cause and effect relationship is defined, and it is one-directional: the A or B element has some impact on the other element B or A, but there is a negation involving the term “not” in the sentence or some similar phrasing, so that if A influences or affects B, B does not influence or affect B in return. As usual, examples of morphological chiasmus, antimetabole and syntactic chiasmus from Harris’ typology could feasibly meet these requirements. In this case, Pelkey and Paul’s hourglass and mirror types are thematically alike, in that the flow of activity is one-directional, as it is with an hourglass and mirror. Some examples and graphics illustrating the relationships between A and B can be found below:

“I don’t hate you because you’re fat. You’re fat because I hate you.” – *Mean Girls (2004 film),*



"…Non i titoli illustrono gli uomini, ma gli uomini i titoli" – Niccolò Machiavelli, Discorsi sopra la prima Deca di Tito Livio, Book 3, Chapter 38

English translation: It is not titles that make men illustrious, but men who do that to titles.

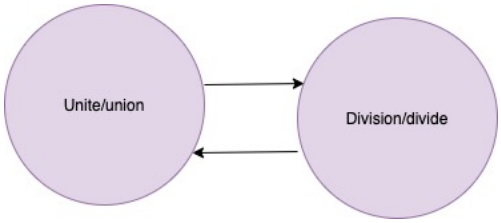


The final type I noted across different language families and groups were chiastic examples which had A and B elements that mutually affected or altered one another, or what I call the **multiple effect** type. To be established as an example of this type, there needed to be two-directional activity or interactivity between the elements. Thematically, this is similar to Pelkey's argyle and diamond, in that those types represent an interactivity of perspectives or entities. Any of Harris' three types – including morphological chiasmus, syntactic chiasmus and antimetabole might be found in this category. Below are a few select examples and graphics to demonstrate the interactivity of the A and B elements:

話說天下大勢，分久必合，合久必分：周末七國分爭，并入於秦。

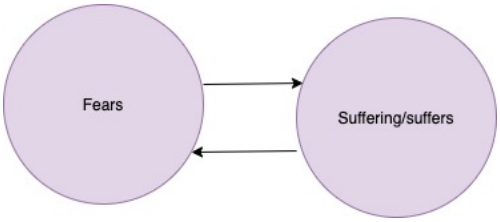
The Romance of Three Kingdoms, attributed to Luo Guanzhong

English translation: The world under heaven, after a long period of division, tends to unite; after a long period of union, tends to divide.



Qui craint de souffrir, souffre déjà de ce qu'il craint" – Michel de Montaigne, Essais, livre 3

English translation: Whosoever fears suffering already suffers from what he fears.



These eight different chiastic types will be explored more thoroughly and with more examples in the next section, but this comparison between my own findings and the research of Harris, Pelkey, and Paul can help facilitate future discussions and highlight each researcher's individual efforts to characterize chiasmus. To my knowledge, my research is unique in that it examines the device chiasmus across different language families and groups. My work meshes well with Harris' typology, as we both analyze form in distinct but not necessarily discrepant ways, and some of my types are also thematically quite similar to those of Pelkey and Paul. Figure 3 on the following page solidifies how my typology (in red) can be considered

alongside Harris', Pelkey's and Paul's contributions. All of this has been reviewed at length in this section. For my research methods and more examples, see the next section.

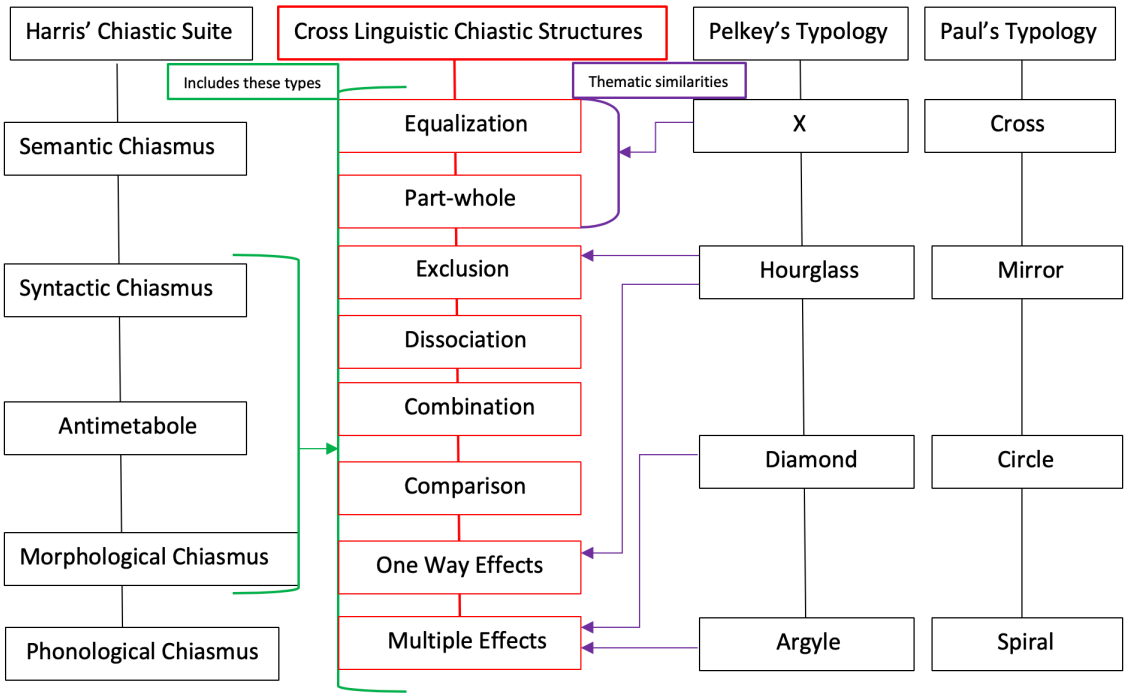


Figure 3. An overview of Chiastic Typology – my contributions in red.

Chiasmus studies are still in their infancy, and as such they will require much nurturance from multiple scholars. There is potential for a range of diverse research projects in this area, as evidenced by the overview of five different researchers provided in this section. Strecker's work in the area of ethnography reveals how chiasmus can be used as a tool for understanding the role of the ethnographer in relation to the people he studies and more. Lissner delves into how chiasmus can be considered an aspect of embodiment. Pelkey expands on Lissner's initial efforts and introduces a typology to analyze semiotic X that is an augmented version of

the syntactical typology of Paul (2014). Harris examines chiasmus as a linguistic form at multiple levels, syntactically, phonologically and semantically, and he also considers what chiasmus and other classical rhetorical devices might have in common. Finally, my work concentrates on investigating the device cross-linguistically, and from my data, I developed a typology to organize the examples I identified. This section has been devoted to reviewing the literature on chiasmus and comparing my research with Harris', Pelkey's and Paul's work.

As truth-functional logic has in some ways influenced how I processed my data and created my typology, the next section primarily focuses on how logic and chiasmus are alike and dissimilar. Aristotle's laws of logic, analytic philosophy, and the topic of systematicity are at the forefront of the discussion. Additionally, the next section considers how examples of semiotic X entwine thematically with moral truths and righteousness. My typology is then presented in greater detail to show the many different facets of chiasmus as a cross-linguistic literary and rhetorical device. I consider chiasmus alongside metaphor, because both of the devices assist a writer or speaker in forming comparisons and metaphor is a more studied device in linguistics and embodied cognition.

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Chiastic Forms and Figures: Truths, Logic and Cross-Linguistic Usage

Abstract: The core of this paper investigates chiasmus cross-linguistically and reveals how syntactic chiasmus has a number of impactful and discriminating effects that assist a speaker or writer in espousing a particular view. The main discussion explores the presence of these chiastic structures in 28 different language families and groups to identify common types and effects. Chiasmus refers to both a syntactic and semiotic phenomenon. The most simplistic example of semiotic chiasmus is the **X** – two lines crossing at a central point. At the syntactical level, chiasmus is characterized by its A-B-B-A pattern, as in the example, “Winners never quit and quitters never win.” For Pelkey (2017) chiasmus is a symbol of the human body in an extreme posture, with arms and legs outstretched. Oftentimes, chiasmus presents a dichotomy – two extreme perspectives that clash and diverge. The **X** may also be considered a symbol of a “truth” that prevails over others, vis-à-vis Western heritage, and the Greek alphabetic correlate *chi*. The *chi* is the first character of *Christ*, and through the influence of Christianity, the sign not only represents a single-minded perspective or cause, but also was meant to attest to the integrity or truthful testimony of whoever used it as a personal signature. X can signify a “truth,” and at the syntactical level, mute out other possibilities or opposites, as in truth-functional logic. Transitioning into a discussion of the relations that are present in both logical formulations and chiasmus, this study touches upon the philosophies of Frege, Wittgenstein and Kripke and the history of logic. Finally, the inquiry goes on to consider whether and how syntactical X patterns may in some way be fundamentally linked to systematicity in language, as chiastic patterns like “mind on my money, money on my mind” are similar to the popular example of systematicity, i.e. “John loves Mary” and “Mary loves John.”

The following paper examines sentence-level examples of chiasmus from twenty-eight different language families and groups, with the intent to show structural similarities that can arise across languages. The purpose here is not to make a claim about the universality of the chiastic ABBA form, but simply to compare and make observations about how chiasmus is used cross-linguistically and its import as a device. Chiasmus is a little known but widely implemented rhetorical tool – and each section of the dissertation strives to accomplish a single goal – to better characterize chiasmus in all of

its multi-faceted incarnations. The discussion that precedes the cross-linguistic survey is focused on semiotic X and truth-functional logic. There are a few objectives that the paper seeks to achieve:

1) To discuss how truth-functional logic (the intent of which is to get at true statements) is in some cases similar to syntactic chiasmus; and to explore a possible connection between the concept of truth in Western culture and semiotic X;

2) To reveal the range and power that syntactic chiasmus has as an instrument of comparison, through a close look at 80 examples taken from 28 different language families and groups;

3) To consider syntactic chiasmus alongside metaphor, which is also a comparative tool;

4) To apply this entire discussion to the relevant field of artificial intelligence, as chiasmus is both a scheme and trope with embodied meanings, but also similar in nature to what Fodor and Pylyshyn define as *systematicity*—as it deals with the logical and organized re-arrangement of elements in a sentence.

To begin with, it is first necessary to define chiasmus, and the broadest

definition is preferred: it is an ABBA structure in language, in which the A elements may either refer to two synonymous or antonymous semantic entities, or the A elements may be morphologically and semantically the same. The B elements are likewise paired with each other. *Antimetabole* features an exact reversal of the elements as they appear, and while some of the 80 examples below are instances of antimetabole, other examples feature reversals that do not have precisely the same reversed elements. The chart below can help to clarify examples of what we will consider chiasmus. Chiasmus includes, but is not limited to the following possible structures containing reversals:

Semantic reversal	**Morphological reversal**	**Antimetabole**
Similar semantic elements: From *Fifteen Dogs* by André Alex: "It was he who, in a manner of speaking, muddied waters that became too clear or clarified those that had grown murky." **Muddied / clear** **Clarified / murky** (The above example is also featured in Randy Harris' 2016 presentation *"Chiasmus, cognition, computation; computation, cognition, chiasmus")* Dissimilar semantic elements, but repeating themes nonetheless, which show two opposite conditions: From Sir Thomas Wyatt's poem "They Flee from me who sometime did me seek" -- "They Flee from me who sometime did me seek" - **Flee / me** **Me / seek**	Almost alike elements: From Evelyn Beatrice Hall's book *The Friends of Voltaire* (1907): "The instinct of a man is to pursue everything that flies from him, and to fly from all that pursues him." **Pursue / flies** **Fly / pursues**	Exact, repeating elements: "One for all, and all for one" **One / all** **All / one**

For the present purposes, the survey does not seek to discriminate or necessarily exclude any of the above possible chiastic configurations — but most of the 80 examples that follow are either of morphological chiasmus or antimetabole. One practical reason for limiting the survey to include examples mainly of this kind has to do with a need to narrow the scope somewhere; presumably other chiastic types could be explored and incorporated. [6] In all of the above possible configurations, chiasmus is an "X" structure which defines two possible arrangements of the elements and A and B – that is, AB and BA. This can be an outright way of comparing between the two, or expressing the co-functioning or disharmonious dynamic between elements A and B. Logical propositions and negations can be defined through chiastic AB and BA arrangements, logical disjunctions can appear when the term "never" is introduced, and other relationships between elements A and B may be formulated.

There are some similarities between chiasmus and logic, but there are also important distinctions between the two that will later be reviewed, as chiasmus achieves a variety of expression that logic does not. Chiasmus tends to come into play when the speaker or writer has an argument to present, which in short form can mute out other possibilities and show a preference for one path of action, either AB or BA — but this is not all that

[6] My decision to focus on morphological chiasmus and antimetabole came about in part because of the obscurity of chiasmus. It is still a device that does not receive much recognition in journals on rhetoric, or in other disciplines — and because it is so little known, I chose to use examples in which the ABBA elements are immediately recognizable because they are the same or nearly the same. The primary intent was to make this more accessible to people who aren't aware of chiasmus.

chiasmus can do, as the survey of examples will reveal. Nonetheless, chiasmus is a powerful instrument of argumentation, as the X structure lends an opportunity to consider two arrangements AB and BA side by side. Without lengthier exposition, chiasmus allows the speaker or writer to consider the two and express which might be better, right or true.

A core value of Western ethics, religion and logic is to get at the truth — and the syntactic and semiotic X may in some ways reflect or hinder these goals, as it is outlines all possible arrangements of the elements, or the seeming totality of available options, but also allows the user to dichotomize between AB and BA and/or select one option while shunning the other. Exploring semiotic X also reveals its possible connection with the concept of truth in Western culture. As a formal signature at the end of documents, X historically represented a vow on the part of the inscriber that he or she has represented the truth within the pages of the document. With other religious symbols like the Chi Rho, the chi may express the truthfulness and righteousness of a adopting a particular religious view.

Semiotics and X: Signatures, Self and the Applications of this Study

It is possible to trace “X” back to an early use in medieval Europe as a common signature. Literacy had a complex role in both the civil and social functioning of medieval Europe, but the majority of laypeople lacked the ability to read and write in Latin. Bäuml (1980) examined this issue and introduced a new frame for analyzing medieval literacy. He concluded that

the modern standard definition of “literate” does not take into account “elusive intermediate levels,” and yet it is clear from the documentation of this period that many men and women did not possess the ability to scrawl even their given name. However, these individuals *could* manage a single letter: the “X” or Greek “chi” became their signature. During the medieval period, the “X” also denoted Christ (**χ**ριστός), and in this double function it legitimated any oath that the signatory swore to keep. It also attested to the truthfulness on the part of the signatories, that all of the material that the document contained was true and accurate. Below is an example from Medieval Spain, dated to between the ninth and twelfth centuries. It is worth noting that the “X” continued to appear on official documents during this period, even though the country was under Muslim control. Although the charter is damaged, Castro-Correa (2014) provides a critical reconstruction of the Latin and reveals that it documents a donation. The elaborate signum or “X” at the bottom belongs to someone named Recamundo. Even today, it is a practice to sign off on emails or texts with “X,” although most people are not aware of how this tradition originated or changed throughout history. The “X” can represent the author himself, or his word—a symbol of truthfulness and good faith of the individual.

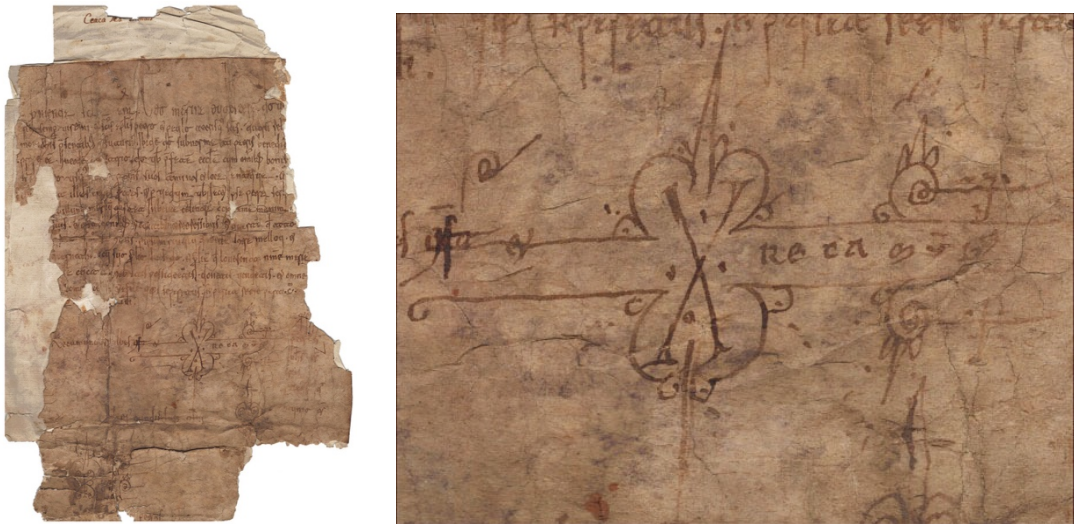


Figure 1. (*Left*): The early Medieval Galician charter in which the signature appears. (*Right*): A close-up of Recamundo's *signum.* From Castro Correa, A. 2014. The reconstruction of early medieval Spanish manuscript sources. *Early Medieval Europe, 22*(1), 69-87.

The semiotics of "X" has a rich and expansive history, one that Jamin Pelkey (2017) comprehensively treats in a book bearing the title *The Semiotics of X: Chiasmus, Cognition and Extreme Body Memory.* Patricia Lissner (2007) produced the first full treatment of "X" and embodiment, on both the figure "X" and the syntactic-rhetorical ABBA pattern referred to as chiasmus. Pelkey extended Lissner's analysis of "X" and chiasmus to the study of paleogesture, arguing that "X" holds a unique place in human development. He proposed that when humans developed the ability to walk in an upright posture, they also honed their ability to compare. This is reflected in several cultures where the terms that describe the anatomy of the upper body are also used in describing the lower body: the terms "lips" and "labia" are one example in English.

One of the earliest comparisons that a human agent will make involves his own body – across the transverse plane between hands and

feet, and across the sagittal plane or left and right sides of the body. The outstretched limbs of the human agent form the embodied “X,” and Pelkey’s thesis is made all the more enticing by an impressive array of icons he has gathered to depict how the “X” figure often appears with humanlike features. These “X” symbols find widespread usage with companies that provide services for the body – healthcare, wellness and fitness industries favor the icons to convey messages about status of the body. The “X” can be readily perceived as a symbol of the dynamic, acting individual.

Pelkey’s previous research on the semiotic history of X has uncovered a wealth of examples that bear out its extreme, dichotomous nature. The X highlights two distinct and diverging but comparable paths. The X may also be considered a symbol of a process and how a “truth” prevails over others, vis-à-vis Western heritage, and the Greek alphabetic correlate *chi.* The *chi* is the first character of *Christ*, and through the influence of Christianity, the sign not only represents a single-minded perspective or cause, but also was meant to attest to the integrity or truthful testimony of whoever used it as a personal signature. Investigating X as the syntactical structure *chiasmus* (or ABBA pattern) further reveals how the pattern has considerable potency – a number of impactful and discriminating effects that assist a speaker or writer in espousing a particular view.

The work continues with an exposition of how X can signify a “truth,” and at the syntactical level, mute out other possibilities or opposites, as in truth-functional logic. Transitioning into a discussion of the relations that are

present in both logical formulations and chiasmus, this inquiry touches upon the philosophies of Frege, Wittgenstein and Kripke and the history of logical theorization. Finally, it is possible to consider whether and how syntactical X patterns may be an essential part of systematicity in language.

Fodor (1975) draws on theories of logic in conceiving of "systematicity" -- a concept he applies in describing how lexical parts combine to create meaningful sentences, and how these parts must flexibly reconfigure to allow for other meanings to be formed. Pullum and Scholz (2007) also remark that systematicity concerns how "parts of expressions in natural languages…can be substituted for others without altering well-formedness." Syntactic-rhetorical chiasmus must accomplish this every time in substituting AB for BA. Therefore chiasmus may be a feature of language capable of furthering our understanding of systematicity. Following in the structuralist tradition of Saussure, Benveniste (1971) reflects that, "a language constitutes a system whose parts are all united in a relationship of solidarity and dependence. This system organizes units, which are the articulated signs, mutually differentiating and delimiting themselves" (83).

When surveying a modest number of examples from fourteen different language families, several distinguishable categories emerge that are worthy of attention: chiasmus works when "A" and "B" elements are somehow comparable, whether because they are similar in constitution and easily interchangeable, or otherwise on the opposite end of a spectrum of difference. The similarities and differences are all spatially construed. This

might seem to be a verification of the systematicity of language and have applications in artificial intelligence, but closer inspection is required to make sense of all of these issues, beginning with an overview of semiotic X.

X Figures, Forms and Truths

The “X” as an alphabetic unit has a complicated history, one that is shared with *t.* In Phoenician and Paleo-Hebrew, “X” represented the *t*—taw, or tav (borrowed into Greek as “tau”). The tav was also used in Hebrew as a sign indicating *meaning* or *signification*. The letter *t* also has historical correlates with an Ancient Egyptian symbol depicting the heart and trachea (Quaknin 1999). In the myths of Ancient Egypt, as indeed it would later be in the doctrine of Aristotle, the heart was thought to be in possession of the faculties that are modernly attributed to mind. The heart bore the responsibility for the person’s actions, ensuring he spoke truthfully. In the afterlife, the heart endured a trial of judgment to determine whether the person had deceived others or had chosen to live an honest life. Another symbol or way of writing “X” resembles fish bones (or a horizontal or vertical tree) and was initially used in the proto-Sinaitic alphabet. According to Quaknin (1999), some scholars including Benveniste “claim it derives from an Egyptian determinative” (338). This “X” however has little in common with the “X” of modern English.

Figure 2. An example from Quaknin (1999) of “tree shape” X.

In English, “X” relates closely to the Ancient Greek “khi” or “chi” and the /k/ still figures in the modern pronunciation /ɛks/.

The “chi” or X gained authority as the essential element of the name *Christ* in the age of Constantine, when the *Chi Rho* came to be embellished on all manner of objects, including clothing and items made of silver or gold. The Chi Rho is a symbol comprising the first two letters of Christ’s name, “X” and “P” in an intersecting arrangement. Oftentimes it is also depicted with the first and last letters of the Greek alphabet, the *alpha* and *omega* – the beginning and the end.

Figure 3. (*Left)*: The Chi Rho. (*Right*): The Chi Rho with the alpha and omega symbols.

There are differing accounts of why and how this christogram came into use, but all claim that the symbol occurred to Constantine in a dream or waking vision and that he believed he could achieve victory with his armies if he

incorporated the Chi Rho into his military decorations.[7] In fact, the history of the symbol is likely to be more complex and influenced by Ancient Egyptian culture; the crux ansata, or the ankh (Fig. 4) is one possible source of inspiration. Bardill (2012) considers this suggestion—that Constantine's advisor Lactantius was describing the crux ansata when he recounted the tale of Constantine's dream. The crux ansata or ankh is a symbol of life. In its most common interpretation, the ankh is viewed as a pictogram representing sandal straps—yet the ankh also appears in reliefs which depict deities offering it towards the mouths of leaders, associating it with food or speech. It is likewise shown adorning staves, and looped around the neck of the snake, which are symbols of authority and power, and it is sometimes given human characteristics – typically human arms, and more rarely faces.

Figure 4. Royal Cartridges of Ramses III. The Temple of Ramses III.

Whatever the symbol's precise origins, Constantine's use of the Chi Rho went hand in hand with a significant change in culture: he systematically converted the citizens of Rome from polytheism to the monotheistic worship

[7] Two stories about the chi rho exist--one from Constantine's counselor Lactantius, and another from Eusebius who chronicled Constantine's life. Lactantius claims that Constantine saw the Chi-Rho in a dream, while Eusebius writes that Constantine encountered the symbol illuminated in the sky.

of Christ. Through the Chi Rho, a single set of values, way of life and truth came to be defined. Constantine's followers and subsequent generations acted in accordance with this truth, and with the Edict of Thessalonika, the Roman Emperors Gratian, Theodosius I, and Valentinian II named Christianity the official religion of all Romans. Any person who refused the monotheistic religion and worship of the holy Trinity was deemed a heretic, and thereby susceptible to severe punishment by the empire. Christianity spread throughout Italy and all of Europe with the force of the Roman army behind it, and relics of the conquest can be found across the continent. The National Museum of Scotland in Edinburgh contains a spoon marked with a Chi Rho, encased along with smithereens of silver recovered from Traprain Law, a hill located in East Lothian, Scotland. It is salient that the symbol is at the focal point of the spoon, an instrument of delivering sustenance. On the one hand, this could simply demonstrate Roman ownership of the utensil, but it could also be a reminder of the power of the empire to provide nourishing food for its military. The fact that the spoon must be inserted in the mouth also may have another significance, as it is from a person's mouth that he is able to speak utterances and such utterances should be expected to align with the messages of the empire, and spoons were used to deliver holy communion to the consumers of the church's message.

According to museum guides at the National Museum of Scotland in Edinburgh, scholars are still puzzling over what occurred at Traprain Law, where the spoon was found with an impressive collection of silver

smithereens. [8] At this point in time the Roman army was under attack from barbaric forces and other forces on all sides. These artifacts may be just some of the remnants of the Romans attempting to Christianize Scotland from AD75 to AD1000. The Romans might have destroyed these artifacts melted the silver down for trade, but it is interesting that a few remained intact—including the silver spoon with the Chi Rho, the powerful symbol of the empire.

Figure 5. Silver spoon from the National Museum of Scotland in Edinburgh. The spoon was recovered from Traprain Law, a hill in southeast Scotland.

The "X" is a deeply strategic tool and a political symbol in the Western tradition through Christianity: it stands for the individual and may also represent the truthfulness or integrity of that individual. At the sentence level, the "X" entwines with truth statements and dialectic. The syntactical "X" structure lays out two possible arrangements, AB and BA, sometimes for the purpose of comparing and evaluating the AB statement as true or better. Speaking truthfully is a fundamental value of Western philosophy in its originary rejection of sophistry. In Plato's dialogues, Socrates criticized anyone who used eloquent language to persuade others to adopt misguided

[8] More information on the hoard of silver treasure from Traprain Law can be found at: https://www.nms.ac.uk/explore-our-collections/stories/scottish-history-and-archaeology/traprain-law-treasure/

views. The dialogues *Theatetus, Gorgias,* and *Phaedrus* capture these criticisms of sophistry. Socrates' chief concern was about speakers who expressed empty sentiments and the audience that would find within those speeches a justification to act wrongfully, unjustly or foolishly. The famous sophist Protagoras for example believed that truths and falsehoods could only be personally defined—and that "man is the measure of all things". Socrates challenged this idea, and sought one, objective truth over such forms of moral relativism. In *Theatetus,* Socrates attempted to describe ways of getting at the truth; he defined three methods, including one that entails formulating a comparison and discerning the difference between the object and other objects. Socrates remarked that knowing what is "true" requires some knowledge of what is the opposite. Aristotle also writes on truth, logic and categorization in *Organon*. In this text and elsewhere, Aristotle formulates definitions of what something is by pondering and rationalizing what it differs from—or what it is not.

With sentence level chiasmus, two ways of engaging with or seeing the world will often be presented and no further options. In logic, this is in keeping with a classic law of thought. Pelkey (2017) mentions how Tertium Non Datur (or the Law of Excluded Middle) can relate to chiasmus: two immutable conditions are defined, with no third option or compromise. [9] While Pelkey's analysis moves beyond such a limiting binary chiastic

[9] It is important to note that a chiastic expression can also home in on the *excluded middle* alone – a category which does not fit either of two extremes. The 1991 movie *Fried Green Tomatoes* contains an example of this, when Kathy Bates' character Evelyn Couch remarks that, "I'm too young to be old and too old to be young."

structure (to note other salient features of the device), there are many examples of chiasmus that seem to point out two ways of acting upon or viewing a situation. A prime example of this is a quote from Evelyn Beatrice Hall, which is commonly misattributed to Voltaire: “The instinct of a man is to **pursue (A)** everything that **flies (B)** from him, and to **fly (B)** from all that **pursues (A)** him.” There are two options covered by this proposition: at any given time, it is either true that the man flies, or it is true that he pursues. In a moment of space and time, a human agent cannot manage to both pursue and flee from a single object, and Hall does not divulge any other compromise or middle way.[10] This is a superficial reading of the quote, which in its context hints at romantic entanglements – but nonetheless, Hall is making a suggestion about human behavior; the object to be pursued is an object of one’s affections, while the object to flee is an object of one’s rejections. There is no in-between. Axiomatic-deductive theories of meaning and truth-functional logic rest on the supposition that a statement will either be true, or false: two conflicting “truths” cannot be upheld simultaneously. Chiasmus may not manage to uphold conflicting reports simultaneously, but it is worth noting how the chiastic sentence can feature a proposition and its negation, and also join the pair together in one unified, whole structure.

More often than not, however, “X” becomes a crossing point of opposite ideas and the listener or reader can extract a certain “truth” from chiastic communications. The examples that follow the Law of Excluded

[10] There are examples of chiasmus that are more equalizing.

Middle might be employed to formulate what appear to be absolutes, and this makes the device a prime tool for asserting an ideology, rule or principle. The following quote that Plutarch credits to Socrates is a further demonstration of this: “Bad men live **(A)** that they may eat and drink **(B),** whereas good men eat and drink **(B)** that they may live **(A)**.”[11] Similar chiastic statements can be found in political speeches, religious texts, spoken word poetry, or casual repartee. The takeaway from the statement happens to be a moral one, but this syntactical example can render axioms defining “good” and “bad” conditions. In syntax, the “X” may be used in these evaluative ways with respect to “same” or “different” relations, or it may represent the *true*, as it can be calculated alongside the *false*. Arguably, such assessments entwine in chiasmus. The chiasmus or “X” is a crossing point of opposite ideas that typically delivers a set of conditions and a truth-value to an audience. Even in practical usage, marking “X” on a page might designate a salient passage requiring further attention, while an “X” that covers the text will indicate a negation or deletion.

The effect of this is the same in formal logics: a truth function is defined either by directing attention to an important proposition, or by stipulating a “not this” condition or erasure. Harris (2016) makes a connection between chiasmus, mathematical and logical formulations. He

[11] This is from Plutarch’s *Moralia, How a Young Man Should Listen to the poets* (Pelling 2005). There are several variations of this original statement. One example is from Ben Franklin’s Poor Richard’s Alamanc (1733), in which Frankling said, “Eat to live, don’t live to eat.”

mentions several formulas in his presentation, listed here:

$m + n = n + m$

$mn = nm$; $m \times n = n \times m$

$m - n \neq n - m$

$m/n \neq n/m$; $m \div n \neq n \div m$

$(p\&q) \leftrightarrow (q\&p)$

$(p \vee q) \leftrightarrow (q \vee p)$

The chiastic structure of such formulations can be noted with clear reversals in each case. When it comes to a consideration of logic and syntax, some chiastic sentences can be written as logical operations, as has been explored in the section, *Chiastic Studies and Typology* in this dissertation. Not all examples of syntactic chiasmus can be written in the symbols of formal logic, but it is interesting that some can be expressed that way and that some logical formulations in turn are chiastic.

Below, Pelkey and Paul's chiastic types are revisited, but this time not for the sake of comparing between my own typology and theirs, but rather to glean from primarily Pelkey's work a few more observations about the chiastic structure and how X relates to truth statements and rhetorical argumentation.

Chiastic Types

Anthony Paul and Jamin Pelkey have both delineated four striking thematic chiastic types, although they have differing interpretations. For Paul, there is:

(1) **X or cross-shape chiasmus**, which he claims causes no "contradiction or clash of meanings." Paul provides several examples, including: "*If a gift is given it can be received; when it is received it can be given"* (23).

(2) **Mirror-chiasmus**, which characterizes a "mental blockage" or contradiction that results in cognitive dissonance. It "combines formal symmetry with paradox or contradiction," as in the Shakespeare example: *"Fair is foul and foul is fair"* (23).

(3) **Circular-chiasmus**, which is "experienced as a 'circling' when it invites the mind to follow a line of thought that returns to the starting point. Leopardi's "L'Infinito" is the example Paul cites, for it contains within it an arrangement of parallels (35). This includes:

"Sempre caro mi fu" // m'è dolce" or "Always dear to me // to me is lovely"

"Interminati // infinito" or "Boundless // infinite"

(4) and **Spiral chiasmus**, which "sets up a more dynamic process of movement" in which the center begins another movement (23-24). Paul

gives the following example in his work (36):

“The world had a beginning

And this beginning could be the mother of the world.

When you know the mother

Go on to know the child.

After you have known the child

Go back to holding fast to the mother.

And to the end of your days you will not meet with danger.”

(Lao Tzu, Tao te Ching, LIII, translated by D.C. Lau).

Pelkey alters Paul’s original categorization and defines the following chiastic types: (1) X (2) diamond (3) hourglass, and (4) argyle. Pelkey considers the “X” a representation of the embodied agent and the extreme postures such an agent can assume. He goes on to identify other types of “X” – including the repeating “X” or argyle pattern. According to Pelkey, the argyle pattern is the individual in direct contact with other individuals. In substantiating these claims, Pelkey draws upon evidence from graphic design, such as the logo for the company Doing Family Right, which features several overlapping or “lattice” spread eagle “X” figures (Pelkey 202).

Figure 6. Doing Family Right Logo (doingfamilyright.com)

The argyle pattern can be representative of bringing people together, as seen in the example above. The two other types of “X” in Pelkey’s classification system are the hourglass type and the diamond type—and these types seem to serve opposite functions. The hourglass as a symbol is associated with passing time and mortality, and Pelkey likens the hourglass type to Lacan’s L-Schema, because its “dihedral symmetry” forms a “double mirror” and the L-schema is a mirroring of the “ego constantly projecting its self-image and assumptions with confidence onto others and having this image reflected back with little change” (Pelkey 89). Below is a visual rendering of the L-Schema and its “X” shape.

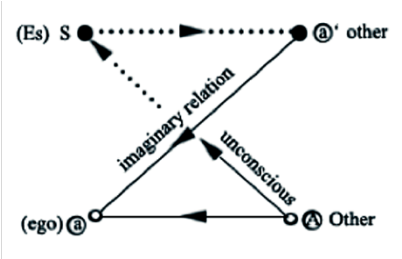


Figure 7. Lacan’s L-Schema – and its hourglass and “X” configuration.

Unlike the hourglass type, Pelkey’s diamond type involves two “X” figures positioned around a shared middle ground. The diamond comes forth in this interspace, and Pelkey posits that this type conveys the experience of one and Other communing in awe over a third Other. “X” may signify reciprocity or exchange—but also represents confrontation. Paul and Pelkey’s different types facilitate a discussion of chiasmus, and help to articulate how even two “X” types can be in conflict: Paul’s “X” type is balancing, while his Mirror-type is destabilizing. The circle type involves an

entrapment, in which the reader ends up right where he started, while the spiral type commands the reverse effect and enables movement.

Following with the connections that Kunze (2010) has made between chiasmus and architecture, what the "X" accomplishes is akin to what Lacan referred to as "mi-dire," or "saying half" – which for Lacan came as a result of reaching after truth. Van Haute and Geyskens (2015) aptly explain Lacan's concept of mi-dire: "Every piece of knowledge leaves a remainder. No one can ever fully express truth; structurally it is half-said." Kunze explores mi-dire alongside Lacan's interest in the mirror stage of human development, which occurs when a young child begins to recognize his or her appearance in the mirror and identifies themselves. According to Kunze, the concept of mi-dire "goes to the heart of the mirror stages primal condition of its own truth told in halves, and halves of a half" (378). In some of its incarnations, "X" can pick a stance or arguing point, which is a "mi-dire" or crossroads within some greater truth or issue. The syntactical "X" or ABBA pattern may create the illusion that two perspectives are under consideration, when oftentimes only one is being emphatically expressed (and several more are possible). The repetitions also have the effect of a mirror or echo, which can amplify the primary sentiment of the sentence or appeal to emotion ("pathos").

Maurice Merleau-Ponty (1968) also applied the term *chiasm* broadly to his discussion of the mind-body dichotomy, language, perception and other phenomena. Merleau-Ponty turned the *chiasm* into an expansive concept. With the concept, he challenged the Cartesian notion of the

disembodied mind as a half-truth, and argued that the mind could not be dissevered from corporeality. The chiasm can dismantle dichotomies, but more often, it seems to be noted for building them.

In politics, this is especially notable. Such dichotomies often demarcate two courses of action, or render a comparison, then go on to suggest which is the correct or proper path. John F. Kennedy's 1961 inaugural speech contains one such example: "Ask not what your country **(A)** can do for you **(B),** but what you **(B)** can do for your country **(A).**" This chiastic example is asymmetric, with the addition of the phrase "Ask not," which puts added stress on the negation of the first clause. This much quoted and catchy line from his speech influenced young men to serve America. The line champions the idea of patriotic service, while also dismissing the importance of a government serving its people, and managing to do so in a way that is not wholly conspicuous. Notably, in 1965 James Baldwin wrote a New York Times article entitled "The American Dream and the American Negro," in which he reflects on the experience of growing up as an African American. Baldwin states, "It comes as a great shock around the age of 5, 6, or 7 to discover that the flag to which you **(A)** have pledged allegiance **(B)**, along with everybody else, has not pledged allegiance **(B)** to you **(A).**" This chiasmus also contains "not," and seems to be engaging in dialogue with John F. Kennedy's earlier speech as it conveys a clear dissatisfaction with a government that does not protect and respect its entire people. This might be seen as the response to JFK's remarks – and both

Baldwin's and JFK's comments could be what Lacan described as "mi-dire," or expressing only a partial truth or perspective. Baldwin's essay articulates a profound disenchantment with America and with patriotic fervor.

This type of chiastic phrasing is still very much in use today in politics. Trump's July 2017 speech to the Boy Scouts contains chiastic phrasing. The persuasive lines reinforce the notion of a mutually beneficial relationship between the nation and the Boy Scouts:

TRUMP: America turns to the Boy Scouts because we know that the Boy Scouts never ever, ever let us down.
(APPLAUSE)
TRUMP: Just like you know you can count on me, we know we can count on you, because we know the values that you live by.
(APPLAUSE)
TRUMP: Your values are the same values that have always kept America strong, proud and free.
TRUMP: And by the way, do you see the billions and billions and billions of additional money that we're putting back into our military? Billions of dollars.[12]

Syntactic-rhetorical chiasmus can appear where reciprocity is expected to exist, and yet in this politically charged example, that seeming reciprocity segues into another message about military support and servitude. This is not to say that chiasmus exclusively misleads and can never express reciprocal relations. Nonetheless, recognizing such patterns exposes the imperfectness and incompleteness of assertions and the mutability of things. It may be beneficial for readers to notice where chiasmus crops up, so as to understand when an assertion has been made and yet

[12] The full transcript of this speech is available online at:
http://time.com/4872118/trump-boy-scout-jamboree-speech-transcript/

subtly repealed within a speech. On a grander scale, pinpointing chiasmus as an aspect of language may change how we conceive of topics like semantics and meaning – moving us away from the perspective that the meaning of a phrase is something which is fixed or static, and towards the view that meaning is in flux and invertible.

The study of chiasmus also has possible implications for how embodied agents conceptualize through language. Patricia Lissner (2007) coins the term “chi-thinking” to denote a dichotomizing way of representing the world that comes to the fore in chiasmus. Rodolphe Gasché (1987) refers to *chiasmus* as “what allows oppositions to be bound into unity…. a form that makes it possible to determine differences with respect to an underlying totality.” Gasché also states that chiasmus is the “originary form of thought” (1987: xvi). While this may seem like a specious claim, chiasmus is more than just a rhetorical device or a figure. Pelkey’s (2017) efforts have gone a long way in deciphering the extreme and fluctuating statuses of “X” figures, but this matter requires still further investigation because of how chiasmus relates to logic. Chiasmus can reveal and debunk some paradoxes that persist in the world and in truth-functional logic (or any system characterized by strict and abiding binaristic rules), even if its practical usages seem to secure a place for such truth proofs.

The story of “X” and truth-functional logic that we began to explore above is also an ongoing one. To expand further on logic and chiasmus, it is

necessary to pick up where we left off with Frege and discuss his impact on other thinkers.

Logic and the Systematicity of Language

Gottlob Frege was a German mathematician and analytic philosopher, whose work centered on logic and arithmetic. In *Begriffsschrift* or *Concept Writing* (1879) and The *Foundations of Arithmetic* (1884), Frege proposed a quantificational logic that was also a theory about thought. Frege separated objects from concepts, establishing that objects are material things in the world, but they can be pondered by means of different concepts. For Frege, concepts existed in a hierarchy, which involved a consideration of an object's properties, with its physical attributes taking precedence over the more abstract qualities of the object. The object itself was the most important entity to consider. This became the backbone of his quantificational logic, which is the precursor to modern set theory, as he defined natural numbers (0, 1, 2, 3) as logical objects. Everything else in the world could be analyzed by means of dealing with these logical objects, or natural numbers.

Frege's particular commitment to logical axiomatization influenced several thinkers in establishing their own theories of meaning, language and cognition. One scholar who expanded on the work of Frege was Ludwig Wittgenstein, who in his earlier work committed to Frege's view of language as axiomatic, or reducible to fixed formulas; however, in his later work, specifically throughout *Philosophical Investigations,* Wittgenstein reflects on

Frege's methods of analysis and definition and ultimately rejects this methodology. Wittgenstein likens analysis and interpretation to "chasing chimeras," but as Hans Schneider (2014) points out, Wittgenstein might not be wholly endeavoring to minimize the importance of logic; he might rather be promulgating his discovery that logic and logical analysis alone are insufficient. Wittgenstein concludes that *language games* are essential for communication—that is, utterances take on significance only when understood through use and activity. Two or more language users set the rules for usage, and these rules undergo constant situational changes, so that generating new terms is ongoing and the terms can be applied in infinite ways. Truths are therefore never fixed, but always undergoing revision.

Wittgenstein states in his own treatment of *tertium non datur* that human beings prefer to say definitively of something, "it must look either like *this* or *that*" -- yet simultaneously we "feel that it is not so" (352). In other words, it is preferred that the meaning of something is precise and fixed. It is possible that in some ways, Wittgenstein also finds himself confined to these possibilities—that his description of "language games" is in some way too restrictive in describing language use, after all—but Wittgenstein seems to be advocating for an end to restrictive categorization altogether. [13]

Saul Kripke draws on Wittgenstein in his discussion of possible worlds within *Naming & Necessity*. Throughout this series of lectures, Kripke concentrates on a popular thought experiment about former United States

[13] Wittgenstein, Ludwig. 2009. *Philosophical Investigations*. Oxford: Wiley Blackwell.

President Richard Nixon. When pondering the subject of other possible worlds, logicians have constructed the following assertion: Nixon won the election in our world, and he might not have won in another world. In conceiving of other worlds, the tendency is to envision an extreme opposite—to pick a point of divergence between *this* and *that.* Less import is ascribed to gradual shifts or minor changes than two extremes. In considering the Nixon thought-experiment, Kripke concludes that mutable conditions are used to fix the referent—or attach an identity to the person. While Fregeans would like for these referents to be definitive and immovable, Kripke proves the arbitrariness of assigning identities based on "this" or "that" descriptive conditions. Kripke's work challenges Frege, but the tendency to represent the world in this way still endures.

The work of Jerry Fodor (1975) also addresses several problems Frege puzzled over. Fodor's theories of cognition asserted there must be an algorithmic language of thought that determined how minds work, and that the predicate calculus of logic and all human language might in some way mirror these original rules of the mind. According to this perspective, the language of thought must be systematic to define the constraints and possibilities of how elements could be manipulated during these mental activities.

Although few continue to adhere to the "classical" notion of systematicity, many scholars studying cognition still view language as systematic, even if they have rejected the representational theory of mind

regarding a language of thought. To clarify the terminology, systematicity "refers to the fact that some sets of representations are intimately linked" (Eliasmith 2013). Fodor and the philosopher Zenon Pylyshyn have contended that human agents must be able to represent "Mary loves John" if they are able to represent "John loves Mary." Such representations are at their core chiastic, if Mary **(A)** loves John **(B)** and John **(B)** loves Mary **(A)**. Fodor and Pylyshyn's theories about systematicity continue to influence modern theories of cognition, and therefore deserve further attention, yet as Johnson (2004) explains, "the nature of systematicity is rarely more than cursorily sketched: an example or two is typically thought to characterize the phenomenon adequately" (112). This does not seem to have changed much, even after the passing of over a decade.

Johnson (2004) takes a skeptical perspective on systematicity and draws upon the theories of Robert Cummins, who conceives of systematic variation as encompassing all possible permutations of the elements in a sentence. There is a difference between all possible permutations of a sentence, however, and all probable and coherent permutations, since not all elements are substitutable in the place of others. Chiastic samples can be collocated to survey what intelligible rearrangements and reversals hold in common. On the other hand, chiasmus can also be recruited as evidence to show how unsystematic language can be – and how new permutations in language are always materializing. This is certainly evident when looking at 80 different examples of chiasmus from 28 different language families and

groups. All of the above focused on the topic of truth and truth-functional, but the survey below departs from that primary focal point, while still requiring it as background to a more thorough discussion on chiasmus as a dichotomizing device, and one that has both important similarities and differences from logic. First, I begin with an overview of how I conducted my research and then I examine particular chiastic examples.

Methodology and Chiastic Typology

Pelkey (2013) reports that “countless examples of chiastic patterning appear cross-linguistically,” and the early explorative stage of my study involved finding these phrases in as many different language families and groups as possible. While this did not begin in a strict or constrained way, and instead consisted of a broad sampling and collocating of examples, it became necessary to adopt a more systematic approach and method. The prime research goal was to confirm the presence of chiasmus in multiple languages, but evolved into developing a typology only after the data reflected a need for one. A Glaserian grounded methodology proved to be most beneficial, in that it does not require making prior assumptions about the data. In this case, the focus was foremost on the data and what could be gleaned from compiling it. As the main goal of the project was to make the survey of languages and types as broad as possible, it seemed best to collect the data and then later to see if any comparisons could be made between the examples taken from different languages.

One aim was to answer the question: how many different language families and groups contain examples of chiasmus? Investigating this question organically required both accessing data through resources on the internet and in research databases. In the interest of narrowing the search for chiastic phrasing, I chose to focus mainly on what Harris refers to as morphological chiasmus and antimetabole -- ABBA patterns with near exact reversals of elements, or exact repetitions of elements. One fruitful way to find these antimetabole examples was through social media and the hashtags for chiasmus, but the greatest success rate came from perusing websites like BrainyQuote, Goodreads and Wikiquote. Mardy Grothe's book *Never Let a Fool Kiss You or a Kiss Fool You* was another helpful resource, although regardless of where each example was originally found, they all needed to be a) cross-referenced and b) traced back to the source text for verification. Some of the chiastic quotes I uncovered were misattributions or impossible to locate in any text. In the case of several of the following examples, I turned to both full texts and articles strictly devoted to proverbs. I read the entirety of those books or articles in a quest for chiasmus. Occasionally, I came across examples in my unrelated readings. All of the sources of the chiastic examples are directly cited in the chart. In the cases where I cross-referenced a proverb and it appeared in multiple locations on the web, no particular source is cited (as the original author is an unknown and this is a standard practice across publications). The sample data for this

project included over five hundred examples, but only 80 were selected to include in the final project due to matters of space and to allow for some discussion of those examples to take place.

After collecting the data, I realized I needed a systematic way to organize it, and that was when the types emerged through a process of comparison between the examples. Each time I identified a sentence with similar structural components to another sentence, I grouped them together. The descriptions of each functional type explains the particular attributes of the examples that make them qualify for inclusion under that type. It also must be acknowledged that in some cases an example could overlap and fall under more than one type. It took more time and effort to identify examples in certain languages over others, due in part to my limited knowledge of those languages. In hindsight, it might have been easier to create a forum and ask native speakers of all different languages to contribute examples of chiastic quotations. This might be a way to expand the project in the future.

Another way to expand would be to consider examples of phonological chiasmus (e.g. “A magician pulls **rabbits** out of **hats**. An experimental psychologist pulls **habits** out of **rats**” – which is a quote of unknown origin). Phonological chiasmus has not been incorporated into this survey because of the need to limit the scope. Longer examples of chiasmus, i.e. syntactical examples with multiple elements such as ABCCBA have likewise been omitted from the survey (although could feasibly be added). As explained in a footnote above, I chose to focus on chiastic

examples where the ABBA repetitions are more explicit. With both morphological chiasmus and antimetabole, it is not difficult to pick out the repeating, chiastic elements. The intent of this was to make the typology more accessible to those who have little background on chiasmus, or perhaps have never even heard of the device at all before. While this is a potential limitation of the typology right now, it is one that can be addressed at some point in the future.

Twenty-eight languages are represented in the typology, from fourteen different language families, including: an **Afroasiastic** language, Hausa; **Niger-Congo** languages, Yorùbá and Igbo; **Indo-European** languages, Dutch, Gaelic, Icelandic, Pashto, Sanskrit, Swedish, Yiddish; **Dravidian** languages, Kannada and Tamil; the **Germanic** languages, English and German; the **Romance** languages, French, Italian, Latin and Spanish; a **Slavic** language, Russian; **Semitic** languages, Arabic and Hebrew; **Sino-Tibetan** languages, Chinese and Tibetan; an **Austro-Asiatic language**, Vietnamese; the **Japonic** language, Japanese; **Turkic** language, Turkish; **Greek**; and also a **French creole**, Haitian.

Eight chiastic types are considered. Categories such as “Exclusions” and “Dissociations” are similar in that they describe different forms of spatial division, but a distinction can be drawn here because the examples found in “Dissociations” explicitly discuss or involve some separation of entities or groups – i.e. *men* and *women*. The examples in the “Exclusions” category do not do this, but instead lay out mutually exclusive conditions: for example,

“Winning” and “quitting” cannot take place simultaneously (i.e. “Winners never quit, and quitters never win”).

The eight chiastic types herein considered are delineated a list and then explained more thoroughly below:

1) Equalization: AB equates to or is the same as BA

2) Part-whole: A is part of B, and B is part of A

3) Exclusion: A excludes B, and B excludes A

4) Dissociation: A dissociates from B, B dissociates from A

5) Combination: A and B, B and A; the elements are grouped together but do not necessarily affect each other

6) Comparison: A and B are better than B and A; or A and B are worse than B and A

7) One Way Effects: A affects B, but B does not affect A; or A does not affect B, but B affects A

8) Multiple Effects: A affects B, and B affects A; or A affects B and B affects A;

can also include more elaborate reversals with repeating C, D, E elements

Equalization

The first type encompasses substitution or associative effects, which can be signaled by *to be* verbs like *is* and *are*—but can also emerge when detailing two processes for accomplishing the same outcome, or through metaphor.

All of these produce some form of **equalization**. Hegel's *Grundlinien der Philosophie des Rechts* (*Elements of the Philosophy of Right*, 1821) includes one such example: "Was vernünftig ist, das ist Wirklich; und was wirklich ist, das ist vernünftig" (What is rational is real; and what is real is rational). At face value and considered as a whole, the chiastic arrangements that involve *to be* verbs might be deemed tautological, but here Hegel's statement cannot be dismissed out of hand as a circular phrase; to get at a better interpretation of the sentence would require exploring his particular views on logical reasoning and dialectic, which would also entail gathering knowledge about philosophers that came before him who had much different views about the definition of rationality. Interpreting this line successfully demands going beyond its atomistic components, and having a wealth of prior knowledge from many texts.

A Tibetan proverb provides a further definitional example:

ཀུན་མ་བཀུ་མཁས་ན་རྐེད་པར་འགྱོ །རྐེད་པ་རྐེད་ཉེས་ན་ཀུ་ལ་འགྱོ །

The proverb asserts, "It's a clever thief who keeps finding things, but finding things too often makes one a thief." These examples illustrate the relationship between a noun or adjective "A" and some qualifying verb or synonymous adjective "B": the "A" is set up as the equivalent or definition of the "B" element. This makes these sentences circular, but necessarily so: the chiastic crux solidifies the definition.

When these types appear in describing a process, they can also enumerate different ways of reaching the same end goal, as in the Yorùbá example: “Ká lọ aṣọ mọ ìdí, ká lọ ìdí mọ aṣọ, kí ìdí ṣáà má ti gbófo” (Whether we tie a wrapper round the waist, or tie the waist round a wrapper, to ensure the waist is not naked is what’s crucial).[14]

There is a progression and movement evident in examples of this type—a self-caressing and self-reinforcement that seem salient and perhaps rooted in embodiment. An equalization can be written as a logical expression, p = q, q = p. Some further examples are featured in the chart below.

Equalizations: A is the same as B, and B is the same as A

1. “Beauty is truth, truth beauty” – *John Keats, English poet, from “Ode on a Grecian Urn”*
2. “L’armi, qua l’armi: io solo / Combatterò, procomberò sol io – *Giacomo Leopardi, from the poem “All’Italia”* **English translation:** The weapons, here the weapons: I’ll fight alone; I’ll fall alone. (Or “alone I’ll fall”).
3. “Et rose, elle a vécu ce que vivent les roses” – *François de Malherbe, French poet* **English translation:** And rose, she lived as live the roses
4. “Was vernünftig ist, das ist Wirklich; und was wirklich ist, das ist vernünftig.” – *Georg Wilhelm Friedrich Hegel, German philosopher*, *from Elements of the Philosophy of Right* **English translation:** What is reasonable is real; and what is real is reasonable.
5. “Ustedes son el mundo y el mundo es de ustedes” – User Sebastian Y. Wende (@sywende) on Twitter **English Translation:** You are the world, and the world is yours.
6. “Выбор громадный, но я всё время был так пьян, что бутылки принимал за девиц, а девиц за бутылки” – Anton Chekhov, Letter to his sister M.P. Chekhov on April 25, 1887

[14] A wrapper is a loin-cloth of sorts, and can refer to a sanitary garment worn by women during menstrual periods.

English Translation: The choice is enormous, but I was so drunk that I took the bottles for girls, and the girls for bottles.

7. “Tala med bönder på bönders vis och med de lärde på latin” – *Unknown, Swedish proverb*
   English translation: Speak with farmers as farmers speak, and with the educated in Latin.

   English interpretation: Similar to the idiom “Now you speak my language” – it is an expression of how to promote understanding between oneself and others.

8. “Kallaik kaNdAl nAyaik kANum, NAyaik kaNdAl kallaik kANum” – Unknown, Tamil proverb
   கல்லை கண்டால் நாயகைக் காணாம், நாயகைக் கண்டால் கல்லகைக் காணாம்

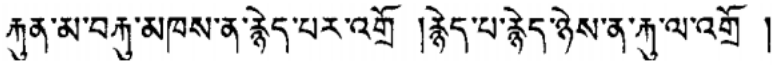
   English translation: When you see a dog’s figure in the rock you can’t realize it’s a rock, when you see the rock you can’t realize it’s a dog.

   English interpretation: Once you adopt a certain perspective on something, you might not be able to see it another way.

9. “Ká lọ aṣọ mọ ìdí, ká lọ ìdí mọ aṣọ, kí ìdí ṣáà má ti gbófo” – *Unknown, Yorùbá proverb*

   English translation: Whether we tie a wrapper round the waist or tie the waist round a wrapper, to ensure the waist is not naked is what’s crucial.

   English interpretation: It doesn’t matter which way you do something important, as long as it is accomplished. (A wrapper refers to a loin-cloth of sorts, and sometimes refers to a sanitary wrapper that women use).

10. “ “
    
    - Unknown, Tibetan proverb
    English translation: It’s a clever thief who keeps finding things, but finding things too often makes one a thief.

Part-whole

Another fairly common A-B-B-A reversal type occurs with elements that have a **part-whole** relation, as in the Greek proverb: “Απ' αγκάθι βγαίνει ρόδο κι από ρόδο βγαίνει αγκάθι (From a thorn a rose emerges and from a rose a thorn). Egyptian writer Anis Mansour composed a similar sentence.

المتشائم: الورد له شوك
المتفائل: الشوك له ورد

In English, the quotation reads, “The pessimist: A rose has thorns. The optimist: Thorns have a rose.” Although the Greek proverb appears straightforward and has a literal signification, the second quotation reveals the potential for these expressions to extend beyond the actual and into the territory of abstraction and metaphor. The rose epitomizes all that is beautiful and fresh, while the thorn pricks and epitomizes pain and unpleasantness. It has already been discussed how metaphors derive from embodiment, but the literary device metonymy also involves part-whole relationships, and it is worth noting how these permutations can bridge the two together. Another poetic example comes from *Fragments d’un discours amoureux* by Roland Barthes: “Le langage est une peau: je frotte mon langage contre l’autre. Comme si j’avais des mots en guise de doigts, ou des doigts au bout de mes mots. Mon langage tremble de désir” (Language is a skin: I rub my language

against the other. As if I had **words (A)** instead of **fingers (B)**, or **fingers (B)** at the tips of my **words (A)**. My language trembles with desire). Such permutations seem naturally suited as a vehicle for metaphor—for attaching two unlike things in one body, but they can also be constructive for making comparisons between the parts within a single object, person or place. There are examples about nations and nationality, which are similar in theme: the German politician Gregor Gysi opines, “Wir brauchen ein europaisches Deutschland. Wir brauchen kein deutsches Europa” (We need a European Germany. Not a German Europe). Dialogue from the film *Ocean’s 8* furnishes another example with an A-B-B-A-A-B structure:

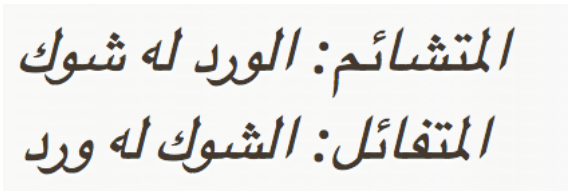
> Debbie Ocean: These are all **Russians. (A)**
>
> Lou: They’re **hackers. (B)**
>
> Debbie Ocean: Are there no **hackers (B)** who aren’t **Russians? (A)**
>
> Lou: No. There’s barely any **Russians (A)** who aren’t **hackers. (B)**

Examples can also pertain to people, such as the reflection that “Danger hides in beauty, and beauty in danger,” attributed to Belva Plain -- or the Russian theatre director and acting teacher Konstanin Stanislavski’s suggestion to “Любите искусство в себе, а не себя в искусстве” (Love the art in yourself, not yourself in the art). Stanislavski’s recommendation about art seems to have overlaps with the **one-way** type, this time with a proposition placed alongside its negation. Several other part-whole examples could also fit into the other types, but are placed here specifically because

the permutated elements are in part-whole relationships.

Comparison between the constituents of other objects or places likely finds a basis in comparing the constituents of the self and embodied cognition. The recognition of self-as-other, and proprioceptive processing of touching one's left hand with the right hand might influence how humans represent part-whole relationships through language. Pelkey (2017) argues this in his recent work—that the ability to compare more broadly stems from making comparisons of the body—across the sagittal plane, and between the hands. He examines the possibility that in evolution, developing the ability to make these most basic comparisons was antecedent to and an incitation in generating language.

***Part-wholes*:** A is part of B, and B is part of A; or A somehow describes or is a possession of B, and B describes or is a possession of A

1. "Любите искусство в себе, а не себя в искусстве" **English Translation:** "Love the art in yourself, not yourself in the art" *Konstanin Stanislavski, Russian actor and director*
2. "  *- Anis Mansour, Egyptian writer* **English translation:** "The Pessimist: A rose has thorns. The Optimist: Thorns have a rose."

(Translator and compiler of Arabic quotes: Ayeshah. Arabicquotes.co.uk).
3. “Wir brauchen ein europaisches Deutschland. Wir brauchen kein deutsches Europa” – Gregor Gysi, German politician **English translation:** We need a European Germany, not a German Europe.
4. “Most countries have armies, but in Pakistan the army has a country.” – The Economist/Economist.com
5. “Le langage est une peau: je frotte mon langage contre l’autre. Comme si j’avais des mots en guise de doigts, ou des doigts au bout de mes mots. Mon langage tremble de désir” – *Roland Barthes, from Fragments d’un Discours Amoureux* **English translation:** Language is a skin: I rub my language against the other. As if I had words instead of fingers, or fingers at the tips of my words. My language trembles with desire.
6. “En mistök eru hluti af skapandi hugsunarferli og ef bú ert að reyna að skapa eitthvað nýtt gerir bú fjölda mistake” – Jón Gnarr, Icelandic actor **English translation:** But mistakes are part of a creative thinking process and if you try to create something new, you make a lot of mistakes.
7. “Ea invasit homines habendi cupido, ut possideri magi squam possidere videantur” – Pliny the Younger **English translation: “**The lust of lucre has so totally seized upon mankind, that their wealth seems rather to possess them, than they to possess their wealth.”
8. “Kai ba ya wuce wuya wuya bay a wuce kai” – , Unknown, Hausa proverb **English translation:** The head cannot pass the neck, nor the neck the head. From: Jang, Tae-Sang. 2002. “Aspects of Poetic Balance and Cohesion in Hausa Proverbs.” *Journal of African Cultural Studies 15*(2), 215-236. **English interpretation:** The author of the article does not offer up an explanation of the proverb, but as these are parts of the body, the part/whole relation is clear.
9. *“*Απ' αγκάθι βγαίνει ρόδο κι από ρόδο βγαίνει αγκάθι*”* – *Unknown, Greek proverb* **English translation:** From a thorn a rose emerges and from a rose a thorn.

10. “ ཁྲིམས་བཟུང་རྒྱལ་ཡོངས་སྒྲ་བ་ལན་གཅིག་ཡིན། །དེ་ལས་མང་ན་རྒྱལ་ས་འཇོན་མི་ཐུབ། །   *- Unknown, Tibetan proverb*   **English translation:** In a law-abiding kingdom, the king should command but once; too many commands will only make a king lose his kingdom.   (Translator and compiler of Tibetan Proverbs: Lhamo Pemba).

Exclusion

These ABBA sentences are similar to a logical exclusive disjunction, defining conditions in which elements “A” and “B” hold no overlaps. The English sentence, “Winners never quit and quitters never win” is one famous example. One cannot be a winner and quitter at the same time. The examples located in the chart are very similar in structure and therefore require little exposition. These examples could be expressed with logic as:

$p \oplus q$ or $p \vee \sim p = T$

***Exclusions*:** A excludes B, and B excludes A

1. “Winners never quit, and quitters never win” – *Unknown*
2. “知者不言， 言者不知”**-** *– Lao Tzu, Chinese philosopher,* from *The Tao Te Ching*   **English translation**: “He who knows does not speak of it; he who speaks does not know it”   **English interpretation:** The knowledgeable person isn’t going to spread gossip of what he knows.
3. “Was Hänschen nicht lernt, lernt Hans nimmermehr” - *Unknown, German proverb*   **English translation**: “What little Hans didn’t learn, adult Hans never

will”
English interpretation: You can’t teach an old dog new tricks.

4. “ Пока есть государство, нет свободы. Когда будет свобода, не будет государства” – *Vladimir Lenin,* from *The State and Revolution*
English translation: So long as the state exists there is no freedom. When there is freedom, there will be no state.

5. “halliddAga kaDle illa; kaDle iddAga hallilla” – *Unknown, Kannada proverb*
English translation: There are no nuts when one has teeth, and there are no teeth when there are nuts.
English interpretation: When you have money or something you want, you’re already too old to enjoy it.

6. “
كم من كلمات على ألسنة الناس بلا معنى ، وكم من معان في أفكارهم بلا كلمات!
- *Abbas Mahmoud Al-Aqqad, Egyptian poet*
English translation: So many words on the tongues of people with no meaning, and so many meanings in their heads with no words! (Translator and compiler of Arabic quotes: Ayeshah. Arabicquotes.co.uk).

7. “Neque enim ingenium sine disciplina aut disciplina sine ingenio perfectum artificem potest efficere” – *Vitruvius, De architectura, Book 1, Chapter I, Sec 3*
English translation: For neither talent without instruction nor instruction without talent can produce the perfect craftsman.

8. “τὸ φρικωδέστατον οὖν τῶν κακῶν ὁ θάνατος οὐθὲν πρὸς ἡμᾶς, ἐπειδήπερ ὅταν μὲν ἡμεῖς ὦμεν, ὁ θάνατος οὐ πάρεστιν, ὅταν δὲ ὁ θάνατος παρῇ, τόθ’ ἡμεῖς οὐκ ἐσμέν” – *Epicurus, Letter to Menoeceus, translated by Robert Drew Hicks*
English translation: Death, therefore, the most awful of evils, is nothing to us, seeing that, when we are, death is not come; and when death is come, we are not.

9. “Tout ce qui n’est point prose, est vers; et tout ce qui n’est point vers, est prose” – *Molière, from Le Bourgeois Gentilhomme, 1670, Act II Section iv*
English translation: “Everything that is not prose is verse, and everything that is not verse is prose.”

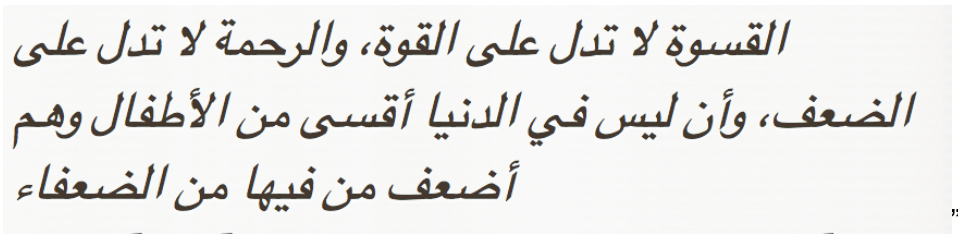
10. Einstaklingsræktin mà ekki vera fólgin í því að rækta eigingirnina – *Þórarinn Björnsson, Icelandic Educator*

English translation: Self cultivation must not involve cultivating selfishness.

Dissociation

These sentences strip the A and B elements of their association and then isolate them through the introduction of either an adjectival modifier and/or negation modifier. A quote commonly misattributed to Dr. Samuel Johnson shows this effect: “Your manuscript is both good and original, but the part that is good is not original and the part that is original is not good.”

Dissociations: A dissociates from B, and B dissociates from A

1. “Your manuscript is both good and original, but the part that is good is not original and the part that is original is not good” – *a quote misattributed to Dr. Samuel Johnson*
2. “La guerre, c’est un massacre de gens qui ne se connaissent pas au profit de gens qui se connaissent, mais ne se massacrent pas” – *Paul Valéry*
   English translation: The war is a massacre of people who do not know each other for the benefit of people who know each other, but do not massacre each other.
3. “
   
   القسوة لا تدل على القوة، والرحمة لا تدل على الضعف، وأن ليس في الدنيا أقسى من الأطفال وهم أضعف من فيها من الضعفاء
   ”
   - *Abbas Mahmoud Al-Aqqad, Egyptian poet*

   English translation: Cruelty does not mean power, neither does compassion mean weakness; children – the weakest amongst the weak – are some of the cruelest in the world.

   Notes: This example is more complex, in that it dissociates cruelty from power and compassion from weakness, and also builds an association between weakness and cruelty.

b. Another Arabic example:

فالإنسان وهو مرعوب قد يقف عقله ويهرب بجسده، أو قد يحدث العكس فيتسمّر بجسمه في مكانه ويهرب بعقله.

- *Yusuf Idris, Egyptian doctor and writer*
English translation: When terrified, a man's mind may stop and his body flee; or, the opposite may happen: his body petrifies and his mind flees.

(Translator and compiler of Arabic quotes: Ayeshah. Arabicquotes.co.uk).

4.

गृध्राकारो ऽपि सेव्यः स्याद् धंसाकारैः सभासदैः ।
हंसाकारो ऽपि सन्त्याज्यो गृध्राकारैः स तैर् नृपः ॥ ३२५ ॥

gṛdhrākāro 'pi sevyaḥ syād dhaṃsākāraiḥ sabhāsadaiḥ |
haṃsākāro 'pi santyājyo gṛdhrākāraiḥ sa tair nṛpaḥ || 325 ||

– Sanskrit, from the Panchatantra or *Pañcatantram* by Vishnu Sharma, Verse 325 from Mitra Bheda or the Loss of Friends. Passage above from Dr. Naveen Kumar Jha's *Pañcatantram*.

English translation: If the king is like a vulture but surrounded by swan-like courtiers, he must be served well; if a swan-like king is surrounded by people who act like vultures, then he should be ignored.

5. "Qui stultis videri eruditi volunt stulti eruditis videntur" – Quintilian, De Institutione Oratoria, Book X, Chapter VII, 21
English translation: Those who wish to seem learned among fools are merely regarded as fools among the learned.

6. "Dieser absolute Bereicherungstrieb, diese leidenschaftliche Jagd auf den Wert ist dem Kapitalisten mit dem Schatzbildner gemein, aber während der Schatzbildner nur der verrückte Kapitalist, ist der Kapitalist der rationelle Schatzbildner" – *Karl Marx, Das Kapital, Chapter 4*
English translation: This absolute enrichment instinct, this passionate hunt for value, is common to the capitalist and the hoarder, but while the hoarder is only the crazy capitalist, the capitalist

is the rational hoarder.

7. "ווען די קינדער זײַנען יונג דערציילן די עלטערן זייערע חכמות;
ווען די עלטערן זײַנען אַלט דערציילן די קינדער זייערע נאַרישקײַטן.

"Ven di kinder zaynen yung dertseyln di eltern zeyere khokhmes; ven di eltern zaynen alt dertseyln di kinder zeyere narishkaytn"
- Unknown, in Hebrew and Yiddish, Yiddish proverb

(Shared by Johanna Kovitz of YiddishWit.com and originally taken from the text *Der Oyster fun der Yidisher* or *The Thesaurus of the Yiddish Language* by linguist Nahum Stutchkoff)

English translation: When children are young, their parents talk about how smart they are; when parents are old, their children talk about how stupid they are.

8. *"犬を三日飼えば三年恩を忘れぬ。猫は三年飼っても三日で恩を忘れる。 "- Unknown, Japanese proverb*
English translation: Feed a dog for three days and he will remember your kindness for three years. Feed a cat for three years and she will forget your kindness after three days.

This translation in *The Oxford Dictionary of Proverbs*, edited by Jennifer Speake and J.A. Simpson.

9. "Neg rich se milat, milat pòv se neg" – *Unknown, Haitian proverb*
English translation: The rich black is a milat, the poor milat is a black.
[*Milat is a term referring to both color and class—denoting lighter skinned Haitians who are upper class].

10. "
. ཐོས་ཚུང་ངུལ་ཆེ། །མང་ཐོས་ངུལ་ཚུང་། །
- Unknown, Tibetan proverb
English translation: Less comprehension, more pride; more comprehension, less pride.

(Translator and compiler of Tibetan Proverbs: Lhamo Pemba).

Combination

It is noteworthy that although all of the types are on some level comparative, there is a type that does not overtly compare. The **combinative** type occurs when at least one of the elements is polysemous, or where there is simply a listing effect. These sentences are often attended by the conjunction *and,* which contributes to creating a message with dual segments that would be independently coherent. There is a striking effect when they are taken together, however; the complex example by *Twitter user @cl425* poetically illustrates this with the lines,

"At night she played to the beat of Market Street; by day she played the market to beat the street" - *Twitter user @cl425*

All of the elements in the reversal are polysemous. Lakoff and Johnson (1980) explores how one of the ways that polysemy develops is through metaphorical mapping—taking a word from its source domain and applying it to a new target domain on the basis of some commonalities between them. In the case of the example above, "Market Street" refers to a literal street, whereas "the street" in the second clause refers to homelessness. In the first clause, "beat" is a noun that signifies a pulsing or drumming noise; in the second clause, it is a verb that expresses *to overcome.*

In the combinative type, the comparisons can therefore be more subtly comparative through the use of polysemous terms. Xu et al. (2017)

conducted an investigation of polysemy, and determined that the evolution of word meanings through metaphorical mapping is highly systematic. Their findings revealed that *externality* is the strongest predictor accounting for the majority of 5000 metaphorical mappings that they studied. *Externality* describes how words referring to external features of objects in the world become applied to internal aspects of sense, feeling or personality. A good example is the word *hardness,* which applies to the solidity and impenetrability of objects. Through a metaphorical mapping, *hardness* became exapted from its usage as a descriptor of an external object to a descriptor of a more internal attribute – someone's personality or way of behaving. In the Market Street example, this progression can be noted: the term *beat* originally designated *hitting* or *lashing*, and was later extended to refer to the noise associated with the action. The more abstract sense of "beat" (i.e. to overcome) derives from these other usages. The same holds true for the literal referent "Market Street" and the metonymic use of the word *street* to allude to homelessness.[15] There are also combinative examples that do not include polysemous elements, although there can still be an identity shift of one of the elements, brought on by the addition of new terms. One such example is an Igbo proverb that declares, "Dibia gworo ozo mana ozo gburu dibia" (An herbalist cured a certain disease, and another disease killed the herbalist). The term *disease* has not changed, but it has two different referents due to the addition of the preposition *another.*

[15] The chiastic reversal pivots on the terms (A) beat and (B) market, but "street" is also a crucial but complicating element – causing the full reversal to be: AB/C, BA/C.

***Combination*:** AB and BA, or A and B; B and A

1. “Je lève mon verre au beau sexe des deux hémisphères, et aux deux hémisphères du beau sexe” – attributed to *Marquis de Bièvres* **English translation:** I raise my glass to the fair sex of both hemispheres, and to both hemispheres of the fair sex.
2. “ يُخۡرِجُ ٱلۡحَيَّ مِنَ ٱلۡمَيِّتِ وَيُخۡرِجُ ٱلۡمَيِّتَ مِنَ ٱلۡحَيِّ وَيُحۡيِ ٱلۡأَرۡضَ بَعۡدَ مَوۡتِهَاۚ وَكَذَٰلِكَ - Qu’ran, 30:19 **English translation:** He brings the living out of the dead, and brings the dead out of the living [and brings to life the earth after its lifelessness. And thus you will be brought out]. (Abdul-Raof, 2006, 247).
3. “Essendo adunque un Principe necessitato sapere bene usare la bestia, debbe di quella pigliare la volpe e il lione; perchè il lione non si defende da’ lacci, la volpe non si defende da’ lupi” – *Machiavelli, The Prince, Capitolo 18* **English translation:** “A prince being thus obliged to know well how to act as a beast should imitate the fox and lion, the lion cannot protect himself from snares, and the fox cannot defend himself from wolves.”
4. “Architect, *n.* One who drafts a plan of your house, and plans a draft of your money” – *Ambrose Bierce*
5. “Dibia gworo ozo mana ozo gburu dibia” – *Unknown, Igbo proverb* **English translation:** An herbalist cured a certain disease and another disease killed the herbalist. (Isidienu, Department of Igbo, African & Asian Studies at Nnamdi Azikiwe University, Awka) **English interpretation:** Nobody will be able to know everything; there will always be something else to know.
6. “ 凡是敵人反對的，我們就要擁護；凡是敵人擁護的，我們就要反對。 ” *- Mao Tse-tung, The Little Red Book, Chapter 2; first appeared in Interview with Three Correspondents from the Central News Agency, the Sao Tang Pao and the Hsin Min Pao from September 16, 1939*

English translation: We should support whatever our enemies oppose, and oppose whatever our enemies support.

7.

“ אַז איך נעם אַ טרונק בראָנפֿן וואַר איך אַן אַנדער מענטש, און דער אַנדערער וויל אויך אַ טרונק בראָנפֿן. ”

“Az ikh nem a trunk bronfn ver ikh an ander mentsch, un der anderer vil oykh a trunk bronfn”

- *Unknown,* in Hebrew and Yiddish, *Yiddish proverb*

(Shared by Johanna Kovitz of YiddishWit.com and originally taken from the text *Der Oyster fun der Yidisher* or *The Thesaurus of the Yiddish Language* by linguist Nahum Stutchkoff)

English translation: When I take a drink I become another person, and the other person wants a drink, too.

8. “ So kanka wani ya ƙi ka // ƙi kanka wani ya so ka. ” – Unknown, Hausa proverb
English translation: Love yourself, another will hate you; hate yourself, another will love you.
From: Jang, Tae-Sang. 2002. “Aspects of Poetic Balance and Cohesion in Hausa Proverbs.” *Journal of African Cultural Studies 15*(2), 215-236.

9. “Àgùtàn tó bá bá ajá rìn á jẹ ìgbẹ́, ajá tó bá bá ewúrẹ́ rìn á jẹ èpo ìṣu.” – *Unknown, Yorùbá proverb*
English translation: A sheep that moves with dogs will eat feces and a dog that moves with goats will eat yam peelings.
English interpretation: One’s behaviors reflect the behaviors of those in whom you spend your company.

10. “

البحر لا ينام. وفي يقظة البحر نعزية لروح لا تنام

- Jubran Khaleel Jubran

English translation: The sea never sleeps, and in the sleeplessness of the sea is a consolation to a soul that never sleeps.
(Translator and compiler of Arabic quotes: Ayeshah. Arabicquotes.co.uk).

Comparison

All chiastic types are inherently comparative, but also there exists an

explicitly **comparative** type. Each sentence of this type includes qualifiers like “better,” “worse,” “more than” – or other added terms that make for a clear-cut ranking between the elements as options. Overall, the “AB” and “BA” elements in these sentences also seem to encompass a range of possible circumstances that have been reduced down to form strong generalizations about courses of action or people. Donald Tusk’s *Address to the European Committee of the Regions* in October 2017 contains the following example: “Because the **force (A)** of **arguments (B)** is always better than the **argument (B)** of **force (A)**.” In the previous types, it was easy to distinguish how the clauses in a given sentence could be separated into two statements that were by themselves comprehensible. The comparative type, on the other hand, relies on the interaction between all of the elements to transmit the claim. In the above example, the term “force” is polysemous, with two different referents. Many other sentences of this type are more direct, and utilize monosemous A and B elements. A quote perhaps misattributed to Max Hennessy supplies an example, stating, “Lieber ein Ende mit Schmerzen als Schmerzen ohne Ende” (Dearer an end with pain than pain without end). A line from the novel *Metella* by George Sand serves as another exemplification: “La vie ressemble plus souvent à un roman qu’un roman ne ressemble à la vie” (Life resembles a novel more often than novels resemble life). Some examples do not include qualifiers to rank the elements, or to indicate some greater frequency of occurrence. The following Russian proverb compares between two different ways of behaving depending upon

situational factors: “Молоде́ц про́тив ове́ц, а про́тив молодца́ -- и сам овца́” (A brave fellow against a lamb, but against a brave fellow – he is the lamb itself).

***Comparisons*:** A and B are better than B and A; or A and B are worse than B and A; or some form of ranking or measurement exists between two elements A and B

1. “Lieber ein Ende mit Schmerzen als Schmerzen ohne Ende” – *Unknown, German proverb* **English translation:** Dearer an end with pain than pain without end. Another German example: “Allein ist besser als mit Schlecten im Verein: mit Guten im Verein, ist besser als allein” – *Unknown, German proverb* **English translation**: Better to be alone than in bad company: and being in good company is better than being alone.
2. “Formidabilior cervorum exercitus, duce leone, quam lenonum cervo” *Unknown, Latin proverb* **English translation:** An army of stags would be more formidable commanded by a lion than one of lions commanded by a stag.
3. “Молоде́ц про́тив ове́ц, а про́тив молодца́ -- и сам овца́” – *Unknown, Russian proverb* **English translation:** A brave fellow against a lamb, but against a brave fellow – he is the lamb itself.
4. “Aon ghlainne, chan fheàirrde ‘s cha mhiste. Dà ghlainne, ‘s fheàirrde ‘s cha mhiste. Trì glainneachan s’ miste ‘s chan fheàirrde.” – *Unknown, Gaelic proverb* from Caithness Translated by the Scottish Gaelic broadcaster Ruairidh MacIlleathain, from “Camhairle Ghallach (Litir Bheag 243)” – *Learngaelic.scot* **English translation:** One glass, not the better of it and not the worse of it. Two glasses, the better of it and not the worse of it. Three glasses, the worse of it and not the better of it.

5. “是故勝兵先勝，而後求戰；敗兵先戰，而後求勝” – *Sun Tzu, Art of War*
   English translation: Victorious warriors win first and then go to war, while defeated warriors go to war first and then seek to win.

6. “

إذا فاجأني الموت في وقت من الأوقات ، فإنني
أصافحه و لا أخافه ، بقدر ما أخاف المرض ، فالمرض
ألم مذل لا يحتمل ، لكن الموت ينهى كل شيء !

   - *Abbas Mahmoud Al-Akkad, Egyptian writer*
   English translation: If Death surprises me at anytime I will shake hands with him; I don’t fear Death as much as I fear illness…illness is an unbearable humiliating pain. But Death ends everything.

   (Translator and compiler of Arabic quotes: Ayeshah. Arabicquotes.co.uk).

7. “Because the force of arguments is always better than the argument of force” – *Donald Tusk, Address to the European Committee of the Regions*, *October 10, 2017*

8. “La vie ressemble plus souvent à un roman qu’un roman ne ressemble à la vie” – *George Sand, Metella, Chapter 1*
   English translation: Life resembles a novel more often than novels resemble life.

9. خوئې له زړه، دنيا له پرينه؛ تر خوئ لا دنيا شرينه
   - *Unknown, Pashto Proverb* (Thorburn, 1876)
   English translation: A son is from the heart, wealth from the liver; wealth is dearer than a son
   English interpretation: The author does not offer an explanation of this proverb; however, the term “dearer” makes it fall into this category of explicit comparison.

10. “
בעסער רעדן מיט אַ יידענע און טראַכטן וועגן גאָט אייידער רעדן מיט גאָט און טראַכטן וועגן אַ יידענע.
”
“Beser redn mit a yidene un trakhtn vegn got eyder redn mit got un trakhtn vegn a yidene.”
- *Unknown,* in Hebrew and in Yiddish, *Yiddish proverb*

(Shared by Johanna Kovitz of YiddishWit.com and originally taken from the text *Der Oyster fun der Yidisher* or *The Thesaurus of the Yiddish Language* by linguist Nahum Stutchkoff)

English translation: It's better to talk to a woman and think about God than to talk to God and think about a woman.

One-Way Effects

This chiastic sentence type includes carefully placed negation like *don't* and *not.* One such example comes from Confucius, Analects, Xue Er 16:

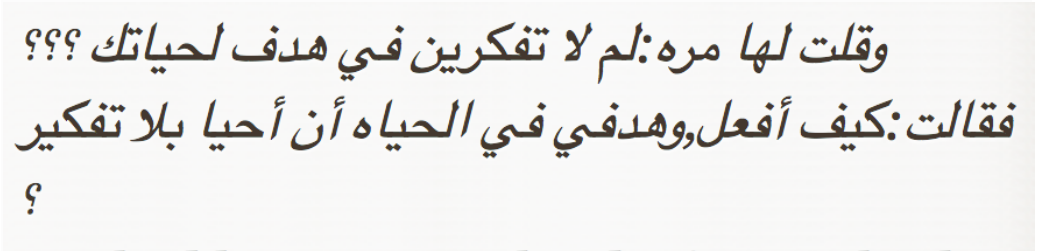
子曰：不患人之不己知，患不知人也。 "I will not be afflicted at men's (A) not knowing me (B); I will be afflicted that I (B) do not know men (A)."

Taken together, this arrangement includes two clauses, with the second clause bearing all of the characteristics of a propositional statement, and the first clause bearing the characteristics of a negation—except they are not featured alongside the proposition or negation for which they are pairs. The absent proposition of the first clause would be: "I will be afflicted at men's not knowing me," to pair with its negation, "I will not be afflicted at men's not knowing me." The second clause could be taken as a proposition, "I will be afflicted that I do not know men," and the absent negation would be: "I will not be afflicted that I do not know men." Within the combination of these expressions are the more basic conditions: "I will be afflicted"/"I will not be afflicted" and "men's not knowing me"/"I do not know men."

In many other examples of this type, the more complex cause-and-

effect relationship becomes established in a similar way. Another more informal example is a line from the film *Mean Girls,* “I don’t hate you because you’re fat. You’re fat because I hate you.” The absent proposition and negation would be: “I hate you because you’re fat”/”You’re not fat because I hate you.” Within the context of the scene, this seems to arise as an epiphany for the speaker, although it is situated within a flash forward moment in which the characters are engaging in a dialogue centered on conflict resolution with one another. Still, many of these sentences seem to be constructed as responses to counter someone else’s statement, even if a specific speaker is not present or nameable. John F. Kennedy’s famous line from his 1961 Inaugural address follows this structure, encouraging Americans to “Ask not what your country can do for you, but what you can do for your country.” The song *Love The One You’re With* by Stephen Stills offers a different example: “And if you can’t be with the one you love, honey, love the one you’re with.” The remaining song lyrics reveal this to be a dialogue, in which the singer addresses someone who wishes ardently to be with the person he loves, so much so that he seems to be “angry” and “sad” due to an inability to woo her. In this instance, the reader or listener has access to more context and details of what prompted the singer’s response. Overall, examples of this type tend to be one-sided and may include an exhortation, or counterclaim.

One-way Effects: A affects B, but B does not affect A; or A does not affect B, but B affects A

1. “Не ме́сто кра́сит челове́ка, а челове́к -- ме́сто.” – *Unknown, Russian proverb* **English translation:** It isn’t the place [or “room”] that graces the person, but the person the place [or “room”].
2. *“*Quand on n'a pas ce que l'on aime, il faut aimer ce que l'on a*”* – Roger de Rabutin, Comte de Bussy **English translation:** If we have not the thing we love, then must we love the thing we have.
3. “Der Mensch gebärdet sich, als sei er Bildner und Meister der Sprache, während doch sie die Herrin der Menschen bleibt” – Martin Heidegger **English translation:** Man acts as though he were the shaper and master of language, while in fact language remains the master of man.
4. “子曰：不患人之不己知，患不知人也。 - *Confucius, Analects, Xue Er 16* **English translation:** “I will not be afflicted at men’s not knowing me; I will be afflicted that I do not know men.”
5. “I don’t hate you because you’re fat. You’re fat because I hate you.” – *Mean Girls, American Film*
6. “Mal canı kazanmaz, can malı kazanır” – *Unknown, Turkish proverb* **English translation:** Property will not earn life, but life will earn property. **English interpretation:** Having good health comes before all other things.
7.  وقلت لها مره:لم لا تفكرين في هدف لحياتك ؟؟؟ فقالت:كيف أفعل,وهدفي في الحياه أن أحيا بلا تفكير ؟ *- Yusuf Idris, Egyptian physician and writer* **English translation:** I asked her once: Why don’t you think of a goal for your life? She said: how can I when my goal in life is to live without thinking? (Translator and compiler of Arabic quotes: Ayeshah. Arabicquotes.co.uk).

8. "…Non i titoli illustrono gli uomini, ma gli uomini i titoli" – Niccolò Machiavelli, Discorsi sopra la prima Deca di Tito Livio, Book 3, Chapter 38 **English translation:** It is not titles that make men illustrious, but men who do that to titles.
9. "Alla känner apan, men apan känner ingen." – Unknown, Swedish proverb (Ström, 1981) **English translation:** Everyone knows the monkey, but the monkey knows no one. **English interpretation:** Famous people are known by all, but they don't know everyone else.
10. "یو په سلو لرلې کیږي، نه سل په یوه" – *Unknown, Pashto proverb* (Thorburn, 1876) **English translation:** One can be kept well by a hundred, not a hundred by one. **English interpretation:** The author does not provide an explanation of the proverb; however, the one-way relationship is clear through use of the negating term "not."

Multiple Effects

Chiastic sentences of this type reveal mutually influencing or reciprocal relationships. Below is an example from John F. Kennedy's 1963 Televised Address on the Nuclear Test Ban Treaty:

"Each increase of **tension (A)** has produced an increase of **arms (B)**; each increase of **arms (A)** has produced an increase of **tension (B)**."

Ronald Reagan would later express a similar sentiment in his Address to the 41st Session of the United Nations General Assembly: "Nations don't mistrust each other because they armed; they are armed because they mistrust each other." This reciprocal type is not exclusive to political speeches or proverbs; they are pervasive in pop culture and found in informal contexts, such as on social media platforms. An example from pop culture is a song lyric in Taylor

Swift's song *Look What You Made Me Do*: "I don't trust nobody, and nobody trusts me." A number of examples explicitly refer to a subject or agent, which is not outrightly unusual or striking in an active sentence. Predictably, they have a content pertaining to interpersonal relationships; however, some such examples which incorporate inanimate objects will assign them human attributes, as in the Scottish Gaelic proverb: "Tuig thus' an t-eathar, 's tuigidh an t-eather thu" (Understand the boat and the boat will understand you). Benjamin Franklin's *Poor Richard's Almanack* contains another similar case: "Keep care of thy shop and thy shop will keep care of you." There are examples that are not overtly of an interpersonal nature, but still show a bidirectional flow of causation.

***Multiple Effects*:** A affects B, and B affects A; or A affects B and B affects A; can also include more elaborate reversals with repeating C, D, E elements

1. "*Cười người hôm trước, hôm sau người cười" – Unknown, Vietnamese proverb* **English translation:** Laugh at others today; tomorrow, others will laugh at you.
2. " אף הוא ראה גולגלת אחת שצפה על פני המים. אמר לה:על דאטפת, אטפוך. וסוף מטיפיך יטופון. " – Hillel the Elder, Ethics of the Fathers (Pirkei Avot, Chapter 2, Section 6) **English translation:** He also saw a skull floating upon the water. Said he to it: Because you drowned others, you were drowned; and those who drowned you, will themselves be drowned.

3. Né fe' amor anti che gentil core, né gentil core anti ch'amor natura" – *Guido Guinizzelli, Italian poet*
   English translation: Nature neither created love before the gentle heart, nor the gentle heart before love.
4. "Denka leer gij doende zijt en doende denk dan nog" – *Guido Gezelle, Dutch writer*
   English translation: Think before acting, and while acting still think.
5. "Tuig thus' an t-eathar, 's tuigidh an t-eather thu" – *Unknown, Scottish Gaelic proverb*
   English translation: Understand the boat and the boat will understand you.
   English interpretation: Take care to mind your things and in return they'll serve you well.
6. "Wer mit Ungeheuern kämpft, mag zusehn, dass er nicht dabei zum Ungeheuer wird. Und wenn du lange in einen Abgrund blickst, blickt der Abgrund auch in dich hinein" – *Friedrich Nietzsche,* from *Jenseits von Gut und Böse*
   English translation: He who fights with monsters should look to it that he himself does not become a monster. And when you gaze long into the abyss, the abyss also gazes into you.
7. "I don't trust nobody and nobody trusts me" – *Taylor Swift, Lyrics to the song Look What You Made Me Do*
8. "Ἐγγὺς μὲν ἡ σὴ περὶ πάντων λήθη, ἐγγὺς δὲ ἡ πάντων περὶ σοῦ λήθη" – Marcus Aurelius, Meditations, Book VII, 21
   English translation: Soon you will have forgotten everyone, and soon everyone will have forgotten you.
9. 話說天下大勢，分久必合，合久必分：周末七國分爭，并入於秦。
   - The Romance of Three Kingdoms, attributed to Luo Guanzhong
   English translation: The world under heaven, after a long period of division, tends to unite; after a long period of union, tends to divide.
10. "Qui craint de souffrir, souffre déjà de ce qu'il craint" – Michel de Montaigne, Essais, livre 3
    English translation: Whosoever fears suffering already suffers from what he fears.

Chiasmus and Comparison

Chiasmus is a vehicle for comparison, and in some ways covers more ground than both metonymy and metaphor. In the opening pages of Geary's book on metaphor (2011), he notes that the poet Rimbaud pursued a "systematized disorder" for his poetic program. For Rimbaud, "the poet needed to see similarity (A) in difference (B) and difference (B) in similarity (A)" (2). Although Geary does not point out the chiasmus here, this is an effect that chiasmus also achieves by degrees. The chiastic examples in the charts above describe whether and how two elements may co-exist, as well as cause and effect relationships between elements. Four types highlight some similarity between A and B (i.e. the Equalizations, Part-wholes, Combinations and Multiple Effects types), and four types highlight some difference between A and B (i.e. Exclusions, Dissociations, Comparisons, and One-Way Effects). The categorizations of "same" and "different" (or "this" and "that," if we are comparing to Wittgenstein) seem to prevail. Yet while these syntactic chiastic types might seem structurally as rigid as a child's block puzzle, the elements that fit into the intractable wooden slots are incredibly malleable. The examples that fall into any one category are still quite different. Although putting these examples in categories is helpful for examining the chiastic form cross-linguistically, it unfortunately entails overlooking some of their subtler characteristics.

Fodor and Pylyshyn's example "John loves Mary" and "Mary loves John" would belong to the last categorization of Multiple Effects. Many sentences with a subject and a direct object would fall into this category, but sub-types should exist to encompass multiple effects. Perhaps even further delineations are needed between abstract terms like "love" which have layers of complexity, and terms that refer to events or material circumstances in the world (i.e. "John kisses Mary" and "Mary kisses John"). It must be recognized that the term *systematic*, at least in regards to language, is also taken to be a descriptor of sentences or representations that do not have to be perfect reversals, but do incorporate the same elements (i.e. "John ate a banana," "Mary ate a banana," and "John and Mary both ate bananas"). The definition of systematic, according to the Oxford English Dictionary, is "done or acting according to a *fixed* plan or system."

Applying this terminology to the subject of language and cognition, however, may be to completely misapprehend the flexible and ever-changing aspects of language usage: effective communication may depend in some part on an adherence to a methodological use of common forms and figures. But successful and memorable communication relies on more than following along with convention and formality. Language is just as fixed as it is unrestrained, and the challenge for those in Artificial Intelligence, for example, is to find the appropriate and humanlike balancing act that takes place between the two. Examining chiastic sentences shows the importance of achieving this, for even within these confined and seemingly systematic

structures, inventive expression flourishes.

Additionally, it must be noted that these chiastic types construct well-formed sentences, but these sentences are only considered “well formed” due to changing elements of grammar, which contribute to the overall effect—i.e. verbs, conjunctions, and prepositions. Every example illustrates this, although we will focus on only one. The following quote will serve our purposes: “People can’t change the truth, but the truth can change people.” The reversal in this case pivots on the verb *can’t/can*, and the conjunction *but*. The point is that these seemingly systematic forms contain other structural elements, too, and these slight variations greatly affect meaning. Understanding these possible systematic forms may be important when considering some potential skills that artificial intelligence would have to possess to understand natural language. Below, I will briefly delve into current ways of addressing systematicity in artificial intelligence, followed by a discussion of chiasmus’ status as a trope and scheme (which has important implications related to embodiment and thus artificial intelligence).

Implications for Artificial Intelligence

Language is permutative, even if there are some preferred structures and rules that human beings adhere to in composing sentences. Determining these rules might not be as important as determining the

nuances of how humans innovate even given such restrictions. "Systematicity" is a subject that comes out of classical symbolist theories of how the human brain has a "language of thought" or symbol system – but it is no longer regarded as a plausible explanation of human intelligence; however, systematicity of language is still a concern of researchers investigating human cognition.

Chris Eliasmith (2013) and colleagues utilize matrix multiplication to contend with systematicity and other "binding problems" that require bringing together semantically different parts to construct a new whole. In his program Nengo, which is software written in Python, and the accompanying hardware SPAUN (a "Semantic Pointer Architecture Unified Network), sentences can be input as Discrete Fourier Transform (DFT) sequences—or linear, finite length vectors. Calculating a circular convolution of two vectors results in a more manageable entity—information that can later be decoded to get back to the original values.

Bayesian and predictive processing models, on the other hand, conceive of the brain as anticipating statistical regularities of the environment. Following this view, there are regularities and standardizations in language that the brain must process and implement in its own compositions. Thus, it might be said that Bayesian predictive processing models are already equipped to address systematicity or any system in which regularities are assessable. Zenker (2012) and Hahn & Oaksford

(2006) both connect the Bayes Theorem to argumentation or rhetoric more generally. This should be unsurprising, considering the origins of the theorem and its connection to inductive reasoning (and therefore argumentative reasoning).

Thomas Bayes was a reverend, who had read David Hume's "On Miracles," from *An Enquiry Concerning Human Understanding*, in which Hume ponders miracles, and concludes that they are very uncommon events. Bayes' undertaking was to figure out what evidence a person required to determine that an improbable "miracle" had occurred (Pearl 2018). Bayes' formula does not successfully account for miracles, but what Bayes instead invented was a formula for inductive reasoning. In deductive reasoning, a person begins with a guess and works at finding evidence to support that guess. With inductive reasoning, the person starts with an observation or data and comes to a supporting theory based on that. Below is Bayes' formula:

$$P(A \mid B) = \frac{P(B \mid A)\, P(A)}{P(B)}$$

Zenker (2012) offers the following deconstruction of the formula:

The formula poses the question: what is the probability that a guess is true, given some piece of evidence – an observation "B"?

"P(BIA) represents how much more likely evidence would be if the hypothesis turned out to be true rather than false (if you do in fact have "B" given "A")

P(A) represents the degree of belief in the hypothesis

P(B) represents the quality of the evidence" (Zenker 2012).

This helps in planning ahead, for example, with respect to weather; if someone's cellar tends to flood and the forecast claims it will rain, that person might be inclined to check the cellar for rainwater. One important facet of the Bayesian research project is that it emphasizes an exploration of counterfactuals: it has become important not only to entertain a consideration of certain correspondences between events "A" and "B" in the world, but to also focus on possibilities that *do not* occur. If counterfactuals are indeed the sounding points that the mind negotiates with in perception and cognition, then there may be a need to develop a new view of both logic and semantics. In everyday language processing, decoding the *meaning* of a sentence can sometimes depend on possessing the knowledge of other possibilities, including logical opposites. For example, a chiastic Vietnamese proverb declares, "*Cười người hôm trước; hôm sau người cười.*" "**Laugh (A)** at **others (B)** today; tomorrow, **others (B)** will **laugh (A)** at you."

Here, the second clause is a consequent of the first, and the two clauses from the Vietnamese proverb can be considered individually and together. A total of three scenarios can be entertained:

1. A situation in which you laugh at others.
2. A situation in which others laugh at you.
3. When taken together, a multiple effect: a mutual disrespect.

In spite of the array of available options, the reader needs to glean a further permutation from the sentence:

4. You shouldn't laugh at others, and they shouldn't laugh at you.

The meaning does not lie in the surface-level coding, but in the reader being able to infer this final moral lesson from social knowledge that goes beyond the sentence. The *meaning* is the totality of the possible arrangements, compared against each other and ultimately inverted; the takeaway of the Vietnamese proverb is the opposite of its superficial reading. The logical interpretation of the sentence would be p->q, but properly interpreting the sentence depends on the reader's ability to tease out ~p^~q. Chiastic phrases make for a compelling study because of how logical opposites meet within them, and because they naturally either hinder or promote an examination of the full order of semantic possibilities. It is possible that

artificial intelligence with the ability to decode chiastic phrasing would be better equipped to handle the challenges of language interpretation in general, given the demands it places on the reader.

Outside of understanding chiasmus as a syntactical structure, it may also serve as an important facet of human cognition for other reasons – because of the chiastic structure of vision. The neuroanatomical structure the optic chiasma sits in the midbrain, and information from the left eye is conveyed to the right side of the brain while the information from the right is conveyed to the left. The hemispheres of the body are likewise cross-configured this way, with the left side of the brain controlling the movements of the right and vice versa. These topics will be taken up again at the end of the thesis, in the section entitled, *Models of the Brain: Metaphors, Architectures and Chiastic Applications.*

For now, the discussion will remain on chiasmus as a device in language, and how understanding its role as both a trope and scheme has important implications for embodiment and how human interpreters make meaning in spatially-defined ways more broadly. This carries with it some implications about how the study of chiasmus could impact artificial intelligence and replicating that meaning-making process. The next section in this paper considers how chiasmus compares to other tropes like metaphor, which has been demonstrated to tie into embodiment. Bringing together a discussion of systematicity with Lakoff and Johnson's (1980)

"linguistic templates," it is possible to see how both chiasmus and metaphor relate to the bodily aspect of balance and destabilization.

Systematicity, Tropes and Schemes

If chiasmus can be taken to be an effect of systematicity in language, then certain tentative observations can be made based upon this short survey: chiasmi may show how syntactic parts or elements may permute and come together to generate meaningful new articulations, and how more generally these syntactical units are capable of interacting in a number of previously unexplored and spatially defined ways. George Lakoff and Mark Johnson (1980) argue that embodiment in the world imbues humans with linguistic "templates," and this investigation of chiasmus might be an elaboration of those templates. O'Reilly and Harris (2017) posit that chiasmus (and antimetabole more specifically) are linked to the image schema of BALANCE. The image schema is a "cognitive entity based on relations that are best realized in formal terms, such as containment and relative position" (O'Reilly and Harris 2017). Although tropes and image schemata are distinctive, and O'Reilly and Harris place metaphor in the category of *trope* while placing chiasmus or antimetabole in the category of *schema*, there are several reasons why this delimitation might fail to appreciate how chiasmus helps to build metaphors—and why putting chiasmus in one category or another would entail ignoring its essential character. Strecker (2014) seems to disagree with O'Reilly and Harris'

assessment in two respects: he not only views chiasmus as a trope, but one that is also incredibly destabilizing. Pelkey (2017) also points out how semiotic chiasmus can be destabilizing with his discussion of his hourglass type. For Ivo Strecker, “The internal dynamics of chiasmus . . . are very different [from metaphor], for the two parts of this trope are characterized not by consonance but by dissonance, not by stabilizing resemblance but destabilizing antinomy” (77). However, chiastic sentences like, “You are the world, and the world is yours” (or in Spanish, “Ustedes son el mundo y el mundo es de ustedes” – Twitter User @Sywende) are in fact balancing, as O’Reilly and Harris note; and yet there is a metaphor in this sentence which rests entirely upon the structure of the chiasmus. The metaphor and chiasmus are here inseparable, both as feature and form of the sentence. Thus, two conclusions can be drawn: chiasmus is both destabilizing and stabilizing, and can fill the role of both trope and schema.

Across the body of his work, Pelkey seems to endorse this perspective, and also relates chiasmus to Fauconnier and Turner’s (2002) theories of conceptual blending. Simply defined, conceptual blending occurs when an association is drawn through between two radically unlike things, with differing frame structures whose identities and inputs are blended. Pelkey (2017) argues that the topics of conceptual blending, double scope networks and analogic cognition could be better understood through chiasmus. Double scope networks involve extracting elements from two different frames, which might other clash, and bringing pieces of them

together to form a third, harmonious entity. Turner (2003) explains this with the example of Jesus, who is unsinning – and becomes the sacrificial lamb for humanity, who are sinful (13). The crucifixion is the double-scope story or frame, involving one who is punished while simultaneously not responsible for any misdeeds. Pelkey (2017) argues that there is a grounded mechanism for coming up with such stories and conceptual blends—and it is rooted in the bodily aspect of possessing arms and legs, and an understanding of part-whole relations in the human form (147).

The chiastic exchange depends on the relation between two elements: they must in the first place be semantically capable of taking each other's places (or alike enough that it would not be confusing to re-arrange them when considering the other elements in the sentence). Metaphor can also in turn depend in part on a chiastic move being made: in the first case it requires concentrating on certain shared qualities of the source and target. Black (1962) developed "interaction theory" to explain what occurs in metaphor. He uses the pervasive metaphor that "Man is a wolf" to elucidate his theory. Geary (2011) gives an account of Black's "interaction theory" that is chiastic, elaborating that, "…in comprehending the 'Man (A) is wolf (B)' metaphor, what we know of wolves (B) interacts with what we know of man (A)" (146). For Black, "a metaphor activates two thoughts of two different things at the same time" (Geary 145-146). Black implements several metaphors in his own explication, referring to "screens," which allow another view of the subjects to be taken up. Chiasmus accomplishes something

similar, but with crucial differences. With metaphor, for instance, it is possible to apply the screen of “zoo” to the term “schoolyard”—to say that the “the schoolyard is a zoo,” but chiastically reversing such a phrase would make for an unsuccessful metaphor. An exchange of knowledge or “interaction” between the concept of *zoo* and *schoolyard* must still take place for the phrase “the schoolyard is a zoo” to be comprehensible, and yet “the zoo is a schoolyard” does not inspire the same visual imagery or descriptive thrust.

Chiasmus and metaphor are distinct, but they both rely on the interpreter’s ability to perform an exchange. For chiasmus, the elements must have greater interchangeability: they must be able to slot into the roles of the other elements. With metaphor, there is a partial semantic exchange that takes place: some aspect of the one element should be compatible with and layerable onto an existing aspect of the other element. “The schoolyard is a zoo” because of the wild behavior of its occupants, because of the mess left in the wake of its occupants or because it is enclosed like a pen. One or several of these exchanges can be made—between the children and animals, the effects of the activities of children and animals, or the physical design of the zoo and schoolyard. Like metaphor, chiasmus achieves a complex interaction of elements.

Further Discussion and Conclusions

Chiastic forms and figures are prevalent in the world and in language. It is a vehicle for comparison, and as such it has the potential to be used in

speech and text to convince a listener or reader to adopt one point of view rather another. It can be seen as a short-form essay, which either rebuts other alternative perspectives, or brings them under its jurisdiction. It may also show the extent to which two perspectives are compatible or the same. X entwines with a history of logic, truth valuation and logical argumentation. The structures of chiasmus in some ways overlap with logical structures but still remain distinct from them. As a figure, X also has associations with Christianity, and the monotheistic ideology that spread, replaced other ideologies and shaped the thinking of Europe and ultimately the world.

This small survey reveals certain chiastic categories or configurations tend to appear cross-linguistically. Withholding judgments about whether or not chiasmus accurately characterizes systematicity is prudent, but there should be some overlap between these intelligible chiastic permutations and any fuller account of systematic forms in language. To investigate this fully, a much larger sample would have to be presented and it would be beneficial to extend the search to other languages and language families. [16] Chiasmus is inherently comparative, and for that reason it can be reductionist: it treats sameness and difference, but the many ways it effectuates a comparison is remarkable. Even a cursory assessment of chiasmus affirms the variation that can arise in such bounded forms. If chiasmus entwines with systematicity after all, then it is clear that systematicity does not entail fixity of

[16] As Pelkey (2013) writes, "countless examples of chiastic patterning appear cross-linguistically in ancient texts from early Semitic and Indo-European language families (Welch 1981) to classical Chinese (McLuhan 1972: 6, Lissner 2007:108-109)….Symmetrical reversals are noted to play a role in the structure of texts at every linguistic level, from the phonological and the orthographic to 'words, sentences, lines, stanzas, chapters, books' and more (Nänny 1988: 51) - both in ancient and contemporary sources. (Nänny 1988, Welch 1981, Norrman 1998)."

order and form, but rather a more loosely delimited structure with ample room for alteration.

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Appendix: Eight Notable Chiastic Types

Equalizations: A is the same as B, and B is the same as A

11. "Beauty is truth, truth beauty" – *John Keats, English poet, from "Ode on a Grecian Urn"*
12. "L'armi, qua l'armi: io solo / Combatterò, procomberò sol io – *Giacomo Leopardi, from the poem "All'Italia"*
    English translation: The weapons, here the weapons: I'll fight alone; I'll fall alone. (Or "alone I'll fall").
13. "Et rose, elle a vécu ce que vivent les roses" – *François de Malherbe, French poet*
    English translation: And rose, she lived as live the roses
14. "Was vernünftig ist, das ist Wirklich; und was wirklich ist, das ist vernünftig." – *Georg Wilhelm Friedrich Hegel, German philosopher, from Elements of the Philosophy of Right*
    English translation: What is reasonable is real; and what is real is reasonable.
15. "Ustedes son el mundo y el mundo es de ustedes" – User Sebastian Y. Wende (@sywende) on Twitter
    English Translation: You are the world, and the world is yours.
16. "Выбор громадный, но я всё время был так пьян, что бутылки принимал за девиц, а девиц за бутылки" – Anton Chekhov, Letter to his sister M.P. Chekhov on April 25, 1887
    English Translation: The choice is enormous, but I was so drunk that I took the bottles for girls, and the girls for bottles.
17. "Tala med bönder på bönders vis och med de lärde på latin" – *Unknown, Swedish proverb*
    English translation: Speak with farmers as farmers speak, and with the educated in Latin.
18. "Kallaik kaNdAl nAyaik kANum, NAyaik kaNdAl kallaik kANum" – Unknown, Tamil proverb
    கல்லை கண்டால் நாயைக் காணாம், நாயைக் கண்டால் கல்லைக் காணாம்
    English translation: When you see a dog's figure in the rock you can't realize it's a rock, when you see the rock you can't realize it's a

dog.

19. “Ká lọ́ aṣọ mọ́ ìdí, ká lọ́ ìdí mọ́ aṣọ, kí ìdí ṣáà má ti gbófo” – *Unknown, Yorùbá proverb*
English translation: Whether we tie a wrapper round the waist or tie the waist round a wrapper, to ensure the waist is not naked is what’s crucial.

20. “ “
ཀུན་མ་བཀུ་མཁས་ན་རྐེད་པར་འགྲོ། །རྐེད་པ་རྐེད་ཉེས་ན་ཀུ་ལ་འགྲོ། །
- Unknown, Tibetan proverb
English translation: It’s a clever thief who keeps finding things, but finding things too often makes one a thief.

Part-wholes: A is part of B, and B is part of A; or A somehow describes or is a possession of B, and B describes or is a possession of A

11. “Любите искусство в себе, а не себя в искусстве”
English Translation: “Love the art in yourself, not yourself in the art”
Konstanin Stanislavski, Russian actor and director

12. “
المتشائم: الورد له شوك
المتفائل: الشوك له ورد

- Anis Mansour, Egyptian writer

English translation: “The Pessimist: A rose has thorns. The Optimist: Thorns have a rose.”
(Translator and compiler of Arabic quotes: Ayeshah. Arabicquotes.co.uk).

13. “Wir brauchen ein europaisches Deutschland. Wir brauchen kein deutsches Europa” – Gregor Gysi, German politician
English translation: We need a European Germany, not a German Europe.

14. “Most countries have armies, but in Pakistan the army has a country.” – The Economist/Economist.com

15. “Le langage est une peau: je frotte mon langage contre l’autre. Comme si j’avais des mots en guise de doigts, ou des doigts au bout de mes mots. Mon langage tremble de désir” – *Roland Barthes, from*

Fragments d'un Discours Amoureux
English translation: Language is a skin: I rub my language against the other. As if I had words instead of fingers, or fingers at the tips of my words. My language trembles with desire.

16. "En mistök eru hluti af skapandi hugsunarferli og ef bú ert að reyna að skapa eitthvað nýtt gerir bú fjölda mistake" – Jón Gnarr, Icelandic actor
English translation: But mistakes are part of a creative thinking process and if you try to create something new, you make a lot of mistakes.

17. "Ea invasit homines habendi cupido, ut possideri magi squam possidere videantur" – Pliny the Younger
English translation: "The lust of lucre has so totally seized upon mankind, that their wealth seems rather to possess them, than they to possess their wealth."

18. "Kai ba ya wuce wuya wuya bay a wuce kai" – , Unknown, Hausa proverb
English translation: The head cannot pass the neck, nor the neck the head.

From: Jang, Tae-Sang. 2002. "Aspects of Poetic Balance and Cohesion in Hausa Proverbs." *Journal of African Cultural Studies 15*(2), 215-236.

19. *"*Απ' αγκάθι βγαίνει ρόδο κι από ρόδο βγαίνει αγκάθι*"* – *Unknown, Greek proverb*
English translation: From a thorn a rose emerges and from a rose a thorn.

20. " ཁྲིམས་བཟུང་རྒྱལ་ཡོད་སྣ་ཚ་ལན་གཅིག་ཡིན། །དེ་ལས་མང་ན་རྒྱལ་ས་འཇིག་མི་ཐུབ། །
- Unknown, Tibetan proverb

English translation: In a law-abiding kingdom, the king should command but once; too many commands will only make a king lose his kingdom.
(Translator and compiler of Tibetan Proverbs: Lhamo Pemba).

Exclusions: A excludes B, and B excludes A

11. "Winners never quit, and quitters never win" – *Unknown*

12. "知者不言，言者不知"**-** *– Lao Tzu, Chinese philosopher,* from *The Tao Te Ching*
English translation: "He who knows does not speak of it; he who speaks does not know it"

13. "Was Hänschen nicht lernt, lernt Hans nimmermehr" - *Unknown, German proverb*

English translation: “What little Hans didn’t learn, adult Hans never will”

14. “ Пока есть государство, нет свободы. Когда будет свобода, не будет государства” – *Vladimir Lenin,* from *The State and Revolution*
English translation: So long as the state exists there is no freedom. When there is freedom, there will be no state.

15. “halliddAga kaDle illa; kaDle iddAga hallilla” – *Unknown, Kannada proverb*
English translation: There are no nuts when one has teeth, and there are no teeth when there are nuts.

16. “
كم من كلمات على ألسنة الناس بلا معنى ، وكم من معان في أفكارهم بلا كلمات!
- *Abbas Mahmoud Al-Aqqad, Egyptian poet*
English translation: So many words on the tongues of people with no meaning, and so many meanings in their heads with no words! (Translator and compiler of Arabic quotes: Ayeshah. Arabicquotes.co.uk).

17. “Neque enim ingenium sine disciplina aut disciplina sine ingenio perfectum artificem potest efficere” – *Vitruvius, De architectura, Book 1, Chapter I, Sec 3*
English translation: For neither talent without instruction nor instruction without talent can produce the perfect craftsman.

18. “τὸ φρικωδέστατον οὖν τῶν κακῶν ὁ θάνατος οὐθὲν πρὸς ἡμᾶς, ἐπειδήπερ ὅταν μὲν ἡμεῖς ὦμεν, ὁ θάνατος οὐ πάρεστιν, ὅταν δὲ ὁ θάνατος παρῇ, τόθ’ ἡμεῖς οὐκ ἐσμέν” – *Epicurus, Letter to Menoeceus, translated by Robert Drew Hicks*
English translation: Death, therefore, the most awful of evils, is nothing to us, seeing that, when we are, death is not come; and when death is come, we are not.

19. “Tout ce qui n’est point prose, est vers; et tout ce qui n’est point vers, est prose” – *Molière, from Le Bourgeois Gentilhomme, 1670, Act II Section iv*
English translation: “Everything that is not prose is verse, and everything that is not verse is prose.”

20. Einstaklingsræktin mà ekki vera fólgin í því að rækta eigingirnina – *Þórarinn Björnsson, Icelandic Educator*
English translation: Self cultivation must not involve cultivating

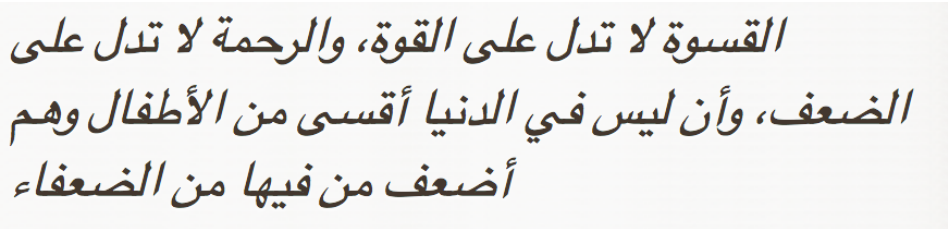
selfishness.

Dissociations: A dissociates from B, and B dissociates from A

11. "Your manuscript is both good and original, but the part that is good is not original and the part that is original is not good" – *a quote misattributed to Dr. Samuel Johnson*

12. "La guerre, c'est un massacre de gens qui ne se connaissent pas au profit de gens qui se connaissent, mais ne se massacrent pas" – *Paul Valéry*
English translation: The war is a massacre of people who do not know each other for the benefit of people who know each other, but do not massacre each other.

13. "



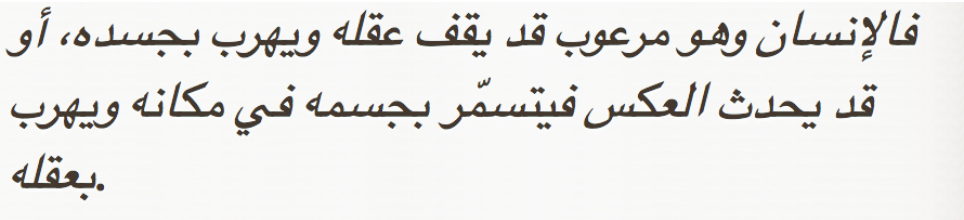
"

- *Abbas Mahmoud Al-Aqqad, Egyptian poet*

English translation: Cruelty does not mean power, neither does compassion mean weakness; children – the weakest amongst the weak – are some of the cruelest in the world.

Notes: This example is more complex, in that it dissociates cruelty from power and compassion from weakness, and also builds an association between weakness and cruelty.

b. Another Arabic example:



- *Yusuf Idris, Egyptian doctor and writer*
English translation: When terrified, a man's mind may stop and his body flee; or, the opposite may happen: his body petrifies and his mind flees.

(Translator and compiler of Arabic quotes: Ayeshah. Arabicquotes.co.uk).

14.

गृध्राकारो ऽपि सेव्यः स्याद् धंसाकारैः सभासदैः ।
हंसाकारो ऽपि सन्त्याज्यो गृध्राकारैः स तैर् नृपः ॥ ३२५ ॥

gṛdhrākāro 'pi sevyaḥ syād dhaṃsākāraiḥ sabhāsadaiḥ |
haṃsākāro 'pi santyājyo gṛdhrākāraiḥ sa tair nṛpaḥ || 325 ||

– Sanskrit, from the Panchatantra or *Pañcatantram* by Vishnu Sharma, Verse 325 from Mitra Bheda or the Loss of Friends. Passage above from Dr. Naveen Kumar Jha's *Pañcatantram*.

English translation: If the king is like a vulture but surrounded by swan-like courtiers, he must be served well; if a swan-like king is surrounded by people who act like vultures, then he should be ignored.

15. "Qui stultis videri eruditi volunt stulti eruditis videntur" – Quintilian, De Institutione Oratoria, Book X, Chapter VII, 21
English translation: Those who wish to seem learned among fools are merely regarded as fools among the learned.

16. "Dieser absolute Bereicherungstrieb, diese leidenschaftliche Jagd auf den Wert ist dem Kapitalisten mit dem Schatzbildner gemein, aber während der Schatzbildner nur der verrückte Kapitalist, ist der Kapitalist der rationelle Schatzbildner" – *Karl Marx, Das Kapital, Chapter 4*
English translation: This absolute enrichment instinct, this passionate hunt for value, is common to the capitalist and the hoarder, but while the hoarder is only the crazy capitalist, the capitalist is the rational hoarder.

17. "ווען די קינדער זײַנען יונג דערציילן די עלטערן זייערע חכמות;
ווען די עלטערן זײַנען אַלט דערציילן די קינדער זייערע נאַרישקײַטן.

"Ven di kinder zaynen yung dertseyln di eltern zeyere khokhmes; ven di eltern zaynen alt dertseyln di kinder zeyere narishkaytn"
- Unknown, in Hebrew and Yiddish, Yiddish proverb

(Shared by Johanna Kovitz of YiddishWit.com and originally taken from the text *Der Oyster fun der Yidisher* or *The Thesaurus of the Yiddish Language* by linguist Nahum Stutchkoff)

English translation: When children are young, their parents talk about how smart they are; when parents are old, their children talk about how stupid they are.

18. *"犬を三日飼えば三年恩を忘れぬ。猫は三年飼っても三日で恩を忘れる。 "- Unknown, Japanese proverb*
English translation: Feed a dog for three days and he will remember your kindness for three years. Feed a cat for three years and she will forget your kindness after three days.

This translation in *The Oxford Dictionary of Proverbs*, edited by Jennifer Speake and J.A. Simpson.

19. "Neg rich se milat, milat pòv se neg" – *Unknown, Haitian proverb*
English translation: The rich black is a milat, the poor milat is a black.
[*Milat is a term referring to both color and class—denoting lighter skinned Haitians who are upper class].

20. "
. ཐོས་ཆུང་ངུ་རྒྱལ་ཆེ། །མང་ཐོས་ངུ་རྒྱལ་ཆུང་། །
- Unknown, Tibetan proverb
English translation: Less comprehension, more pride; more comprehension, less pride.

(Translator and compiler of Tibetan Proverbs: Lhamo Pemba).

Combinations: AB and BA, or A and B; B and A

11. "Je lève mon verre au beau sexe des deux hémisphères, et aux deux hémisphères du beau sexe" – attributed to *Marquis de Bièvres*
English translation: I raise my glass to the fair sex of both hemispheres, and to both hemispheres of the fair sex.

12. "
يُخۡرِجُ ٱلۡحَيَّ مِنَ ٱلۡمَيِّتِ وَيُخۡرِجُ ٱلۡمَيِّتَ مِنَ ٱلۡحَيِّ وَيُحۡيِ ٱلۡأَرۡضَ بَعۡدَ مَوۡتِهَاۚ وَكَذَٰلِكَ

- Qu'ran, 30:19

English translation: He brings the living out of the dead, and brings the dead out of the living [and brings to life the earth after its lifelessness. And thus you will be brought out]. (Abdul-Raof, 2006, 247).

13. "Essendo adunque un Principe necessitato sapere bene usare la bestia, debbe di quella pigliare la volpe e il lione; perchè il lione non si defende da' lacci, la volpe non si defende da' lupi" – *Machiavelli, The Prince, Capitolo 18*
    English translation: "A prince being thus obliged to know well how to act as a beast should imitate the fox and lion, the lion cannot protect himself from snares, and the fox cannot defend himself from wolves."

14. "Architect, *n.* One who drafts a plan of your house, and plans a draft of your money" – *Ambrose Bierce*

15. "Dibia gworo ozo mana ozo gburu dibia" – *Unknown, Igbo proverb*
    English translation: An herbalist cured a certain disease and another disease killed the herbalist.
    (Isidienu, Department of Igbo, African & Asian Studies at Nnamdi Azikiwe University, Awka)

16. "

    凡是敵人反對的，我們就要擁護；凡是敵人擁護的，我們就要反對。

    "

    - *Mao Tse-tung, The Little Red Book, Chapter 2; first appeared in Interview with Three Correspondents from the Central News Agency, the Sao Tang Pao and the Hsin Min Pao from September 16, 1939*
    English translation: We should support whatever our enemies oppose, and oppose whatever our enemies support.

17.

" אַז איך נעם אַ טרונק בראָנפֿן וועט איך אַן אַנדער מענטש, און דער אַנדערער וויל אויך אַ טרונק בראָנפֿן. "

"Az ikh nem a trunk bronfn ver ikh an ander mentsch, un der anderer vil oykh a trunk bronfn"

- *Unknown,* in Hebrew and Yiddish, *Yiddish proverb*

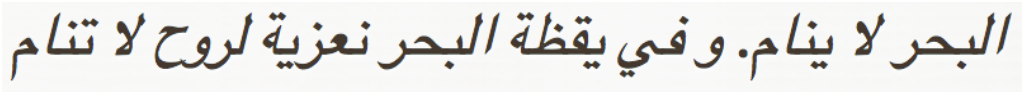
(Shared by Johanna Kovitz of YiddishWit.com and originally taken from the text *Der Oyster fun der Yidisher* or *The Thesaurus of the Yiddish Language* by linguist Nahum Stutchkoff)

English translation: When I take a drink I become another person, and the other person wants a drink, too.

18. " So kanka wani ya ƙi ka // ƙi kanka wani ya so ka. " – Unknown, Hausa proverb
    English translation: Love yourself, another will hate you; hate

yourself, another will love you.
From: Jang, Tae-Sang. 2002. “Aspects of Poetic Balance and Cohesion in Hausa Proverbs.” *Journal of African Cultural Studies 15*(2), 215-236.

19. “Àgùtàn tó bá bá ajá rìn á jẹ ìgbẹ́, ajá tó bá bá ewúrẹ́ rìn á jẹ èpo ìṣu.” – *Unknown, Yorùbá proverb*
English translation: A sheep that moves with dogs will eat feces and a dog that moves with goats will eat yam peelings.

20. “

البحر لا ينام. و في يقظة البحر نعزية لروح لا تنام
- Jubran Khaleel Jubran

English translation: The sea never sleeps, and in the sleeplessness of the sea is a consolation to a soul that never sleeps.
(Translator and compiler of Arabic quotes: Ayeshah. Arabicquotes.co.uk).

Comparisons: A and B are better than B and A; or A and B are worse than B and A; or some form of ranking or measurement exists between two elements A and B

11. “Lieber ein Ende mit Schmerzen als Schmerzen ohne Ende” – *Unknown, German proverb*
English translation: Dearer an end with pain than pain without end.

Another German example: “Allein ist besser als mit Schlecten im Verein: mit Guten im Verein, ist besser als allein” – *Unknown, German proverb*
English translation: Better to be alone than in bad company: and being in good company is better than being alone.

12. “Formidabilior cervorum exercitus, duce leone, quam lenonum cervo” *Unknown, Latin proverb*
English translation: An army of stags would be more formidable commanded by a lion than one of lions commanded by a stag.

13. “Молоде́ц про́тив ове́ц, а про́тив молодца́ -- и сам овца́” – *Unknown, Russian proverb*
English translation: A brave fellow against a lamb, but against a brave fellow – he is the lamb itself.

14. “Aon ghlainne, chan fheàirrde ‘s cha mhiste. Dà ghlainne, ‘s fheàirrde ‘s cha mhiste. Trì glainneachan s’ miste ‘s chan fheàirrde.” – *Unknown, Gaelic proverb* from Caithness

Translated by the Scottish Gaelic broadcaster Ruairidh MacIlleathain, from “Camhairle Ghallach (Litir Bheag 243)” – *Learngaelic.scot*

English translation: One glass, not the better of it and not the worse of it. Two glasses, the better of it and not the worse of it. Three glasses, the worse of it and not the better of it.

15. “是故勝兵先勝，而後求戰；敗兵先戰，而後求勝” – *Sun Tzu, Art of War*
English translation: Victorious warriors win first and then go to war, while defeated warriors go to war first and then seek to win.

16. “

إذا فاجأني الموت في وقت من الأوقات ، فإنني
أصافحه و لا أخافه ، بقدر ما أخاف المرض ، فالمرض
ألم مذل لا يحتمل ، لكن الموت ينهى كل شيء !

- *Abbas Mahmoud Al-Akkad, Egyptian writer*
English translation: If Death surprises me at anytime I will shake hands with him; I don’t fear Death as much as I fear illness…illness is an unbearable humiliating pain. But Death ends everything.

(Translator and compiler of Arabic quotes: Ayeshah. Arabicquotes.co.uk).

17. “Because the force of arguments is always better than the argument of force” – *Donald Tusk, Address to the European Committee of the Regions*, *October 10, 2017*

18. “La vie ressemble plus souvent à un roman qu’un roman ne ressemble à la vie” – *George Sand, Metella, Chapter 1*
English translation: Life resembles a novel more often than novels resemble life.

19.

خوئې له زړه، دنيا له پرينه؛ تر خوئ لا دنيا شرينه

- *Unknown, Pashto Proverb* (Thorburn, 1876)
English translation: A son is from the heart, wealth from the liver; wealth is dearer than a son

20. “

בעסער רעדן מיט אַ ייִדענע און טראַכטן וועגן גאָט אייִדער רעדן מיט גאָט און טראַכטן וועגן אַ ייִדענע.

”

“Beser redn mit a yidene un trakhtn vegn got eyder redn mit got un trakhtn vegn a yidene.”
- Unknown, in Hebrew and in Yiddish, *Yiddish proverb*

(Shared by Johanna Kovitz of YiddishWit.com and originally taken from the text *Der Oyster fun der Yidisher* or *The Thesaurus of the Yiddish Language* by linguist Nahum Stutchkoff)

English translation: It’s better to talk to a woman and think about God than to talk to God and think about a woman.

One-way Effects: A affects B, but B does not affect A; or A does not affect B, but B affects A

4. “Не ме́сто кра́сит челове́ка, а челове́к -- ме́сто.” – *Unknown, Russian proverb*
English translation: It isn’t the place [or “room”] that graces the person, but the person the place [or “room”].

5. *“*Quand on n'a pas ce que l'on aime, il faut aimer ce que l'on a*”* – Roger de Rabutin, Comte de Bussy
English translation: If we have not the thing we love, then must we love the thing we have.

6. “Der Mensch gebärdet sich, als sei er Bildner und Meister der Sprache, während doch sie die Herrin der Menschen bleibt” – Martin Heidegger
English translation: Man acts as though he were the shaper and master of language, while in fact language remains the master of man.

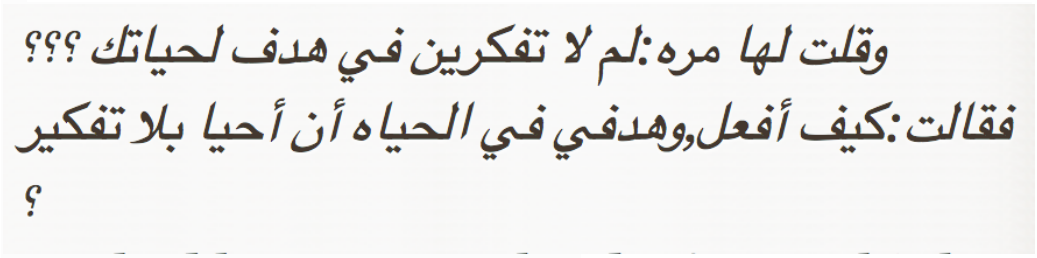
4. “子曰：不患人之不己知，患不知人也。 - *Confucius, Analects, Xue Er 16*

English translation: “I will not be afflicted at men’s not knowing me; I will be afflicted that I do not know men.”

5. “I don’t hate you because you’re fat. You’re fat because I hate you.” – *Mean Girls, American Film*

6. “Mal canı kazanmaz, can malı kazanır” – *Unknown, Turkish proverb*
English translation: Property will not earn life, but life will earn property.

7.



- Yusuf Idris, Egyptian physician and writer
English translation: I asked her once: Why don't you think of a goal for your life? She said: how can I when my goal in life is to live without thinking?

(Translator and compiler of Arabic quotes: Ayeshah. Arabicquotes.co.uk).

8. "…Non i titoli illustrono gli uomini, ma gli uomini i titoli" – Niccolò Machiavelli, Discorsi sopra la prima Deca di Tito Livio, Book 3, Chapter 38
English translation: It is not titles that make men illustrious, but men who do that to titles.

9. "Alla känner apan, men apan känner ingen." – Unknown, Swedish proverb (Ström, 1981)
English translation: Everyone knows the monkey, but the monkey knows no one.

10. "يو په سلو لرلې کيږي، نه سل په يوه" — *Unknown, Pashto proverb* (Thorburn, 1876)
English translation: One can be kept well by a hundred, not a hundred by one.

Multiple Effects: A affects B, and B affects A; or A affects B and B affects A; can also include more elaborate reversals with repeating C, D, E elements

11. "*Cười người hôm trước, hôm sau người cười" – Unknown, Vietnamese proverb*
English translation: Laugh at others today; tomorrow, others will laugh at you.

12. "

אף הוא ראה גולגלת אחת שצפה על פני המים. אמר לה:על דאטפת, אטפוך. וסוף מטיפיך יטופון.

"

– Hillel the Elder, Ethics of the Fathers (Pirkei Avot, Chapter 2, Section 6)
English translation: He also saw a skull floating upon the water. Said he to it: Because you drowned others, you were drowned; and those

who drowned you, will themselves be drowned.

13. Né fe' amor anti che gentil core, né gentil core anti ch'amor natura" – *Guido Guinizzelli, Italian poet*
English translation: Nature neither created love before the gentle heart, nor the gentle heart before love.

14. "Denka leer gij doende zijt en doende denk dan nog" – *Guido Gezelle, Dutch writer*
English translation: Think before acting, and while acting still think.

15. "Tuig thus' an t-eathar, 's tuigidh an t-eather thu" – *Unknown, Scottish Gaelic proverb*
English translation: Understand the boat and the boat will understand you.

16. "Wer mit Ungeheuern kämpft, mag zusehn, dass er nicht dabei zum Ungeheuer wird. Und wenn du lange in einen Abgrund blickst, blickt der Abgrund auch in dich hinein" – *Friedrich Nietzsche,* from *Jenseits von Gut und Böse*
English translation: He who fights with monsters should look to it that he himself does not become a monster. And when you gaze long into the abyss, the abyss also gazes into you.

17. "I don't trust nobody and nobody trusts me" – *Taylor Swift, Lyrics to the song Look What You Made Me Do*

18. "Ἐγγὺς μὲν ἡ σὴ περὶ πάντων λήθη, ἐγγὺς δὲ ἡ πάντων περὶ σοῦ λήθη" – Marcus Aurelius, Meditations, Book VII, 21
English translation: Soon you will have forgotten everyone, and soon everyone will have forgotten you.

19. 話說天下大勢，分久必合，合久必分：周末七國分爭，并入於秦。
- The Romance of Three Kingdoms, attributed to Luo Guanzhong
English translation: The world under heaven, after a long period of division, tends to unite; after a long period of union, tends to divide.

20. "Qui craint de souffrir, souffre déjà de ce qu'il craint" – Michel de Montaigne, Essais, livre 3
English translation: Whosoever fears suffering already suffers from what he fears.

Merleau-Ponty's Chiasm: A Theory of Perception

Abstract: One of Maurice Merleau-Ponty's important contributions to philosophy is the multi-faceted concept of the chiasm, which appears in the unfinished work *The Visible and the Invisible*. As a term, *chiasm* has a range of rich associations, and in the context of his work has been interpreted in a variety of different ways. The following is an argument that Merleau-Ponty's chiasm is a five-fold bodily relation and that a closer reading of his work reveals a richer theory of perception. For Merleau-Ponty, the chiasm is a defining perceptual logic, rooted in how the eyes form "one sole Cyclopean vision" (VI 141) and how the hands or hemispheres each have their own tactile sense, but connect and compensate for each other through the body. There are three other bodily relations he explores, including the relation between world and *flesh*. Flesh is a primal element, the nonmaterial potentiality for things, and all material is chiastically realized through flesh, through differentiation and expression. Another bodily relation Merleau-Ponty explores is that of social interaction, the dynamic between One and Other, in which there is a risk of one view dominating when the chiastic relation is ignored. The last is a linguistic relation, with a chiastic chain connecting all situational usages of terms and "meaning" is always in flux. Turning to earlier texts to further the analysis, the intent is to show the depth and richness of Merleau-Ponty's theory and its applications to present issues in cognitive science.

Maurice Merleau-Ponty was a French phenomenologist born in 1908, and influenced by prominent figures of the preceding generation like Husserl and Heidegger. He had an interest in Gestalt psychology, and his first forays into examining the human condition are accomplished through a taking up of the Gestalt lens. Muller (2017) explains his career as one of, "progressive

development," in which "he moves from analyzing scientific consciousness (*The Structure of Behavior*) to a phenomenological analysis of behavior as lived (*Phenomenology of Perception*)" and then beyond that in *The Visible and the Invisible.* His early work examines an eclectic array of subjects — including human behavior and social interaction, perception and mind, and linguistic and artistic expression. In his later work, all of these converge as the various aspects of a central bodily relation: the *chiasm*. His unfinished text *The Visible and the Invisible* concerns this pivotal concept. A *chiasm* may refer to any crossing point and the term has been used to define a range of phenomena. It is centrally important that, from among the number of options that he could have selected to convey the occurrence of an *intersection* or intertwining, Merleau-Ponty chose the chiasm*.* Merleau-Ponty may have derived the term *chiasm* from its usage in anatomy, where it refers to how the optic nerve fibers decussate. [17] Regardless of whether this was intentional or not, what he lays out in *The Visible and the Invisible* is a description of binocular vision and the chiastic nature of perception. This will be more deeply explored below in the section of this paper on perception, but there are several reasons that it may be the case that Merleau-Ponty had been attending to the anatomical structures in his use of the term *chiasm.*

When Merleau-Ponty died, Descartes' *La dioptrique* (1637) was open on his desk, an essay on optics that describes how refraction works and

[17] It is important to note that I am not reducing Merleau-Ponty's concept of chiasm to just its physical structure. There is an explicit description of the optic structure in his text, as well as several references that point to this physical structure being one component of his chiasm—but the concept goes well beyond just the physical.

discusses the crossing of the optic nerve (Toadvine 2019). Merleau-Ponty also referred to Descartes' repeatedly in his working notes and specifically mentions *La dioptrique* (1637). A sketch by an unknown artist taken from *Tractatus de homine* brings to life the content of Descartes' work on vision. This illustration that accompanied his explanations of the eye and optic nerve can be seen below:

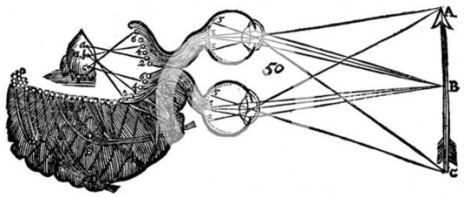


Figure *1*. A sketch by an unknown artist from Descartes' *Tractatus de homine* (1677), found on page 124. Although Merleau-Ponty was reading a different text, *La Dioptrique*, the descriptions in this essay are of these same optical structures.

The chiasm is a literal referent, but also rife with metaphorical extensions. The term brings unity and coherence to the work Merleau-Ponty produced over the course of his career. Even in his earliest published texts, precursors to the chiasm begin to emerge as Merleau-Ponty ponders human behavior, grapples with the mind-body dichotomy, considers the special talents of artists, ruminates on language, and envisions a new perceptual logic. In Merleau-Ponty's final account, the chiasm signifies the reversibility between the perceptible world or the "visible," and the perceiving subject or "invisible" that is consciousness — it is a concept of perception (i.e. vision) and yet much more. While Merleau-Ponty devoted his attention to five chief topics in *The Visible and the Invisible*, which are expounded below, the chiasm

accounts for all sensual being and aspects of the senses, beyond visual and tactile sensation. As Merleau-Ponty stated early on in the work*:* "My body does not perceive: but it is as if it were built around the perception that dawns through it: through its whole internal arrangement, its sensory motor circuits…" (VI/9). [18]

Tracing the development of the chiasm throughout all of Merleau-Ponty's texts helps to clarify its purpose. Merleau-Ponty rejected empiricism, along with the effort to reduce every phenomenon to certain primitives that could be definitively pinned down, but he seems to conceive of the chiasm in all of its many extensions as the way of accessing an "ultimate truth" (VI 155). However, this is not a truth that can be defined with any sort of constancy; the laws of identity do not hold, with an object being defined as itself and therefore deemed different to all other things. According to Merleau-Ponty, there also cannot be a synthesis of the things. There is instead the *reversibility* of the chiasm – which admits of a diversity emerging out of the same *flesh,* or primal element. Flesh is a complex concept that requires deeper attention in the sections of this paper that follow, but it is through flesh that the chiasm can occur at all. The chiasm involves a process that both preserves and separates—it transforms flesh and bestows upon it a material presence and alterity. Two beings are knowable to each other,

[18] Merleau-Ponty said in his working notes, "Each 'sense' is a 'world,' i.e. absolutely incommunicable for the other senses, and yet constructing a *something* which, through its structure, is from the first *open* upon the world of the other senses" (217). He brings together all of the senses in his description of the chiasm, but his attention throughout *The Visible and the Invisible* was primarily on the **visual** and the **tactile**, which he considered separable but ultimately mutually engaged through the chiasm. He does not include full chapters on the other senses, or attend to them at length in the way he does with visual and tactile sensation. The whole phenomenological tradition that Husserl saw as beginning with Descartes, and which is the starting point for Merleau-Ponty, is focused on vision. The fact that Merleau-Ponty also focuses on touch to the extent he did is an innovation.

because Other shares a common essence but is not reducible to Self. The agent or perceiver also engages with objects by recognizing their stable and yet re-combinative properties that come to the fore through flesh.

Irigaray (1993) and Hughes (2017) have suggested that the reversibility of the chiasm refers to the exchangeability or substitutability between the perceiver and the object, and the One and Other. This reversibility would not allow for a full appreciation of difference. [19] For reasons that will be expanded upon below, Merleau-Ponty's *réversibilité* need not entail the replacement or substitution of an object or individual. Even in the *réversibilité* of an article of clothing, there is the usefulness of its distinct sides, if only employed in the manner to which each might have been intended. So too, the chiastic reversal may rather be a productive way of treating diversity as it pertains to socialization, as well as phenomenology of mind and body. It may be a way of escaping the entrapment of the subject-object and mind-body dichotomies. Merleau-Ponty's chiasm arguably supplies the "new paradigm" that Mensch (2010) explains was required to grant "some continuity allowing us to transition" between world and consciousness. Within the editor's foreword to *The Visible and the Invisible,* Claude Lefort points specifically to a passage that defines the chiasm as the "ultimate truth." Lefort insists that this ultimate truth "upon which *The Visible and the Invisible* comes to an end is also that from which the work draws its origin: the truth does not constitute a stopping point" (VI/xxx). The ultimate

[19] Irigaray is a French feminist philosopher whose research is focused on how language plays a role in the oppression of women and how women are often viewed as commodities.

truth must always be imminent, as the world and people change, and signification (which is intricately tied up with these objects) must likewise shift. This perspective differs drastically from other more common approaches in Western philosophy, which deems the vast array of phenomena in the physical world as fixed and discoverable through science. The chiasm complicates this considerably, not departing from it entirely – but proposing a view more wrapped in relativity of the body and its positions in space. Closely examining Merleau-Ponty's concept of the chiasm provides several useful insights with respect to understanding embodiment and the human condition.

The chiasm is a complex bodily relation, originating in perception and branching to all other aspects of Being. Much of Merleau-Ponty's work discloses an expectation that a cross-disciplinary effort will prevail and elucidate the mysteries of the perceptual process, and his concept of chiasm represents his last effort to contend with those mysteries. The chiasm refers to the nature of the bond between all perceiving and non-perceiving things, and also encompasses language and human social engagement. Merleau-Ponty elaborated on this in his working notes for *The Visible and the Invisible*: "The chiasm is not only a me other exchange (the messages he receives reach me, the messages I receive reach him), it is also an exchange between me and the world, between the phenomenal body and the 'objective' body, between the perceiving and the perceived: what begins

as a thing ends as consciousness of the thing, what begins as a 'state of consciousness' ends as a thing" (215).

Re-interpreting this concept and its role in Merleau-Ponty's theories of perception, language and society reveals potential new applications of his work, and demonstrates how his theory might complement and augment more recent theories of the perceptive mind. Such an exploration of the chiasm opens up the possibility of a major paradigm shift and re-envisioning of models of the mind. Through metaphorical extensions, the chiasm also alters our understanding of linguistic signification and social relationships. The chiasm defines five important bodily relations: between the eyes, between the arms which engage in touching and touching oneself, between Self and World. With social interaction, the chiasm bridges Self with Other, and also manifests through linguistic and artistic expression. This work is important because Merleau-Ponty's concept of the chiasm is complex, and through interpretations and deeper analysis of its features, it may be possible to glean lessons applicable to a wide range of fields, including but not limited to cognitive science, linguistics and sociology. It may result in richer theories of perception, signification and interpersonal relationships.

On the Chiasm

In another note for *The Visible and the Invisible*, Merleau-Ponty asserted that the chiasm finds a basis in human anatomy: "The other's visible is my invisible; my visible is the other's invisible; this formula (that of

Sartre) is not to be retained. We have to say: Being is this strange encroachment by reason of which my visible, although it is not superposable on that of the other, nonetheless opens upon it, that both open upon the same sensible world------And it is the same encroachment, the same junction at a distance, that makes the messages from my organs (the monocular images) reassemble themselves into one sole vertical existence and into one sole world" (216). This passage concerns the mind-body and me-other dichotomies that Merleau-Ponty sought to eliminate, but the other urgently important aspect of the chiasm under consideration here is its foundation in the organs of sight, and more specifically in the crossing nerve fibers that route contralaterally to produce vision. Muller (2017) also briefly calls attention to the chiasm as an anatomical referent in an article that shows continuity of themes between the *The Structure of Behavior* (1942) and *The Visible and the Invisible*.

What Merleau-Ponty continuously hints at throughout *The Visible and the Invisible* and even in *Phenomenology of Perception* (1945) is a cross-hemispheric process of perception — one that he perhaps could not fully articulate at a time prior to more intensive research programs that undertook studies of split-brain patients and hemispheric specialization.[20] In

[20] In 1960, Michael S. Gazzaniga began to study with R.W. Sperry at Caltech, and his research on split-brain patients represented efforts to better understand the roles of the cerebral hemispheres and their specialized roles in linguistic and perceptual processing. Much was already known about this topic, and the role of the left hemisphere in speech production and processing.
In the1800s, the anatomist Broca discovered a region of the brain in the left frontal lobe dedicated to speech production, and later the anatomist Wernicke discovered a region in the left temporal lobe dedicated to speech processing. It was noted that damage to these crucial areas of the brain resulted in different types of aphasia. For a more complete overview on the history of aphasia, see the Handbook of Clinical Neurology, Vol 95. on the History of Neurology, chapter 36 *History of aphasia: from brain to language* by Paul Eling and Harry Whitaker. Gazzaniga confirmed the importance of the left hemisphere to language processing, but also took this research one step further with specific studies that showed the right hemisphere's aptitudes for

spite of the fragmentary and incomplete nature of Merleau-Ponty's work, it is possible to piece together his core ideas and find within his writings a more elaborate theory of perception, which descriptively points to a "crisscrossing" of the "touching and the tangible" – "two systems… applied upon one another, as the two halves of an orange" (VI/133). The imagery of the orange is salient, as an orange in fact contains many segments, but Merleau-Ponty divides the fruit into *halves* to explain not only the relation between the touching and the touched, as when one hand caresses another—but also the relation between seer and world, the viewer's "prepossession of the visible" (VI/133).[21]

Merleau-Ponty sought an alternative to positivist attempts that tried to establish conclusively a primitive relation between me-other, mind-body, and the identities of the objects processed as "monocular images". He also turned to specialized sciences and mathematics to inform his phenomenology.[22] The concept of the chiasm has roots in Euclidean geometry and the vesica piscis, which is a structure involving two circles that overlap. Merleau-Ponty even goes so far as to describe the "body as a visible thing contained within the full spectacle" as a "reciprocal insertion…. two circles, or two vortexes, or two spheres, concentric while I live naively, and as soon as I question myself, the one slightly decentered with respect to

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grasping context, and examining the holistic structure of a scene, while the left hemisphere excels with language and particular details or parts of a scene.

[21] Within the same paragraph, Merleau-Ponty also reminds us that, "a delimitation of the senses is crude." Although he speaks of two halves and two systems, his imagery with the orange (which has multiple segments) is a subtle way around this delimitation (VI/133).

[22] Thomas-Fogiel (2014) provides a brief overview of this.

the other. . . .” (138). The chiasm has a well-defined structure in mathematics and anatomy, but for Merleau-Ponty it is not just a rigid structure.

Merleau-Ponty presented several key components of the chiasm in its perceptive role:

1) The chiasm is the connector of the visible and the invisible -- it is an essential relation bound in *flesh*.
2) It deals with the coordination between the two eyes making “one sole Cyclopean vision” (141),
3) and the relation of the hands, which each have their own “tactile experience” but connect to “one consciousness” through the body (141).
4) It delineates a relation of logic and language accounting for objects and their opposites, without any need for negation,
5) and this applies also in the case of subject-object distinction—specifically to the problem of Self and Other.

Each of these components demands further elaboration. The visible and the invisible refer to the perceptual world and the mind, respectively, and Merleau-Ponty argued that both are united in the same *flesh*. By *flesh,* Merleau-Ponty does not simply mean the flesh of the human body, physical matter or any type of material; it is an ambiguous concept that invites much interpretation. Tentatively, we can liken flesh to a shared essence—the force that all things hold in common that permits the chiasm to exist—for its exchange to be made at all. The first section of the paper below examines some readings of Merleau-Ponty’s concept of flesh, and what follows thereafter expands upon the four main facets of the chiasm to articulate Merleau-Ponty’s overlooked theory of perception, and new applications of his work.

The Concept of Flesh, the Chiasm and Perception

There are many potential interpretations of *flesh*, as Merleau-Ponty is not argumentative or traditional in his way of writing; his often circuitous and fragmentary style allows for a wide range of theories as he covers perceptual, linguistic and social phenomena. In an introduction to a collection of articles on flesh and chiasm, Evans and Lawlor (2000) proposed that *flesh* could be a metaphor for social institutions. Merleau-Ponty's application of flesh comprises more than intersubjectivity, however: it entwines the perceptual and social aspects of experience. Throughout *The Visible and the Invisible,* Merleau-Ponty utilizes *flesh* primarily in discussions of the natural world involving its depth and thickness, but flesh encompasses all that is perceptible, including the self; "the presence of the world is precisely the presence of its flesh to my flesh, that I 'am of the world' and that I am not it" (VI 127). Flesh might be taken as the element that self and world mutually consist in, and out of which several divergences, offshoots and possibilities emerge: the self is just one projection of the flesh, and all of these projections are chiastically connected. Mensch (2010) and Muller (2017) both define flesh as an *element.* Dastur (2000) refrained from assigning a stable referent to flesh, and yet concluded that it must be the "final notion" which "one succeeds in reaching after having traversed every region of being" (35). Flesh could be the totality of all living beings and all configurations of the world. Given this perspective, Merleau-Ponty's concept of the flesh may almost seem to have a spiritual resonance in line with Zen

principles, and yet he explicitly states in his notes section that the concept of flesh is not a hylozoism, even if at times he appears to be suggesting that the whole universe is alive and in confluence with itself. Instead, flesh is something other than *life*—although life can exist through flesh. So, what then is flesh, and can a stable referent ever be assigned to this concept?

Muller (2017) insists that any account of flesh will have to contend with how "the sensible-sentient structures of the human body" can exist along with the "autonomy of nature" (188). Any viable explanation of flesh must deal with how diversity and distinction arises through its sameness. Drake (2005) ponders the issue, considering that for Merleau-Ponty, "While the body differentiates itself from the world of objects in terms of our experience of it, it must also be of the same order as those objects for perception to occur" (57). The chiasm is Merleau-Ponty's answer to this conundrum: it is a relation that both differentiates and individuates flesh while binding it. Abram (1996) reasoned that flesh is a "matrix that underlies and gives rise to both the perceiver and the perceived as interdependent aspects of its own spontaneous activity" (66). Conceptualizing flesh as a matrix or grid may be appropriate, given the mathematically based assertions in Merleau-Ponty's note section of *The Visible and the Invisible*. Muller (2017) takes issue with Abram's overall interpretation, however, claiming that *flesh* as Abram develops it leaves no place for the "necessary divergence that makes perception possible," because Abram treats bodies and world as being ultimately of the same *carnal* nature (188). Flesh is itself preobjective,

formless but capable of taking on many forms, and it is only clear from Merleau-Ponty's note section how its differentiation is realizable through the chiasm. Merleau-Ponty states that, "I call it flesh…in order to say that it is a *pregnancy of possibles*, Weltmöglichkeit (the possible worlds variants of this world, the world beneath the singular and the plural), that it is therefore absolutely not an object, that the blosse Sache mode of being is but a partial and second expression of it" (250). The phrase *blosse Sache* can be translated as the "bare thing" and according to Roberta Lanfredini (2014), it is "a unit in itself concluded" or – the sphere of the material thing.[23] *Blosse Sache* elicits the shape of an unfinished chiasm—the partial or second sphere that projects from another underlying original. It is also noteworthy that Merleau-Ponty referred to *blosse Sache* as a second *expression*, because this idea of a second expression appeared in Merleau-Ponty's earlier works. As Hass and Hass (2000) point out, acts of *expression* for Merleau-Ponty are vital to his treatment of mathematical proofs and his notion of truth. Hass and Hass focus on a crucial passage from the "The Cogito" chapter in *Phenomenology of Perception*, which is relevant in this discussion and interpretation of *flesh* (179). In "The Cogito," Merleau-Ponty wrote about a geometrical theorem of the triangle:

> When I prove a conclusion, I commit the first structure [i.e., the image of a triangle] to a second one, the "parallels and secant" structure. How is that possible? It is because my perception of the triangle was not, so to speak, fixed and dead, for the drawing of the triangle on the paper was merely its outer covering; it was traversed by lines of force,

[23] Lanfredini's original wording is: "una unita in sé cochiusa" or a unit in itself concluded – and "la sfera della cosa materiale" or the sphere of the material thing.

> and everywhere in it new directions not traced out yet possible came to light. In so far as the triangle was implicated in my hold on the world, it was bursting with indefinite possibilities of which the construction actually drawn was merely one. The construction possesses a demonstrative value because I cause it to emerge from the dynamic formula of the triangle. It expresses my power to make apparent the sensible symbols of a certain hold on things… It is an act of productive imagination. (PP 443/386)

The reason this passage is so striking and pertinent has to do with Merleau-Ponty's reference to *indefinite possibilities,* and how the geometer works through a construction of a second structure: there is no "truth" or proof realizable in fixity, but instead truth is an effect of perception. These same ideas and processes are apparent in Merleau-Ponty's notations about flesh. Hass and Hass remark that, "For Merleau-Ponty, reaching the conclusion of a proof, or grasping some essential step along the way, 'an act of expression' both 'transcends and transfigures' the initial situation" (179). This transcendence and transfiguration manifest themselves through the chiasm: they are an opening and a progression from some possibility of flesh to a second expression or projection, and it is all the work of an embodied perceiver. Equipped with this view of mathematical proofs, and Merleau-Ponty's above clarifications on flesh, it can be concluded that flesh may indeed be construed as a matrix or medium, through which the perceiver can explore the pregnancy of possibles from his limited vantage point—although flesh can never be assigned a stable referent, since flesh by its very nature is unstable. These ideas are continuously reiterated in Merleau-Ponty's early works and later writings, but with important additions and improvements

regarding how the perceiver engages with these "possibles" and forms a second expression or projection. Bannon (2001) defines flesh as a "relational ontology," though it is most than just a "relation between bodies" – it is a relation that bodies actively help to construct.

As early on as 1942, with the publication of *The Structure of Behavior,* Merleau-Ponty constructed a plausible suggestion of how organisms intelligently interface with their world, which would almost appear to be in dialogue with the modern theories of perception that shall be touched on at the end of this work. Merleau-Ponty wrote of action, perception and the importance of the organism maintaining equilibrium, ruminating that, "For the most part preferred behavior is the simplest and most economical *with respect to the task in which the organism finds itself engaged*; and its fundamental forms of activity and the character of its possible action are presupposed in the definition of the structures which will be the simplest *for it*, preferred *in* it (147). He drew the conclusion that "…the internal determinants of this equilibrium are not given by a plurality of vectors, but by a general attitude toward the world" and that "…the organism measures the action of things upon it and itself delimits its milieu by a circular process which is without analogy in the physical world" (148). In part, Merleau-Ponty's puzzling "circular process" may be his fledgling notion of what he will eventually call the chiasm, but either way these remarks affirm Merleau-Ponty's early commitment to the idea of an organism ascribing structure to the world *for itself* and in bodily relation to itself. *Expression* is this activity of

the body, as it involves the recognition of some initial structure and an extracting of information to re-produce and create new structures.[24] No two human beings produce the same expressions. Merleau-Ponty believed there was an individually calibrated system, which he variously discussed in his later works as a "system of equivalents" or "system of equivalencies" that was responsible for determining how and why each person differs so drastically from the next in composing expressions. This he particularly applied in his discussions of artists, who painted rich scenes that seemed to capture so much more than what could be accessed in the initial spectacle. Merleau-Ponty attributed the genius of artists to their bodily experience and unique ways of bringing together objects in a picture. In chapter 6 of *Phenomenology of Perception*, entitled "The Body as Expression and Speech", Merleau-Ponty again employed the phrase "system of equivalents" in his treatment of "bodily presence" and the identity of objects:

> I am not well able to visualize, in my mind's eye, the existence of the fireplace as the flat projection….On the contrary, I perceive the thing in its own self-evident completeness and this is what gives me the assurance that, in the course of perceptual experience, I shall be presented with an indefinite set of concordant views. The identity of the thing through perceptual experience is only another aspect of the identity of one's own body throughout exploratory movements; thus they are the same in kind as each other. Like the body image, the fireplace is a system of equivalents not founded on the recognition of some law, but on the experience of a bodily presence (198).

Within *Phenomenology of Perception,* Merleau-Ponty deemed the

[24] Muller (2017) and Landes (2013) both offer compelling evidence of the continuity between Merleau-Ponty's early work in *The Structure of Behavior* and his later work in *The Visible and the Invisible;* Muller primarily focuses on "flesh," whereas Landes takes up the subject of "expression."

body to be “a ready-made system of equivalents and transpositions from one sense to another” and “the seat or rather the very actuality of the phenomenon of expression (Ausdruck)” (273). The first of these passages appears to insist that objects are identified through the system of equivalents, which is different for each person and depends on bodily orientation, while still being more precise than “expression”, in that it implies that everyone has a sort of perceptual thesaurus, or perceptual logic, that balances or rectifies the diversification of like-objects. The “system of equivalents” also entails other intelligent and complex capabilities.

Merleau-Ponty’s posthumous *The Prose of the World* further solidifies the signification of “system of equivalents,” as he uses powerful but disturbing imagery to describe this phenomenon. In a passage on artistry, Merleau-Ponty reflects on how “The painter re-arranges the prosaic world and, so to speak, makes a holocaust of objects, just as poetry melts ordinary language. But in the case of works that one likes to see or read again, the disorder is always another order. It is a new system of equivalences which demands *this* upheaval and not just any one, and it is in the name of a *truer* relation among things that their ordinary ties are broken” (63-64). Each person shatters and distorts the world, only to impose another structure on it—to reconfigure the world according to her own vision. Such an extreme statement may seem to be favoring subjectivity, and discarding any “true relation” that can be delineated in an objective regard, but a note of paramount importance from *The Visible and the Invisible* proves otherwise,

as Merleau-Ponty explains that:

> since there are such structural modifications of the quality by space (transparency, constancies) as well as by the other qualities, we must understand that the sensible world is this perceptual logic, this system of equivalencies, and not a pile of spatio-temporal individuals. And this logic is neither produced by our psychophysical constitution, nor produced by our categorical equipment, but lifted from a world whose inner framework our categories, our constitution, our 'subjectivity' render explicit … (247-248).

In essence, Merleau-Ponty conceives of there being compatibility between the perceiver and the perceived, and so the "system of equivalencies" for each person is an integral aspect of some greater perceptual logic that superintends all. The "system of equivalencies" is a derivative of the perceptual logic, and constrained by it, but the very existence of such a "system" requires there to be transcendence—a divergence from the sensible world that manifests through each individual. Merleau-Ponty often assessed this as a "magical" or mysterious phenomenon, and yet his use of these nonscientific adjectives does not invalidate the very clear details he provides; he had some idea of how this transcendence was achieved, how each person negotiated his or her own "system of equivalencies," and where this system is located. For Merleau-Ponty, the chiasm is perhaps the underlying structure of this perceptual logic, and also the structure of this "system of equivalencies" – as it demonstrates the creation of a new expression that must in some way copy features of an original while also departing from its point of nascence.

The chiasm may be Merleau-Ponty's ultimate endeavor to grapple

with perception, and address the perceiver's situation as a participant in the flesh of world, a transcendent realization of all its possible incarnations, and as a being that has a "system of equivalencies" at its disposal. Foremost, the literal referent of chiasm cannot be overlooked. Figure 1 displays a sketch of the anatomy of the human brain and the optic chiasm, which may be the locus or at least a fundamental component that permits perceivers to establish a "system of equivalencies."

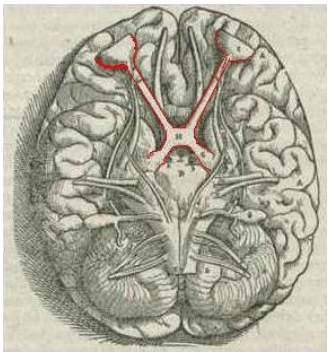


Figure 1. The optic chiasm, also referred to as *optic chiasma*.

Routing cross-hemispherically, the chiasm grants the perceiver one unitary vision of the world rather than two separate pictures, but each hemisphere processes visual data differently: the right hemisphere generates more complex 3D representations, while the left hemisphere produces more simplistic and sometimes 2D representations. This is not to forge a dichotomous account of the hemispheres, because ultimately both hemispheres process the same material things; however, the left and right hemispheres have disparate cortical functions, even though they have a highly symmetrical architecture and patterns of activation. What is central to

this discussion is that the hemispheres seem to accomplish a 'transcendence' and 'transfiguration' akin to what Merleau-Ponty lays out in *Phenomenology of Perception* and subsequently revisited in *The Visible and the Invisible* in his writings on mathematical proofs, flesh and expression. In typical visual processing, the hemispheres can generate at least two distinct accounts of the world: one that is fuller and richer, and a second expression that is much sparser. This seems to be a natural contender as the site of a "system of equivalencies," as the hemispheres differ in their expressive skills and functionality. [25]

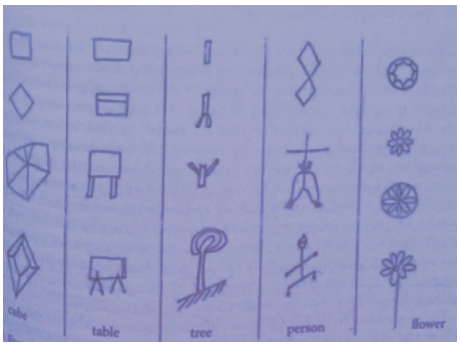
The right hemisphere predominates in 3D processing, and the left hemisphere processes what under this interpretation might be considered the *second expression* of the objects, one that is somehow a *partial* copy. In *Phenomenology of Perception,* Merleau-Ponty stipulated that,

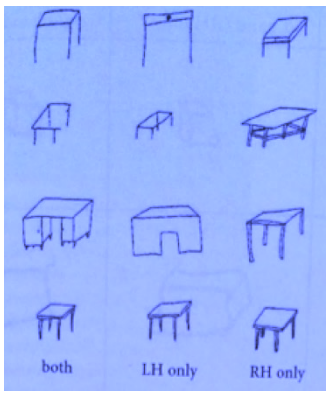
> I have visual objects because I have a visual field in which richness and clarity [or neatness] are in inverse proportion to each other, and because these two demands, either of which taken separately might be carried to infinity, when brought together, produce a certain culmination and optimum balance [or maximal point] (PP/371).

Coping with the two demands between richness and neatness might be the work of the hemispheres in the brain. The left hemisphere contends with a neater or sparser picture of the world and has the ability to define objects through verbal expressions. When inspecting an image of a knight, the left

[25] Although here I speak of the hemispheres of the brain, it is crucial to emphasize that each hemisphere is connected to the opposite side of the body. For me, there need not be a distinction between the hemispheres of the brain and body – they are one and the same, chiastically bound together.

hemisphere can declare “knight,” while the right hemisphere mutely flounders for the term, but succeeds in noticing the context—the richer details of the image (Sidtis et al. 1981; Gazzaniga 2015, p. 243). Nikalaenko (1997) inactivated the right and left hemisphere successively to demonstrate their different perceptual abilities. His study disclosed how each of the human brain hemispheres independently coped with the task of drawing everyday objects, and proved that the right hemisphere better attends to details. These outcomes are shown below, but many other studies have also confirmed that 3D processing relies on the right hemisphere, and that the right hemisphere presides more over shape-information.[26] This is significant because it may in some ways be evidence of how the human brain contends with the “richness” and “neatness” that Merleau-Ponty hints at in his philosophical analysis of perception—if one hemisphere of the brain deals with richer visual input than the other.





[26] Dövencioglu, Ban, Schofield and Welchman (2013) studied the dorsal and ventral visual streams in the brain to gain insight into the phenomena of disparity and shading, which enable human beings to process 3D information. They also showed that “3D pictorial information provided by shading relies on a quite different generative process that is subject to different constraints and prior assumptions.” Thompson et al. (2011) offered further evidence that 3D processing differs from other forms of visual processing. Pathologies like prosopagnosia additionally demonstrate how visual processing of shape-information can be disturbed when there is a lesion in the right hemisphere. Patients with this rare condition claim that faces appear flat or plate-like.

Figure 2. Images from Nikolaenko's (1997) study, which also appear in McGilchrist (2009). The first image shows the artistic talent of the left hemisphere in brains with right hemispheric deactivation. The second image is a sample of subjects' reproductions when both hemispheres are active, and either the left or right hemisphere is active.

V.S. Ramachandran (2011) describes a case study of one his patients called Nadia—an autistic seven-year-old girl who could not communicate, but possessed superior talents as an artist. Nadia skillfully drew a horse in full gallop, including 3D details like the rippling and straining of muscles. Ramachandran hypothesizes that this savant gift is the result of a functioning region of cortical tissue in Nadia's right parietal lobe, which he claims allowed Nadia a greater facility with "isolation" – something that occurs when an "artist emphasizes a single source of information—such as color, form, or motion—and deliberately plays down or deletes other sources" (221). Nadia's sketch is more elaborate, like the sketches of those belonging to the subjects with right-hemisphere only activation. The sketches of the left hemisphere-only subjects from Nikolaenko's study have more in common with the simplistic drawing of the normal eight-year old child seen below in Figure 3.

Figure 3. Nadia's sketch on the left, compared to a drawing of Da Vinci's, and that of a normal eight year-old child (Ramachandran 2011).

Each of the above images show that the hemispheres possess different expressive aptitudes—one richer, and one more simplistic. Expression (which amounts to a "system of equivalencies") occupied much of Merleau-Ponty's professional focus, and yet the applications of his work have been largely overlooked, even now that he has begun to attract more attention from scholars in neuroscience and cognitive science. Although he was unaware of the different expressive aptitudes of the hemispheres, it likely would have been of interest to him, and should factor more in modern theories of perception.

Evans and Lawlor (2000) note that, "balancing between maximum clarity and maximum richness regulates the entire field of human activity and constitutes the stability of our relation to the world…. [and] the hallmark of Merleau-Ponty's philosophy, the balance between unity and plurality, identity and difference, stability and novelty, is therefore reflected and based in the balance between clarity and richness that he finds at the level of perception" (7). Within this particular publication, Evans and Lawlor's do not provide an extensive analysis of Merleau-Ponty's text to prove their argument. They are here most focused on the concept of *balance*, which is implied but not explicitly emphasized in the passages on "richesse" and "netteté" (or richness and neatness) in *The Phenomenology of Perception.* It is in other sections of the work that Merleau-Ponty's mentions *equilibré* or balance, and

several passages elucidate his more precise views on the matter. In a discussion of meaning and perception, Merleau-Ponty reflects:

> Whether a system of motor or perceptual, our body is not an object for an 'I think' – it is a grouping of lived-through meanings, which moves towards it equilibrium. Sometimes a new cluster of meanings is formed; our former movements are integrated into a fresh motor entity, the first visual data into a fresh sensory entity, our natural powers suddenly come together in a richer meaning, which hitherto has been merely foreshadowed in our perceptual or practical field, and which has made itself felt in our experience by no more than a certain lack, and which by its coming suddenly reshuffles the elements of our equilibrium and fulfills our blind expectation (PP/177).

Finding balance in the data is the work of an engaged body, and occurs through perception. Arriving at a meaningful result is not reaching a dead end, but a new entry point that continues the whole dynamic process. Merleau-Ponty further elaborates on the process at a later point in *Phenomenology of Perception,* explaining that in normal vision,

> An oblique position of the object in relation to me is not measured by the angle which it forms with the plane of my face, but felt as a lack of balance, as an unequal distribution of its influences upon me. The variations in appearance are not so many increases or decreases in size, or real distortions. It is simply that sometimes the parts mingle and become confused, at others they link up into a clearly articulated whole, and reveal their wealth of detail. There is one culminating point of perception which simultaneously satisfies these three norms, and towards which the whole perceptual process tends (PP/352).

Referring to this point of culmination connects this passage into the one about richness and neatness, the "two demands" that "produce a certain culmination" (PP/371). It is possible that the hemispheres of the body and brain preside over these two demands in perception.

Significantly, many modern theories of perception seem to seek explanations of how the brain stores information, and these theories take inspiration from prior methods that computer software engineers have used to *compress* data. In computer systems, compressing involves reducing large files into smaller files without information loss. This is often necessary for transferring or uploading high-resolution images. After omitting some pixels to cut down the size of the file, the lower quality images can be used to re-constitute the original. All that need be done is to take the pixels from that low quality image and use what remains to guess at the values of the missing pixels. Predictive coding is a formulation for compressing information. Linear predictive coding began as a method of data compression, and then later was coopted into a model for vision by Rao and Ballard (1999).

More recently, linear predictive coding has inspired other theories that embrace a predictive processing and specifically Bayesian explanation of cortical function (Friston 2005; Howhy 2013; Clark 2017). Predictive processing in the brain involves reliance on priors, or past experiences that allow the agent to optimally estimate future states of the world and calculate the likelihood of some occurrence. Other data compression strategies are also evident in neural networks designed to perform like a human brain. The robot SPAUN (or “Semantic Pointer Architecture”) and its accompanying software Nengo uses a data compression strategy: scalar or vector values are multiplied to produce representations, and later dereferenced to get at

the sum of their parts or complexities. It is currently thought these *compression*s could either be generated primarily from the bottom-up (as in SPA) or in a top-down manner (as in many predictive processing models). In SPA there is an initial value of the perceptual input that is then encoded into a second value based on an assumption that the visual areas convey the perceptual signal to the basal ganglia, thalamus, motor areas and to the prefrontal cortex. Conversely, for different predictive processing models, the dorsal or ventral medial prefrontal cortex will generate predictions that are then shared with the lower cortical areas, including the motor and visual areas. Perhaps, if something similar to compression does take place in the human brain, the "compressions" are simply generated simultaneously along with the more elaborate picture: at least, this thinking seems to be most in line with Merleau-Ponty's reasoning about a "system of equivalencies" and may fit with the phenomenological and scientific evidence.

That is not to say the brain lacks a probabilistic, predictive mechanism, however; cross-disciplinary evidence continues to emerge in favor of such a perspective, and in fact Merleau-Ponty speaks of the *probable* in *The Visible and the Invisible.* Within the first sections, he remarks that, "the real, after all, is only the less improbable or the more probable" (VI/40). Merleau-Ponty refers to an experience of venturing along a beach and mistaking a clayey rock for a piece of wood, only to determine upon closer inspection that it was a misperception, or *dis-illusion*—"a loss of evidence only because it is the acquisition of another evidence." (VI/40). His

theory of perception in part complements a predictive theory of mind, for he argues that perceptions are “possibilities that could have been, radiations of this unique world that ‘there is’”, and that “false” perception is but a “mutilated or partial truth” (VI/42). How does the mind perceive this “partial truth”? Schwiedrzik et al. (2014) reports that the left occipital cortex contains a single node involved in adapting to new or changing percepts, whereas the right dorsal medial prefrontal cortex “generates predictions about the upcoming stimulus” (1161). A fuller explanation of the neuroanatomical underpinnings of perceptual prediction will continue to be sought after, but Merleau-Ponty’s work underscores the importance of chiastic processes in mind and body – a “system of equivalents” that seems to have a role in the activity of expression and must originate first in perception.

Eye, Consciousness and the Pregnancy of Possibles

We have already briefly entered into a discussion of the optic chiasm and how the eyes are the “channels of one sole Cyclopean vision” (VI/141). What a person ultimately sees is not two distinct images, but one unified and rich view of the world. To Merleau-Ponty, “…a human body is present when…between one eye and the other…a kind of crossover occurs, when the spark of the sensing/sensible is lit” – “quality, light, color, depth, are there only because they awaken an echo in our bodies and because the body welcomes them” (OE/125). While this seems like a grandiloquent description of vision, Merleau-Ponty’s notes show progress towards the development of a more precise way of addressing this matter: he utilized the phrasing

"pregnancy" broadly to encompass this aspect of flesh and compatibility between the seer and the seen, and in his ruminations on the "system of equivalencies." These incomplete notes are, to this interpretation, a keystone of Merleau-Ponty's thesis in *The Visible and the Invisible:*

> Profound idea of a pregnancy that is not only that of the forms privileged for reasons of geometrical equilibrium-but also according to an intrinsic regulation, a *Seingeschick* of which the geometrical pregnancy is but one aspect. It is in this way I want to understand 'empirical pregnancy' – Understood in this way, it consists in defining each perceived being by a structure of a system of equivalencies about which it is disposed, and of which the painter's stroke—the flexuous line—of the sweep of the brush is the peremptory evocation. It is a question of that λόγος that pronounces itself silently in each sensible thing, which we can have an idea of only through our carnal participation in its sense, only by espousing by our body its manner of 'signifying'…. (VI/207-208).

The "pregnancy" that Merleau-Ponty spoke of throughout his work is a crucial idea, because it not only refers to objects with which interaction is possible – a "good" form that attracts the eye, and invites the action of the agent. But it is also, as Merleau-Ponty said, to "break forth" – like a needle poking through paper, and permanetizing a moment of perception, which becomes irreversibly and unalterably defined (VI/208). Merleau-Ponty conceived of the structure of the world and any empirically observable phenomena as but one aspect of vision, which coexists alongside another aspect of perception—a logic or "system of equivalencies" of each sensible thing, which is determined by how each body participates in the activity of signification. Each "breaking forth" or "pregnancy" is an instant of this activity: "every painting, every action, every human enterprise is a crystallization of time, a cipher of

transcendence" (VI/208). "Pregnancy" is a term that bears some similarities to the term "affordance" as developed by James J. Gibson: "the affordances of the environment are what it offers the animal, what it provides or furnishes" (1979). Nevertheless, this "pregnancy" differs in that it suggests a much deeper confluence between the perceiver and perceived, one which for Merleau-Ponty makes up the "miracle of consciousness" and:

> consists in its bringing to light through attention, phenomena which re-establish the unity of the object in a new dimension at the very moment when they destroy it. Thus attention is neither an association of images, nor the return to itself of thought already in control of its objects, but the active constitution of a new object… (PP/35).

The eyes and the optic chiasm are vital to constituting the object, not just because they are the primary organs of visual sense, but also because the eyes are capable of processing two distinct objects but somehow must impose just one interpretation on the world. Merleau-Ponty explored this subject through diplopia or double vision in *The Phenomenology of Perception* – which occurs when a person's eyes are unable to focus on a single location in space. Diplopia is a disorientating condition, which reduces the perceiver's ability to navigate around and interact with objects. The coordination of the eyes and cooperative effort is required for normal vision. Binocular rivalry is a phenomenon of perception that happens when attending to two pictures—one seen with the left eye and one seen with the right. The perceiver will blank out one of the pictures, and although two images are present, only one can be seen. How the eyes and mind accomplish this is the subject of many predictive processing theories, which

endorse the perspective that the goal of perception is to give the agent a complete picture of the world, and this sometimes entails occluding improbable stimuli—blocking out one image that would not probabilistically appear along with another.

Predictive processing approaches tend to embrace the thesis that the perceiver has a pre-conceived or "prior" expectation of what the world will hold. Merleau-Ponty's perspective may align in some ways with a predictive processing approach, if only because he claimed that, "The precise and entirely determinate world is… posited in the first place, no longer perhaps as the cause of our perceptions, but as their immanent end" (PP/36). Instead, the mind may be the cause, and Merleau-Ponty remarked that we have to "ask how the very idea of the world or of exact truth is possible, and look for its first appearance in consciousness." He used the example of the moon on the horizon, which both has a measurable size and also appears to the perceiver as "enormous" (PP/36). This is the same idea that he later reiterated as he wrote of the "empirical pregnancy" as one aspect of some greater "intrinsic regulation" in *The Visible and the Invisible*: the "empirical pregnancy" is that the moon has a measurable size, yet to the perceiver its size also depends on something else. There is yet another aspect of consciousness that is engaged in its own, somewhat distinct perceptual process, which Merleau-Ponty named as "signification." In the contexts in which Merleau-Ponty employed "signification," the term seems to be similar to qualia, and yet also quite different. Qualia involves an appreciation of

some quality or appearance of the world and an almost passive receptivity, where as “signification” involves active interpretation and responsiveness to the world—a co-creation of it. Dastur (2000) reminds us that for Merleau-Ponty, each individual or the “for-itselves have to form a ‘system’; they have to be open to one another as so many partial perspectives confirmed in the same common world” (36). The “empirical pregnancy” may represent this opening to the common world, but to truly understand perception, this other elusive aspect of consciousness that Merleau-Ponty began to elucidate must be understood as well—and this is not just “subjectivity,” as Merleau-Ponty pointed out—it is a central feature of perception, which grants a deviation from the “empirical pregnancy” that should not be ignored.

As some proponents of predictive processing might suggest, it could follow that a deviation from an “empirical pregnancy” or the *actual* state of the world is the effect of prior exposures to a situation or stimulus. That is to say that the mind could have certain predefined expectations that lead to a wrong interpretation as the perceiver encounters the conditions of a new, but similar object or situation, and responds just as it did in the past, at least until the perceiver re-assesses the *actual*. Howhy (2013) discusses the rubber hand illusion, in which a perceiver assigns tactile feeling to a visible rubber hand during a virtual reality simulation while his own hand is out of sight. The perceiver relies entirely on visual cues that override the other *actual* sensory input to his real hand (150). This also holds true in some cases of optical illusions, which rely on cues of depth, size, and shading to trick the perceiver.

The perceiver will be heavily influenced by prior experience and exposures. Merleau-Ponty is more focused on the generative capabilities of the perceiver, however—how the perceiver not only experiences more than a mere “empirical pregnancy” of the world, but also actively creates alternatives to that “empirical pregnancy” through signification. Merleau-Ponty did not see this as the work of just the visual organs or mind, either: he viewed it as the total engagement of all senses of the body, including touch.

Touch and Proprioception

Husserl assigned special importance to tactile sensation, as self-caressing is for him a much different experience than seeing oneself. It is possible for a person to touch his own arm, and have the sense of it in both the limb that is receiving the physical contact and in the fingers that are carrying out the action; it is not however possible to see and be seen in the same way, because a person’s reflection lacks its own perceptual ability. Nevertheless, Merleau-Ponty parted ways with Husserl’s perspective, and claimed that such a “delimitation of the senses is crude” (VI 133). Merleau-Ponty saw the senses as much more interwoven and chiastic, positing that:

> There is a circle of the touched and the touching, the touched takes hold of the touching; there is a circle of the visible and the seeing, the seeing is not without visible existence; there is even an inscription of the touching in the visible, of the seeing in the tangible— and the converse; there is finally a propagation of these exchanges to all the bodies of the same type and of the same style which I see and touch— and this by virtue of the fundamental fission or segregation of the sentient and the sensible which, laterally, makes the organs of my body communicate and founds transitivity from one body to another (VI 143).

Movement and gesticulation are part of tactile sensation for Merleau-Ponty, as he regarded “the movement of one’s own body” as being “to touch” what “lighting is to vision” (PP/367). In the working notes of *The Visible and the Invisible,* Merleau-Ponty went one step further and insisted that “perceive” and “move,” or “Wahrnehmen” and “Sich Bewegen” are synonymous, and yet he established that there is a “vision-touch divergence” which comes from the “fact of our organization” (VI/255-256). This particular passage perhaps convolutes and frustrates his own aims to explicate what *touch* is, for Merleau-Ponty also establishes language as the foundation of thought, and similarly links movement to perception in the same way. “Language… is to the I think what movement is to perception,” Merleau-Ponty asserts (VI/257). For the sake of simplification, Figure 4 attempts to illustrate all of the chiastic connections and comparisons that Merleau-Ponty made within this part of his text.

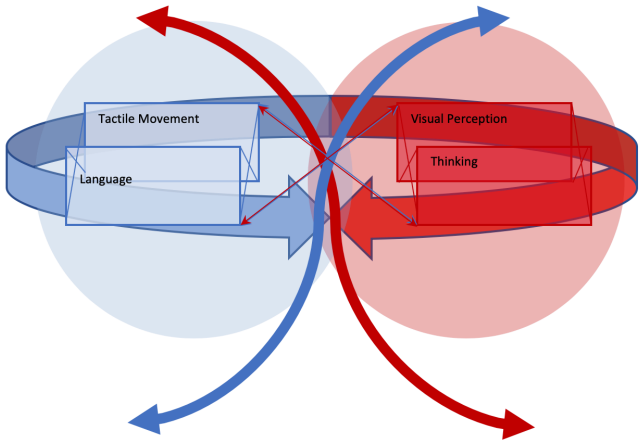


Figure 4. An effort to show all of the complex relationships and comparisons that Merleau-Ponty

developed in his working notes of *The Visible and the Invisible.* This model points to a co-functioning of tactile movement and language, in coordination with a co-functioning of visual perception and what Merleau-Ponty refers to as thinking. Note that this model is structured this way to hint at the hemispheric attributes of brain and body, with the left in blue and the right in red. The left hemisphere in a neurotypical adult is associated with "approach behavior" or action, and most often these areas of the brain correspond to language processing and production. The right hemisphere in a neurotypical adult most often specializes in 3d visual perception as well as spatial reasoning skills.

The above diagram attempts to show the interconnectedness of all of these aspects of Being for Merleau-Ponty, while also still distinguishing between them: every visible can be touched, "every vision takes place somewhere in the tactile space. There is double and crossed situating of the visible in the tangible and of the tangible in the visible; the two maps are complete, and yet they do not merge into one. The two parts are total parts and yet are not superposable" (VI/134). It is through touch and movement that a person is primarily able to express him or herself, and through written or spoken language: perception and thinking, however, do not require the same bodily action within the world, although having a tactile world is a requisite or condition of perception. Through movement, touch and language, individuals are able to go beyond the "empirical pregnancy" discussed in the previous section of this paper. Touch enables human beings to shape the world and create anew, while movement allows for the perceiver to adjust perspective, and language is a chief instrument of expression and signification. In refining his thoughts on this, and the exchange seen in Figure 4, Merleau-Ponty wrote that:

> one would see that the essential is the *reflected in offset (refléchi en bougé),* where the touching is always *on the verge* of apprehending itself as tangible, misses its grasp, and completes it only in a *there is*------ The *wahrnehmen-sich bewegen* [perception-movement] implication is a thought-language implication------The flesh is this whole cycle and

> not only the inherence in a spatio-temporally individuated this. Moreover a spatio-temporally individuated this is an *Unselbstàndig:* there are only radiations of (verbal) essences, there are no spatio-temporal indivisibles. The sensible thing itself is borne by a transcendency. (VI/260).

In view of this passage, it may be that Figure 4 is a rough sketch of the chiasm – "the whole cycle" of perception and action. While Merleau-Ponty's notes are far from clear, what he seems to be arguing is that both tactile sense and language strive to come to grips with a "*there is"* that is not attainable. Instead, what is attainable amounts to "radiations" or offshoots; the individual inevitably falls short of grasping some source or specific indivisible, because there is no fixed point of origin. There is never a complete merge in the sense of touching and being touched, even though the self is tangible, because Being is transitory in space and time. In language, the signifier and signified are entwined in a similar way—every signified is a "radiation" without a fixed origin, without a singular material referent. In the notes that precede this passage, Merleau-Ponty included a list of "fragments" making up the "whole of our experience of sensible being, at the top of which he put "touching---touching oneself." He stated at the start of this paragraph that, "phenomenology is…the recognition that the theoretically complete, full world of the physical explanation is not so" (256). The problem is that perceivers believe they have a well-defined "touching" and "touched" – and Merleau-Ponty's goal was to expound that this is not the case; sensible Being consists of more than this duality, more than these

spatio-temporal indivisibles.

Merleau-Ponty emphasized that it was “necessary to translate into perceptual logic what science and positive psychology treat as fragments of the In Itself” (256). The phrase “perceptual logic” has already been briefly introduced in the section above on flesh and the “system of equivalencies,” but to reiterate, Merleau-Ponty stipulated that, “…we must understand that the sensible world is this perceptual logic, this system of equivalencies, and not a pile of spatio-temporal individuals” (247). The “system of equivalencies,” where it resides within “touching—touching oneself” must be connected to all other senses, but it is particularly entwined with how the perceiver identifies objects through language, and not only because “it seems in the first place impossible to concede to either words or gestures [an aspect of touch] an immanent meaning” (Philosophy of Language/199). One other reason Merleau-Ponty came to this conclusion has to do with the comparability of these processes. The phenomenon of chiasm where it concerns touching oneself requires recognition of an aspect of body, both that of difference and non-difference of the self: one right hand feels the left hand as “other” and part of the same. “To touch oneself, to see oneself, is to obtain such a specular extract of oneself” (VI/255-256). This principle applies in Merleau-Ponty’s theory of language and identity, which endeavors to illuminate that any identifiable element or term must ultimately be exchangeable for that which seems different from it, or diametrically opposite to it—and these two seemingly different elements are united through a

common system.

Logic, Language and Identity

Isabelle Thomas-Fogiel (2014) sheds light on this, and states that, “To think identity within opposition, or opposition within identity is what the chiasm renders possible” (107). Through the chiasm, Merleau-Ponty rejected axiomatic-deductive theories of meaning and truth-functional logic, which rest on the supposition that a propositional statement is either true or false: two truths cannot be simultaneously held. There can only be conflict between a proposition and its negation. The aforementioned proposition and negation can also be represented as a thesis and its antithesis. Post-structuralist thinker Jacques Derrida examined this topic in another way, but hints of Merleau-Ponty’s influence can be found in his work (Toadvine 2019). Jacques Derrida searches for an escape from the impasse between the thesis and antithesis, and finds it not in synthesis—but in a state called “différance.” For Derrida, différance “is immediately and irreducibly multivalent” and any definition of *what is* must therefore be deferred (283-284). Différance *separates* in space and time—“the primordial constituting casualty, the process of scission and division” (284). It is the lacuna or void, which permits signs to stand in relationship to the signs that diachronically come before and after them. Différance is similar to the chiasm—insofar as it describes a crossing, an ephemeral moment between past and future, but the chiasm also is a connective—a bridge and a presence, rather than a void

between proposition and negation. Nevertheless, aspects of Merleau-Ponty's chiastic project are similar to Derrida's work, and there may also be some similarities between Merleau-Ponty's theories and those of Ludwig Wittgenstein's in *Philosophical Investigations.* Wittgenstein was a student of Gottlob Frege, a German philosopher who pushed to create a reductionist and simplified formal system of logic to ward against the imprecisions of language. While Wittgenstein supported these aims early on, in his later career, he rejected the tenets of analytic logic—including the notion that a proposition does not in any way coincide with its opposite, and that the conditions of both can be stably defined. In renouncing both a Fregean and a traditional view of logic, Wittgenstein reflects that, "Frege compares a concept to a region, and says that a region without clear boundaries can't be called a region at all" (38). Wittgenstein presents the case that the concept is in fact "not closed by boundary" (37). The image of the *boundary* is something that Wittgenstein continues to incorporate throughout *Philosophical Investigations,* as he pursues a departure from analytic logic. The boundary appears in Wittgenstein's reflections on the *language game*, in which terms are like "chess pieces" with the constantly shifting aspect of their deployment. A boundary might "be part of the game, and the players are supposed, say, to jump over the boundary; or it may show where the property of one person ends and that of another begins; and so on. So if I draw a boundary-line, that is not yet to say what I am drawing it for" (147). For Wittgenstein, creating such boundaries is not only arbitrary, but also

accomplishes nothing; he ruminates that "we can draw a boundary for a special purpose. Does it take that to make the concept usable? Not at all. No more than it took the definition 1 pace = 75 cm to make the measure of length 'one pace' usable" (37). For both Wittgenstein and Merleau-Ponty, language or the significance of terms must be tied up in their lived usages.

Merleau-Ponty's perspectives are in line with Wittgenstein's and Derrida's thinking, and it is not simply because he embraces holism or synthesis as an alternative to forms of logical analysis; he sides with Paul Valéry, a French poet, in the notion that "language is all," that there is "no dialectical reversal from one… to other; we do not have to reassemble them into a synthesis: they are two aspects of the reversibility which is the ultimate truth." For Hans-Georg Gadamer, who also shares Valéry's perspective, the phrase "language is all" applies to an agent's ability to make sense of being. Madison (1996) elucidates this further, in stating that "all that is and can be for us is by means of language," and "language must be viewed not as a finite system of sign-symbols, but as an infinite medium of possible meaningfulness" (83).[27] Merleau-Ponty advanced the notion of the unification of opposites—that a proposition and its negation are chiastically entangled and ceaselessly in flux but also surpassable.

This may sit poorly with anyone undertaking a serious investigation into these matters, because at first blush, this vision seems to thrust analysis, synthesis and "meaning" into undiscoverable and unsatisfactory

[27] Madison, Gary. Being and Speaking. 1996. In John Stewart (ed.) *Beyond the Symbol Model*, 69-98. New York: State University of New York Press.

obscurity, but Merleau-Ponty's thesis in *The Invisible and Visible* and other later works presents a way around this conundrum: "meaning" is discoverable through the body and spatial arrangement. The body's engagement in the world determines the truth of a proposition: as "truth" is relativistic, identity comes to the fore through the taking up of a position. Philosophers Lakoff and Johnson (1980) developed this thesis differently, positing that embodiment and human motor capabilities imbue each person with linguistic "templates" and these linguistic templates are construed in spatial terms: hence, it is possible to say "he's a *lowlife,*" or "doing that is beneath me." Such statements depend on a spatial ideation. Merleau-Ponty's thesis stands apart from the central arguments of Lakoff and Johnson, however; while "meaning" for him derives from a bodily participation in the world, it is reached in a specific way. The chiasm is not just a spectrum on which the proposition lies at the furthest point from its opposition: the chiasm is the process of the perceiver, who takes up the proposition and not only traces the distance to the opposition, but also actively forms the identities of both while simultaneously challenging them. The perceiver is the shaper of the identities, and each perceiver has the aptitude to go beyond them through creative expression — through artistry and descriptive language, which amplifies or alters and does not precisely repeat:

> Each partial linguistic act, as an act common to the whole of the given language, is not limited to expending its expressive power but re-creates that power by making us verify, through the evidence of given

> and received meaning, the power that speaking subjects have of going beyond signs towards their meaning (PM/103).

But Merleau-Ponty envisaged language as "more than simply the vehicle of a sum of differences in significations" (PM/103). Merleau-Ponty forged another metaphor in his notes in *The Visible and the Invisible* that casts language or the "verbal" as a "specular" – it is the "mirror" of meaning that recaptures and reflects it – sharing identities through flesh, while also achieving a doubling and splitting effect (VI/255-256). "Language is not the servant of meaning and does not govern meaning. There is no subordination or anything but a secondary distinction between them"(PM/112). This relation or mirror effect is apparent in every facet of Merleau-Ponty's chiasm: "Understanding—speaking, "touching—touching oneself," and "seeing—seeing oneself" (VI/255-256). It also applies in the case of how Merleau-Ponty apprehended "Self" and "Other."

Self and Other

Another important aspect of the chiasm is the bodily relation between self and Other. "The flesh is a mirror phenomenon," according to Merleau-Ponty, and he repeatedly cited the myth of Narcissus in his notes and within the completed portions of *The Visible and the Invisible* to make sense of Self and Other (VI/255-256). He maintained that, "there is a fundamental narcissism to all vision" (VI/139). The myth of Narcissus warns what might happen to the Self left unfulfilled in the Other: stagnancy, isolation, and self-absorption can besiege the Self. Failure to identify with Other can have

detrimental outcomes for both parties. The Self might believe he has understood the Other, but he may be merely projecting his own experiences and will onto the other, whereas the Other falls victim to loss of agency or erasure. Other can become a mere reflection into which the Self dives headfirst—seeking ideas that only embodies their views, while not only overlooking Other, but also new possibilities. The story of Narcissus might seem to be one that features a solipsistic world view, where the Self becomes the only known reality, and yet Merleau-Ponty insisted that it is precisely the solitude of Self and inaccessibility of Other that defeats solipsism: for Other must be a zone demarcated as "not mine" (VI/79). Merleau-Ponty did not consider the relationship between Self and Other to be a rivalry—in which other is a "scourge, the continued threat of an absolute reversal… capable of crushing me with a glance into the dust of my world" (82).

Nevertheless, Merleau-Ponty's writings about politics show how the competition of two perspectives results in the potential for social strife and a me-other rivalry. Merleau-Ponty was a Marxist who supported the Soviet regime through his political essays. An essay that he published in 1950 in *Les Temps modernes* (and later included in his 1960 publication *Signs*) focuses on this subject. Within the essay, he stated that, "one can in no case make a pact with one's adversaries… every political position that is *defined* in opposition to Russia and localizes criticism within it is an absolution given to the capitalist world" (Signs 338/269). Later, Merleau-Ponty's attitudes

changed after he learned of the growing number of concentration camps in the USSR and the failure of communist theory put into practice there. This change of sympathies ended his friendship with Jean Paul Sartre. Despite experiencing some strife in his personal life, Merleau-Ponty still insists in the notes of *The Visible and the Invisible* that there is a "co-functioning" of me-other and not just a rivalry (VI/215). This is significant, because it underscores a fluctuation in Merleau-Ponty's views over time and shows that he was not exempt from experiencing difficulties in his own relationships—that he is not just idly proposing a confluence between self and other. For Merleau-Ponty, the Self-Other chiastic relation is a vital bodily relation and one that is indispensable for understanding one's own identity and place in the world.

While the possibility of rivalry certainly exists, it is only through the existence of Other that Self can be affirmed. "Both Self and Other share a sensible world, and the experience of "being outside of myself, [being] in the world, among others…feeds my reflection" – it is through this experience that every individual finds himself. (VI/49). Still, there is an asymmetry of experience that Merleau-Ponty recognized, which leads to "trouble" as Taylor Carman (2008) puts it: Other is "not a problem," but there are aspects of Other that can never be grasped (146). Carman concludes, "Sociality is an essential structure of my experience inasmuch as it discloses a horizon of others whose point of view in the world cannot be collapsed into my own, nor mine into theirs" (149). In spite of this, Other is not the negation or opposite

of Self, but rather just another possible expression of flesh joined in the chiasm.

Conclusions

The chiasm is much more than a metaphor in the work of Merleau-Ponty. As it buds as a concept throughout Merleau-Ponty's early texts and finally comes into full bloom in *The Visible and the Invisible*, the chiasm encapsulates a whole theory of perception, intended to challenge insular and dichotomous thinking about not only the phenomenon of perception, but all aspects of Being. Merleau-Ponty's endeavor to define every feature of the chiasm remains incomplete, but he gave enough insights to accomplish several of his ambitions. One of the reasons that studying Merleau-Ponty's chiasm is important is that it may alter how those in cognitive science currently theorize about perception. He contributed greatly to dismantling the mind-body dichotomy through introducing the alternative notions of flesh and chiasm. His project offers some support for the argument that perception is much more complex, and must incorporate more than "empirical pregnancy" – more than what is obvious and measurable in vision. His consideration of a "system of equivalencies" that manifests primarily through expression (and is unique to each perceiver) is an overlooked contribution of his scholarship, especially as the development of this idea spans over several of his texts. The structure of the chiasm that Merleau-Ponty envisions, and the links he notices between touch and language are worthy of further investigation.

Merleau-Ponty's proposal about logic and language provides an alternative to the logic of analytic philosophy, and his views on meaning may bear some similarities to those of Wittgenstein and Derrida. Lastly, Merleau-Ponty's chiasm relates to not only perception, but also the social aspects of experience, and Merleau-Ponty cautions against a fundamental narcissism which he locates in vision. There is a risk that one person's perspectives can overpower that of Other, but to acknowledge the chiastic intertwining is also to recognize its possible perils. It may inform individuals in times of conflict and remind them not to impose their views on others – in other words, it could be important to studies in sociology and culture.

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PM: Merleau-Ponty, Maurice. 1973. *The Prose of the World,* Claude Lefort (ed.) John O'Neill (trans.) Evanston, Ill.: Northwestern University Press.

OE, "Eye & Mind," cited from: Lawlor, Leonard and Toadvine, Ted. (eds.). 2007. *The Merleau-Ponty Reader.* Evanston, Ill.: Northwestern University Press.

PP: Merleau-Ponty, Maurice. 2005 [1945] *Phenomenology of Perception.* Colin Smith (trans.) New York, USA: Routledge.

VI: Merleau-Ponty, Maurice. 1968. [1960]. *The Visible and the Invisible*, Claude Lefort (Ed.), Alphonso Lingis (trans.) Evanston, Ill.: Northwestern University Press.

Models of the Brain: Metaphors, Architectures and Chiastic Applications

Abstract: When theorizing about visual processing or perception, the dominantly held view is that the brain is hierarchical, and that information is either conveyed through the brain in a “bottom up” or “top down” manner. To explain very simplistically: visual input is either primarily relayed from occipital region of the brain up to the prefrontal cortex, or in the case of generative and predictive-based theories, the perceptual content is generated first in the prefrontal cortex and then conveyed down to the occipital region. This paper begins to establish the reasons why it might be limiting to metaphorize or describe the brain as a *hierarchy.* The focus is also on other metaphors or descriptions of how the brain stores information, all with the goal of criticizing how the metaphors might influence and limit theoretical models in cognitive science and artificial intelligence. All of the following approaches are discussed: Representational Theory of Mind and corresponding logic-based efforts to produce a computer with human intelligence; Connectionism and other descendants in deep-learning, specifically the neural architecture SPAUN (or Semantic Pointed Architecture Unified Network); and Bayesian approaches to mind, which have found momentum along linear predictive coding and Hidden Markov models. The second part of this investigation focuses on the *chiasm,* a term from the work of philosopher Maurice Merleau-Ponty. Drawing on his incomplete work, along with neuroscientific literature on the hemispheres of the brain and body, the chiasm is proposed as a better descriptor for the brain-body architecture. Considering the roles of the hemispheres and how they complement each other in functionality may augment theories about how to build more humanlike artificial intelligence.

Some philosophers reject conceptualizing the mind as a machine, while others champion mechanical theories and computational models of the mind——and yet even if the latter group prevails, and there proves to be computationally determinate processes, or a learning algorithm that adequately characterizes the activity of human mind and body, it may still be limiting for everyone with a range of different perspectives to embrace mind-

machine metaphors. [28] The problem is not whether or how the brain might be machinelike, but rather that in adopting that position, it has become a practice to turn to processes that have a prior use with machines, and to then apply those related general principles to explaining what human minds and brains do.

Metaphors are indispensable instruments of theorization, as they allow scientists to contend with hard to examine phenomena by comparing them to readily observed phenomena. The *mind* is one such candidate for such metaphorization, which has been subject to imprecise description because its dynamism arises from a brain and body about which discoveries are still being made. The long history of metaphorizing the mind has also contributed to its enigma, as *mind* has historically been associated with an invisible or spiritual aspect of Being. In the last century, the view of *mind* has changed, and developed a stronger correlation with the human brain; the brain is the physical matter encased in the skull, while mind stands as a descriptor of its core processes. For some, mind encompasses much more than the *brain,* and extends to both body and world.

The mind continues to be problematized by the language used to define it, specifically when metaphors or descriptions reinforce a mind-body dichotomy. Other problems also arise when theoreticians appropriate a process from machine learning to explain a mental process, or emphasize

[28] Anthony Chemero is one philosopher who proposes a radical embodied cognitive science, which moves away from computational models of cognition. On the flip side, Daniel Dennett is just one proponent of the opposite view—even going so far as to metaphorize the mind as having folders, as is the case with computers. Chemero's (2009) publication *Radical Embodied Cognitive Science* explains his views; Daniel Dennett's recent (2017) publication *From Bacteria to Bach and Back: The Evolution of Minds* expounds his perspectives.

hierarchization of the brain without considering lateralization or cross-hemispheric processes. This paper explores how machine metaphors for mind influence both theory and application, with a twofold purpose: to reveal the constraints that these metaphors place on inquiry, and to propose an overlooked metaphor and model of mind worthy of closer inspection, the *chiasm.*

The first section of this paper begins by delineating two types of metaphors that develop in the science more broadly: metaphors that affect how a scientist 1) construes a *process* or 2) forms *associations*. This part of the discussion also highlights a few core features of the mind and brain that complexify the machine-brain metaphor, focusing on the issues of *representation*, *memory storage* and the *hierarchical organization* of the brain. The section entitled “Building a Brain and the issue of Hierarchies” below elaborates on hierarchization.

The central sections of the paper examine three approaches to artificial intelligence with 1) a general treatment of the symbolist approach; 2) a more particular look at connectionism, and the specific neural network paradigm called Semantic Pointer Architecture; and 3) predictive processing and related Bayesian approaches. These sections consider how these three approaches work in concert with the metaphorization types of section one — how the metaphorization types emerge in and impact the three approaches to artificial intelligence. With respect to the symbolist approach, the main problem is that human thought and action-execution are conceptualized as

logical operations. This perspective has been widely criticized in cognitive science. [29] Although subtle, it involves metaphorization to say that thought is akin to logic—to take logic from one domain, that of argumentation, and apply it to the topic of human thought more generally. Like the symbolist approach, Semantic Pointer Architecture from its foundations is inspired by software engineer Harold Lawson's use of the term *pointer* to describe a process in programming language to store information. While Chris Eliasmith's fully developed SPA (Semantic Pointer Architecture) is different than Lawson's, there are some very basic ways in which they are the same – in which *pointer* has been lifted from its domain in computing and applied to the brain. This is also the case with predictive processing, as efforts to model the brain as a prediction-computing entity came after the development and use of linear predictive coding. Bayesian approaches likewise have the Markov Model, and Hidden Markov Model, which have been grafted onto other theories of how the brain might work. While there are certainly many advantages to exploring how each of these mathematical models could indeed reflect what the brain does, there can also be drawbacks and those will be discussed more fully.

The last section of this paper describes the *chiasm* from the unfinished writings of phenomenologist Maurice Merleau-Ponty and explains its possible usefulness in characterizing mind and brain. It is a term that encompasses the structural attributes and the generative characteristics of

[29] For an overview of the history and thorough explanation of the criticisms of the symbolist approach, see the text *Mindware* (2014) by Andy Clark.

the brain. The term *chiasm* most generally means crossing. Perception occurs in a chiastic way, through two eyes which relay information to the opposite brain hemisphere via the optic chiasma and hemispheres of the body.

Metaphorizing and creating new models of the mind is an important topic to consider, for a multitude of reasons—the first of which is that those in artificial intelligence want to develop an artificial system which engages in human-level cognition. More importantly than that is the desire for researchers in a variety of different fields to have a deeper understanding of the brain, both to better cope with pathologies of the brain and to accurately characterize its processes. Metaphorization can both help and hinder these goals.

Metaphor, Structure and Processes of Mind

Lakoff and Johnson (1999) and Johnson (2007) both treat the "mind as machine" metaphor and concentrate on its usefulness: in the first case, the machine is a graspable object, which can be tinkered with and understood in terms of its full range of components. So far, science does not have complete and robust evidence to offer to explain how the matter of the brain produces mind. Lakoff and Johnson detail a few other metaphors for thought in *Philosophy in the Flesh* (1999) – thought as motion, thought as object manipulation, thought as language and thought as mathematical

calculation. They show how analytic philosophy helped to construct these metaphors and how as a tradition, analytic philosophy embraces the view that concepts have constitutive parts and that those constitutive parts provide the definition of the concept. In the view of the analytic philosopher Frege, thoughts are objective and separable from mind — they are akin to objects in the world. This is one of the reasons that the mind-machine metaphor is so entrenched, because of the need to assign the mind a literal referent in the world — or an objective character. According to Lakoff and Johnson (1999), the mind-machine metaphor is also built on the other metaphors for thought as previously discussed.

Metaphors all serve a purpose to the user, in making abstract concepts easier to grapple with and comprehend. Broadly defined, metaphor is a literary device that draws a comparison between two unlike objects or concepts. Lakoff and Johnson (1980) refer to the pair as the source and the target—the *source* being a concept domain that is more firmly rooted in experience and embodiment, and the *target* a more abstract concept. In the Shakespearian example, “Life is but a walking shadow,” the source is the shadow, which can be experienced when standing within the spotlight on a stage. Life is a more abstract concept, covering the experiences that people undergo as they are born, grow and die. Every source taps into the physical experience of having a body, or *embodiment*—and the target can be better contended with through its metaphorical relation to the source.

Scientific metaphors serve a particular purpose in elucidating physical processes or phenomena that have yet to be deeply examined. Metaphorizing can involve taking one process and its related set of terms and applying it to a new process or concept. Taylor and Dewsbury (2018) use an example common in biology, where genes are metaphorized as "blueprints." They determine this notion to be misleading and problematic, because it primes an expectation of a "one-to-one correspondence" between "particular 'genetic instructions' and phenotypic outcomes in organisms," but environmental and other factors also affect how organisms develop. Another problematic example is the metaphor "greenhouse gases." The reason the metaphor works as a descriptor is because greenhouses take in and trap heat waves, yet a problem arises because "greenhouse" also denotes large glass houses that store a variety of growing foliage. This builds a positive association. A greenhouse is a place where life flourishes, but "greenhouse gases" trap heat in Earth's atmosphere by absorbing and emitting infrared radiation. The term "greenhouse gas" does not evoke a sense of urgency or need to change pollutive habits, and a prime reason for that is the positive association of "greenhouse" supersedes a newer, negative one.

As seen in the above examples, metaphors can be instructions: they delineate how to construct a physical representation of something that is not easily observed. Metaphors also come with built-in biases and associations, which are determined by the experiences the users have had with the source. These prior associations can then inadvertently be projected onto

the target, as seen in the case of the greenhouse metaphor. With metaphors related to the mind, there are added layers of complication: *mind* historically accounts for multiple phenomena, and yet also has a specific physical correlate in the brain. For a number of reasons, the definition of mind should not be reduced to *brain*, but the brain can be considered a component of the mind. Mind and brain metaphors often coincide, but will be carefully distinguished.

The blueprint-gene metaphor above has affected how biologists conceive of a **process** at work in the human body. The greenhouse-gas metaphor, on the other hand, transferred a host of unwanted **associations** while also attempting to describe a process. These problems are also apparent with mind-brain-machine metaphors, which fall under three prime categories:

1. The first category concerns the issue of *representation* and mental **processing**. Representational theory of mind assumes that the mind retains information in a form which is comparable to symbolist programming: thought is a different programming language altogether with its own symbol set. The assumption is that computers manipulate symbol sets to carry out basic functions, and minds must work the same way. These ideas have been repeatedly challenged by philosophers in cognitive science, but these theories are still worthy of discussion, as they have strengthened the

prevalence of the mind-machine metaphor. Such theories may also reinforce a mind-body dichotomy simply by insisting that the mind-brain uses a separate symbol set from those seen in natural language. The brain is involved in nonverbal activities related to spatiality and simulation, but this need not require applying a symbol set that is exclusive to the mind.

2. *Memory storage.* If the mind does not retain information via a system like the one described above, then how does it process and presumably store information about the world? How does it manipulate data at all? Different data compression strategies that have proven effective for use with machine learning algorithms have become richer theories of the mind-brain. This is another issue of pinpointing the mind's possible **process(es)**. The metaphor here is a layered one: the mind is a machine that compresses data. **Compression** is a method of extracting data from an informationally rich source for the purposes of storing or transmitting the important or sparser details of that source. The informationally rich source can then be re-constructed from these sparser details. Mcanlis and Haecky (2016) summarize data compression in two points: "reduce the number of unique symbols in your data (smallest possible "alphabet") and "encode more frequent symbols with fewer bits (fewer bits for more common "letters") (3). There are many different compression strategies for consideration. Whether an algorithm involves matrix multiplication or executes probability estimations, both can entail coping with a large amount of data from the input

layer and removing or manipulating the elements to avoid overwhelming the system. [30] These are effective for machine learning, but compression is another metaphor for *mental process* worthy of further critical examination. Specific compression processes will be elaborated upon in the sections on connectionism and neural networks, Predictive Processing, and Bayesian approaches to machine learning and cognition.

3. *Hierarchization.* Another metaphor that pervades the literature on the human brain and artificial intelligence is one describing structure: the brain is often deemed a hierarchy. It is necessary to elaborate on why, but here it is important to note that this metaphor is problematic because of the **associations** that come with the term hierarchy. Hierarchy has Greek roots, from hieros and arkhēs: sacred ruler. This metaphor prompts visions of political offices and or leadership roles in the brain that might ultimately be misleading, or fail to appreciate the role of lateralized processes.

Before contending further with all three of these issues, the problem of hierarchization must be more thoroughly addressed.

[30] There are also neural networks which attempt to retain the initial inputs at each layer, i.e. Recurrent Neural Networks – however, using these networks to develop a machine's repertoire of sophisticated concepts from the basic inputs is a challenge. Stramandinoli et al. (2017) report that their project is unique in attempting to instill higher order concepts in a neural network at all. Although suffering some limitations of all connectionist or neural networks, Stramandinoli et al. implemented a partial recurrent neural network with the humanoid robot iCub. They used a combination of motor, perceptual and linguistic inputs—but they limited such higher order concepts to action commands, at first training the network on more basic task executions like *push* and *pull,* and combining the two to create the more abstract concept *cut*.

Building a Brain and the issue of Hierarchies

In the last decade, competing views of the brain have exerted considerable influence on artificial intelligence, and artificial intelligence has also shaped those views—but it is difficult to produce an accurate model of an organ that has not fully been probed. In 1949, Donald Hebb recognized that "neurons that fire together wire together" and a direct way to study the brain entails analyzing each one of those connections or wires. At Harvard University, Sebastian Seung and other researchers devote their energies to Connectomics, mapping out more than 100 trillion synaptic connections in the human brain. No current imaging technology can offer a complete and detailed picture of the brain, and algorithms cannot skillfully catalogue the images of the synaptic connections that Seung's team seek to identify. The process will take a long time to complete because of its need for discerning human interpreters. One long-standing and influential discovery about the brain is that it seems to consist of a hierarchy, in which the prefrontal cortex resides at the top, and the occipital cortex at the bottom. Pyramidal neurons that extend over a vaster cortical range might be instrumental in controlling top-down processing (Friston 2009). This is reinforced by data from pathologies and injury, as damage to the prefrontal cortex chiefly affects personality and behavior. While significant frontal lobe damage in the case of stroke or other injury often results in coma or vegetative state, the renowned case of Phineas Gage revealed what might occur if a person suffers injury to

the left frontal lobe and then recovers. Pierced through the skull by an iron rod, Gage slipped into a coma and later awakened with substantial personality, mood and behavioral changes. According to Harlow (1868) Gage's relatives and acquaintances found him so altered that they said he was no longer the same man. Tobia (2015) explains the incident, analyses it and challenges such an insular view of personality and identity. Nevertheless, the prefrontal cortex is strongly correlated with identity and behavior, and the *compositional* nature of the brain further solidifies evidence of hierarchization in the brain. Compositionality relates to how, in perception, the lower visual areas process smaller elements like dots and lines, and the more complex structure of a scene is processed in other cortices, especially the right parietal lobe. If the occipital lobe processes more simplistic minutiae of a scene, and the parietal lobe grapples with the complexities, then the chain of command in the brain *should* be clear.

It is not a foregone conclusion, however, that *hierarchy* is the best metaphor for the brain. In the past, the brain has been conceived as a "global neuronal workspace," akin to a democracy (Dehaene 2014). The brain is variously construed as a decentralized system and a centralized one, but the latter seems to be the more widely championed perspective. Using the term hierarchy might involve assigning greater importance to one part of the brain than another. Menon (2012) defines three core neurocognitive networks, including the Central Executive Network, the Salience network, and the Default Mode Network. The Central Executive Network comprises

the dorsolateral prefrontal cortex and posterior parietal cortex. As the executive areas of the brain, these regions would be involved in planning and decision-making, like any functional executive office. The Salience Network includes the anterior insula, the fronto-insular cortex and the anterior cingulate cortex. As the term *salience* suggests, these areas of the brain are active during attentional tasks, and guide the executive network in determining where to focus its resources. The Default Mode Network encompasses the posterior cingulate cortex, medial prefrontal cortex, medial temporal lobe and angular gyrus. *Default Mode* inspires imagery of a computer, placed on a particular setting for its web access options, or any number of default settings. In the brain, the Default Mode Network handles the mundane cognitive tasks, similar to those functions that Dreyfus (2014) might refer to as expert "skillful coping" – i.e. driving or riding a bike, but only after the person has thorough practice and no longer expends so much mental energy concentrating on the task.

The problem of metaphorizing the mind then becomes more compounded; brains and minds are not only machines, but the parts of these machines must co-function in a particular and rigid command structure. With these issues in hand, it is possible to delve into the converging theories across fields, and to see how these metaphors impact upon theory and application. One possible effect of emphasizing hierarchization of the brain is that the importance of lateralization can be overlooked. According to Asenova (2018) the interactions between the hemispheres are still an

understudied aspect of brain dynamics. In part, this is due to the limitations of present neuroimaging technologies and a need to rely upon individual cases of pathology or split-brain studies for data. Cross-hemispheric processes are crucial in perception, however; in vertebrates, the optic chiasma produces normal stereoscopic vision. Routing of visual information proceeds through this crossing structure within the midbrain, such that the left hemisphere receives input from the right visual field and the right hemisphere receives input from the left field. The same proves true with auditory and tactile stimulation, with each brain hemisphere receptive to inputs or events on the opposite hemisphere of the body. This chiasmic structure of the human brain and body is the subject of the final section of the paper, but before it is possible to appreciate why the term *chiasm* might be favorable and better facilitate present attempts to describe cognition, it is necessary to navigate historical and contemporary attempts in cognitive science and machine learning.

Representational Theory of Mind and Symbolist Machine Learning

George Boole created the form of logic known as Boolean starting in 1840, culminating with his book *An Investigation of The Laws of Thought* (1847). The laws of thought he developed were rigorous formulations of logic. Boole mathematized logic by developing logical operators and incorporating the formal symbols of algebra into its usage. The intended

purpose of the work was to systemize human thought, and yet it found later implementation in 1936 when Alan Turing envisioned a hypothetical machine that could utilize a Boolean logic symbol set. Thought, logic and machine learning have this shared history – one that makes machine-metaphors for mind deeply entrenched.

Symbolist approaches in machine learning and cognitive science view the mind as manipulating a symbol set and producing action through a series of rule-based executions. These approaches have proven shortcomings in application, which have hindered developments in artificial intelligence, but their biases still inform more modern and tenable theories. Analytic philosophers Fodor and Pylyshyn have historically championed symbolist approaches to machine learning. As a whole, analytic philosophers are characterized by their preference for analysis, for breaking down complex subjects into more minute parts. Using the tools of logic is one method of performing such analysis. The Analytic school of thought has been around since the beginning of the twentieth century, although arguably analytic philosophers also existed in the ancient world, with Aristotle being one possible candidate for preferring an analytic approach. Aristotle developed taxonomies and other systems of categorization and analysis applied to a range of topics—from flora and fauna to less tangible things, like ethics. Fodor and Pylyshyn, on the other hand, analyzed the mind and its capabilities.

Fodor (1975) suggested that the mind has three important faculties related to representation: *productivity*, or the ability to generate an infinite number of expressions from its symbol set; *systematicity,* the principle that some of these expressions would be intricately related through their way of using that symbol set in building complex representations—and *compositionality*, or compositional structure: it would entail atomistic parts combining into those complex representations. These three aspects make up Fodor's Representational Theory of Mind—which assumes the existence of mental states or propositional attitudes that are either true or false from the perspective of the agent, and can be expressed in the language of thought, or so-called "Mentalese" – a symbolic language system with explicit rules that have some characteristics of first order logic. As delineated in Fodor's early work, the language of thought or "Mentalese" is consistent with symbolist programming language, and Computational Theory of Mind is an important variant of Representational Theory of Mind. Symbolic artificial intelligence or what Haugeland (1985) dubs "GOFAI" ("Good Old Fashioned Artificial Intelligence") found extension through these theoretical perspectives, and these perspectives in turn solidified habits in artificial intelligence design.

The rigidity of formal logic and of symbolist algorithms makes for a poor model of mind, however; human minds are flexible and adaptive, whereas these systems are not. Most symbolist attempts to program a machine with humanlike capabilities follow a similar trajectory: programmers

interview experts and then design their own model to respond the way that the experts would. IBM's DeepBlue is an example of a chess-playing program with human-level sophistication and a symbolist architecture, but it lacks the ability to switch to any other tasks or even a different game (Clark 2014). With these programs and approaches to cognition, the most significant problem is encapsulated in its core metaphor: that the human is a machine which operates on a language of thought, and this *thought* takes the shape of logical formulation. In this context, the term thought indiscriminately encompasses all of perception, intention and deeper reasoning. In the earlier work of Fodor (1975), *thought* is an innate language, one that pre-exists and forms the foundation for spoken language. Logical reasoning seems to be a skill that children acquire around the age of five, however, rather than an innate ability; when presented with two hiding places, and one object to hide in either location A or B, very young children cannot reach the logical assumption "If not A, then B" (Carey 2017). Still, the hardware of computers is modeled on this idea about thought and logic, which reduces human intelligence to a series of yes or no moves. Transistors turn on or off rapidly to reflect this series of logical moves.

The base level of animal perception could rely on these types of reductionist calls, perhaps when making judgments about objects in motion. Only the barest minimum of information must be retained to distinguish each object from another as they complete their journey. Fodor and Pylyshyn (2014) summarize this in their recent work, concluding, "that initial contact

between the world and its perceptual representation begins with only a highly restricted sample of the objects and states of affairs being represented. A plausible first approximation suggests that percepts are initially represented as *indexed objects*, or as this or that" (115). This too is true of the frog, as it scans its environment for flies to eat. Any object in motion that travels along the path of a fly is likely to be food, and the frog responds to it as such, regardless of whether the object is actually a morsel of nourishment or something it would typically avoid. [31] Nonetheless this kind of automaticity of behavior seems to be correlated not only with instinct, but also the hard won prize of experience. For the human being, greater levels of automaticity can be achieved through a process of repetitive exposure and practice. As Dreyfus has noted, the beginning driver lacks the perceptive and motor command to skillfully cope with certain situations requiring instantaneous action. The expert driver on the other hand can execute such moves without a total engagement in the process.

Logic is a closed system, one with many uses, but if even this base level of perception depended solely on a logical, rule-based function, it would be difficult for the human perceiver to adaptively navigate new situations that did not adhere to the rule. Following a logical implication such as "If X, then Y" can be too confining a solution to problems in a changing landscape. If X is a car that pulls into the intersection with an expert driver, Y should be any range of outcomes, rather than a fixed outcome. The expert driver could

[31] This was demonstrated by Lettvin et. al in an experiment in 1940. The findings were published in 1959.

stop, pull off to the side of the road, attempt to speed up to avoid the oncoming car, or carry out another action that would be situationally dependent. For machines, cut and dried rule-based executions are useful, as they allow for consistency rather than unpredictable behavior—yet this type of automaticity differs drastically from the fluid automatic responses of humans. Dreyfus' work homes in on the paradox of modeling even perceptual abilities of the human mind with machines under this paradigm. Automaticity happens when a person becomes acquainted with a great range of situations, and painlessly copes with the variables thrown his way; automaticity is the end point rather than the starting point for sophisticated behavior.[32] With a symbolist approach to machine learning, automaticity is an inherent aspect of the model's being, indispensable to its complete operation.

One of the other problems with the metaphor which likens *logic* to thought is how it lumps all of perception, action and intention together. "Perception" is a complex term with historically many definitions. The phenomenologist Edmund Husserl believed that intention must be present in perception, while philosophers like Dreyfus argue that perception is automatic and does not require intent. Dreyfus uses the term "skillful coping" to refer to an agent's capacity to navigate the world fluidly without

[32] It is arguable that for species success, certain hardwired instructions or logical connectives are automatically present from the time of birth. For example, baby gulls will peck at red spots, regardless of whether they are red spots painted onto a decoy object, or red spots on a mother bird's bill. The baby gulls already have the expectation of receiving food, without ever having a prior experience that allowed them to draw that conclusion. This may also be seen in human nursing offspring, which know how to suckle without having any prior knowledge of it. For more sophisticated behaviors, however, automaticity of action is the result of repetitive motor engagement and practice.

consciously considering every move. Occasionally an agent must ponder every move and needs maximum concentration to complete a task, however; this is no longer skillful coping. For Dreyfus, this is what happens to every novice, or an expert thrown into an unusual and challenging circumstance. Logic grants little space for flexibility, and no protocol for scaffolding learning, the way that Vygotsky has demonstrated that human beings learn. The machine that relies heavily on logic is instantly an expert, prepared to solve narrow problems.

Probability is more computationally flexible than a closed system like logic. Quick perceptual responses could be the result of a probabilistic function of the mind, which entails computing the statistical likelihood of an object's identity, based on only its most important attributes. The frog homes in on the flight patterns of a moving object, and because the object has enough attributes of a fly, the frog responds to it accordingly. A model of mind based in probability does not involve set and fixed parameters, but rather casts the perception and action of the organism as reliant upon approximations or degrees of certainty. The degrees of certainty are determined by past experience, or the posterior probability. These are the underpinnings of Bayesian approaches to modeling the mind, which will occupy the focus of a later section of the paper. Bayesian models have a complex history, one that begins with Thomas Bayes in the 18th century and eventually entwines with compression strategies for saving digital files. Before delving into the metaphors and matters associated with Bayesianism,

first it is necessary to touch upon a few prevalent connectionist and neural network models.

Connectionism and Neural Networks

Frank Rosenblatt developed the multilayer perceptron in 1957 and published a paper about it subsequently in 1958. The purpose of the multilayer perceptron was to form a model of human perception, based on research from neuroanatomy and the brain's synaptic connections. The multilayer perceptron is an algorithm, and consisted of three layers in its first incarnation: the input layer involves the visible or known data—a value that is extracted, and then weighted at a hidden layer. Each input receives a weight to correct for any errors at the sampling stage. The activation function is then applied to that value, and this is the determinant of what the model does with the data it has collected, or the output layer. Simple connectionist models came under fire because of the need to add an ever-growing number of layers and nodes, which would need to vastly exceed those in the human brain to handle the same demands. As Clark (2014) points out, a challenge was to "discover connectionist methods that support the multiple usability of bodies of stored information" (85). Early connectionist systems could only be trained to cope with easy tasks, and they were unable to apply what they learned in new situations without connections specifically tuned for that purpose. Marcus (2001) and Jackendoff (2002) provide explanations of why

these early connectionist systems cannot handle the full productivity of natural language. Simple problems could be solved with few layers, but for the more complex tasks and issues like language processing and production, a more complex model would be required. These more advanced connectionist systems are referred to as neural networks.

Neural Networks can be similar in build to Rosenblatt's earlier model: inputs are converted to weighted values and then mapped onto a vector using a sigmoid activation function, or S-curve. In many newer neural network models, these values tend to fall between a range of -1 and 1, based on an assumption about the firing of neurons in the brain. A value lower than 0 imitates the threshold under which a neuron would not fire, and a value greater than 0 imitates an electrical discharge in response to a stimulus. With these architectures, there can be a one-to-one correspondence between a neuron and the thing to which the neuron is responding. In more sophisticated architectures, there are distributed or richer one-to-many correspondences. In the latter case, the neurons or units in the network process the features of an object, instead of the objects themselves. Encoding in more advanced networks entails combining units, as in a convolutional neural network. Convolutional neural networks multiply vectors to form complex representations.

Chris Eliasmith (2013) warns about the potential hazards of metaphor and emphasizes the need to be cautious with their usage, but his groundbreaking convolutional neural network Nengo, and the robot SPAUN

("Semantic Pointer Architecture Unified Network") both take inspiration from the term *pointer*. Eliasmith draws upon the rich history of the connectionist model, and provides a detailed overview of where his work stands in relation to all other sophisticated models, but the *pointer* becomes a metaphor around which Eliasmith's theory and application develop. The software engineer Harold Lawson invented the term *pointer* in 1964 to originally refer to a value that stored the address of another value in computing memory. Barsalou (1999) established a theory of concepts, defining them as *semantic pointers*, and his influential work is cited in Eliasmith's text. Eliasmith's software Nengo computes circular convolutions of Discrete Fourier Transform (DFT) sequences, which are linear and finite length vectors. There are initial values that when multiplied produce or "encode" another value, which makes "pointer" an appropriate term or descriptor for these particular encoding processes. The term "pointer" might not best characterize all of the processes of the biological human brain, however; there is a major assumption about how the brain stores information that underlies Eliasmith's (2013) application.

The assumption is that concepts *point* – that they have an arrow-like constitution or take aim at a specified target. Pointers show the way from one location or state to another location and state: they have a starting point and end point. At first blush, there seems to be no reason to take issue with this metaphor, especially as it has led to notable successes in machine-vision, and aligns with one long held belief about the brain: there are inputs and

outputs, and ways in which these inputs combine into higher order or abstract concepts, or break down into more simplistic ones. Information goes into the mysterious box between someone's ears, and other information comes back out. With Eliasmith's accompanying model of the brain, complex visual or other perceptual input is encoded and stored in short term and long term memory in higher order regions of the brain; input to the visual cortex travels to the basal ganglia and thalamus, the motor areas and prefrontal cortex. The Nengo software includes a protocol for encoding, and then "dereferencing" or decoding—working backwards from the encoded content to the initial input, as presumably the higher order regions of the brain might do.

There are two possible issues at stake with this metaphorization: *pointers* in computer science describe a compression strategy, or a way of taking a larger value or file size and reducing it down to a smaller, more manageable entity. Envisioning the brain as a computer that engages in compressing information has two outcomes: it means foremost that the term *pointer* has effectively been chasing its own tail, finding first usage in computer science, then in cognitive science, before volleying back to machine learning. The second outcome is that this flirts with reinforcing the mind-body dichotomy, by assigning distinct properties to objects as they exist in the world, and objects as they exist in the mind. This criticism is not reserved for this model alone, as finding the right compression strategy of the mind has been the focus of machine learning under other models—yet

this model can also be critiqued for its hierarchization scheme. Eliasmith defines the neuroanatomical framework that might coincide with the processes he designed for his mechanistic mind with a particular hierarchy: the bottom-up flow of information in the brain proceeds from the occipital lobe up to the prefrontal cortex. [33] Not every model emphasizes this flow, and in fact Bayesian models argue in favor of the opposite approach: top-down signals instead influence what the agent perceives. There may be flaws to each perspective, and that suggestion is the focal point of the next sections immediately below.

Bayes' Theorem, Predictive Coding, and a Model of Perception

Thomas Bayes developed a theorem for inverse probability, posthumously published in 1763, in response to Hume's "Of Miracles" from *An Enquiry Concerning Human Understanding* (1748). Pearl and Mackenzie (2018) offer a detailed historical account of Bayes in a recent book on the topic of cause-and-effect, which they aim at a broad audience. Pearl explains that Bayes' reaction to Hume was to generate an important question: "How much evidence would it take to convince us that something we consider improbable has actually happened?" (97). Miracles are improbable events, and Bayes evaluates these and other events based on a certain criterion. He

[33] Eliasmith also adds a potential place for top-down processing in his work, and predictive processing—yet his attentions and his model emphasize bottom-up processing. Working, long term and short term memory are also carefully distinguished in Eliasmith's work.

sought a probable correlation between observable event “B” and a hypothetical cause of that event, “A.”

$$P(A \mid B) = \frac{P(B \mid A)\, P(A)}{P(B)}$$

Figure 1. Bayes Theorem.

The probability that there is a correlation between a possible cause A and possible effect B is equal to the probability that B is in fact the effect of A, multiplied by the probability that A occurred at all, then divided by the probable evidence or outcome B. The frequency or repeated occurrence of B is one important factor, and improves the likelihood of some future occurrence. Overall, this is a formula for induction: collocating all of the available data B results in establishing, strengthening and confirming a robust hypothesis.

Bayesian and predictive accounts of the mind both began as computational methods of forecasting what may occur. Under these theoretical models, anticipating what might happen is the primary activity of the mind or brain. Norbert Wiener developed one early predictive theoretical model in the 1940s to calculate the future flight paths of enemy airplanes. Peter Elias refined the strategy for processing transmitted signal in 1955, and researchers at Bell Labs thereafter made advances with applications in sending and processing speech through digital channels (Atal 2006). In 1967, Bishnu Atal wrote a program with a two-step process referred to as

adaptive predictive coding to reduce the bit rate transmission of speech signal (Atal 2006). Linear predictive coding came next, and involves a process of sampling continual speech signals at discrete times. The formants of speech sounds are estimated and filtered from the signal, leaving what is called buzz and residue. All of these are converted into values that are readily transmittable. The buzz and residue can later be reconverted into the source signal, and the formants into a filter so that they can be recombined. [34]

In the 1970s and 1980s, the linear predictive coding compression strategy was extended for use with digital images and MPEG-4, or video files. The basic idea and application of predictive coding was to remove some of the data from the original signal or file, then to later reconstitute the full file through predictive estimation. Anyone who has ever attempted to send a picture or video online will have experience with some form of compression. If the file size is too big, some email providers cannot send them, and a higher resolution image will need to be converted into a JPEG, which has fewer pixels per inch. Compression extracts data to make file sizes easier to manage, store and transmit. With speech signal, the formants are filtered out, and with digital images, pixels are likewise removed and re-estimated. Predictive processing did not initially offer an account of the mind or brain.

[34] For a review of predictive coding algorithms, see Spratling (2017).

Rao and Ballard (1999) first theorized that a predictive algorithm could adequately characterize human cortical activity. Their model is conceived as a hierarchy of networks, with neuronal populations divided into prediction and error units. Each prediction unit has a one-to-one correspondence with an error unit. These units are arranged into layers, with the higher levels representing the prefrontal cortex and the lower levels representing the primary visual cortex. The higher levels deal with the more complex features in perception, and predict the overall structure of the visual scene, inferring the more simplistic details that the primary visual cortex would supply (i.e. the edges, lines, dots). In machine learning, the model can be actualized in a neural network if its units are set up like autoencoders. An autoencoder can be distinguished from the encoder-decoder scheme described in the previous section on neural networks. With standard encoding, scalars or vectors can come to represent the parts of objects, and multiplying them results in two things: a *compression*, because by multiplying, this data is effectively being pooled and compactly organized; and the network's own *representation* of the given object or input. The target or expected outcome of such a process is to create that compression, which is a secondary model of the input, but does not perfectly match up with the input itself. [35]The autoencoder on the other hand engages in compression, but not for the sake of producing a new model of the input. Instead, the autoencoder compresses and decompresses the data to reconstruct the initial input as closely as

[35] An exception is a neural network that retains the initial input at every layer, i.e. a Recurrent Neural Network, but these are often too simplistic to handle higher order concepts (i.e. combining inputs to result in a new higher order concept).

possible. Spratling (2017) provides a brief overview of Rao and Ballard's algorithm and how it works as a viable model of perception.

Predictive Processing models such as Rao and Ballard's have also influenced new Bayesian frameworks. Bayesian frameworks have an underlying view — that Bayes' Theorem formulaically captures the basic faculties of the human mind and that the key to understanding the mind lies in better understanding probability. As the next section makes clear, Bayesianism extends far beyond Bayes' original formula, but the formula is still a grounding point of the theory. There are possible shortcomings to this approach. It cannot be overlooked how Bayes' theorem closely aligns with induction. Where the Bayesian approach is considered alongside the topic of argumentation, Zenker (2012) states that inductive reasoning and the Bayesian approach go hand in hand. More specifically, he states, "The Bayesian approach to natural language argumentation is a quasi natural choice, firstly, for the study of any argument which seeks to support, or undermine, a claim on the basis of statistical data. After all, on the Bayesian approach, the standards appealed to – that is, **those of inductive logic** (emphasis mine) —will, in one way or another, be part of the reconstructive apparatus and thus be available in argument evaluation (5-6). Bayesianism proposes that the mind engages in an inductive process: it generates a conclusion based on the prior available evidence, and then only seeks new evidence where necessary. Deduction is the opposite process: it starts by generating a hypothesis, and then seeking specific pieces of evidence to

corroborate it. More simply put, induction begins with a sampling of data and then seeks a rationale for that data based on probable correlation, while deduction begins with a general hypothesis and then takes specific evidence into account—and both are vital components of human intelligence. At the very least, Bayesianism runs the risk of seeming reductionist, because of how it narrows the focus to induction. Deductive reasoning might be covered under a related but distinct process for some Bayesian theoretical approaches. For example, deductive reasoning might go hand-in-hand with what Friston describes as *active inference*, which will be described in more detail below but broadly involves processes of trial and error. However, induction would almost fundamentally entwine with perception if embracing a Bayesian view of mind, and this might push deduction into the background.

Bayesian and predictive processing models also ultimately contend with the same metaphor that other neural network architectures use: compression is taken to be one of the core processes of the biological brain. Although methods of compression work very differently across different models, the suggestion is that that brains take richer multisensorial experiences in the world and construct a more manageable truncation of those experiences or inputs. Predictive processing found its first applications as a method of compressing data, and for the aforementioned reasons in the previous section, there may be a greater issue at stake in accepting compression as a metaphor for mental representation and memory. Compression broadly involves altering data at different layers of a neural

network system, thereby alienating those layered representations from the initial input or embodied, real world experience. This could subtly prop up the mind-body dichotomy. The autoencoder might circumvent this problem, because of how it attempts to match its input exactly. There may be other reasons to criticize or praise Bayesian and predictive processing models, however; the next section elaborates on both and their present prominence in both cognitive science and machine learning.

Predictive Processing and Bayesianism

Predictive Processing and Bayesian approaches to machine learning and cognition have proliferated rapidly, gathering support and also finding applications across different disciplines (Pearl 2018; Friston 2017; Clark 2015; Zeevat 2015; Oaksford and Chater 2010; Zenker 2012). The theoretical neuroscientist Karl Friston drew inspiration from both Rao and Ballard's research and from physics to construct a more in-depth and compelling model (2005). From Friston's perspective, the mind strives to achieve accuracy in interpreting its world: it does this by noting statistical regularities in the environment and forming hypotheses based on those regularities. The mind amasses and exploits data, recognizing patterns and co-occurring events. This becomes the prior distribution of data that the mind retains, and to which it assigns a higher probability weight whenever encountering a future, similar circumstance. For example, if there are dark clouds in the sky, the expectation might be that it will storm. Having this

experience once allows the mind to retain a posterior probability about the weather conditions that resulted in specific events. This in turn influences how the person will respond the next time he encounters dark clouds: he might grab an umbrella or choose to stay indoors.

Friston (2009) postulates that the mind acts to reduce free energy, or entropy: it seeks to achieve optimization in its assumptions about the world to avoid early expiry. According to Friston (2017), the mind is a "statistical model of the world it inhabits." Friston divides the faculties of mind into *perception* and *active inference*, both of which depend on *beliefs* or internal states of the system and *observations* about the world, which can cause those states to change. The data itself determines the initial patterns or regularities that are available for processing, until the agent forms those strong associations, and gains a grip on them—to the point that some priors will even override new incoming data. According to Friston's model, the predictive process begins in the ventral medial prefrontal cortex, and predictions are conveyed down to the sensory motor areas, and the visual cortex via alpha waves and pyramidal neurons. [36] This top-down process continues uninterrupted until predictions go awry, and bottom-up error feedback must alter the future expectations of the system. When an agent requires more information about the environment, or takes a calculated risk to obtain maximal reward and avoid error, he engages in active inference.

[36] The dorsal medial prefrontal cortex is the originator of the predictive signal in some other Bayesian models.

Any strategy that the agent deploys during active inference is termed a *policy*, as shown in Figure 2 below.

In cognitive science but also in machine learning, Bayesian networks are considered *generative models*. Machine learners that make use of Naïve Bayes "naively" assume that every new variable or piece of evidence should be incorporated into the model.[37] These learners generate and try out the different possible variations or states of the system. In some cases, the greater probability of one event can inversely affect the probability of another. This creates interdependencies, or chains between the possible states. The MCMC (Markov Chain Monte Carlo) algorithm fits well with the Bayesian approach to perception, and many proponents of the approach use Hidden Markov Models to explicate how this might unfold. In a Hidden Markov Model, each internal state of the system is an unknown variable, with transition probabilities and emission probabilities that must be realized before a shift occurs and another state can be assumed (Jurafsky and Martin 2018). Observations about the world may influence whether the internal state will remain the same, or if an alteration will take place. This allows parallel processing and would presumably happen at every successive neural layer in the hierarchy, unless an event disrupted the smooth flow of the process.

[37] There are other protocols by which the model can drop some of these variables or *attributes*, so that the system does not become too unwieldy.

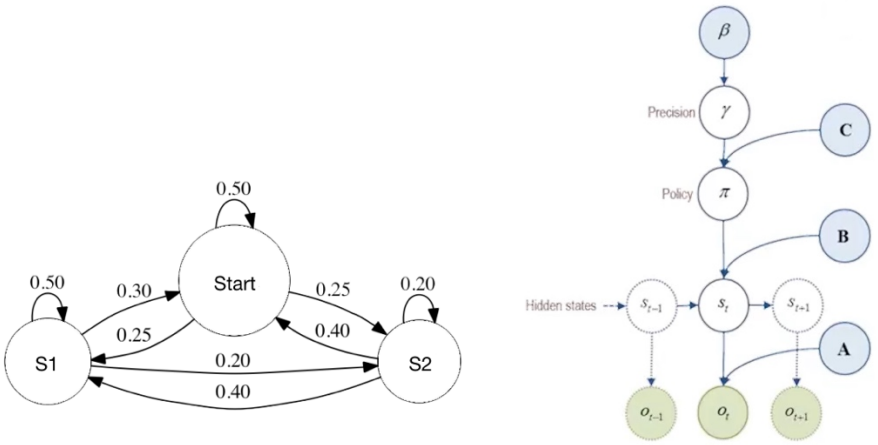

Figure 2. *Left*: A simplistic Hidden Markov Model; S1 and S2 represent internal states. *Right:* Friston's (2017) model of active inference and policy selection.

Bayesian approaches stress a hierarchical structure of the brain and the role of priors in perception at each level. The brain predicts and forms a picture of what is "out there" based on prior exposures, and shares that picture with each lower region of the brain until encountering "surprisal" – or a moment when what is "out there" does not match with the prediction, and the entire picture must be updated. Minimizing prediction error amounts to generating internal models that are flexible enough to allow for statistical variation in input. Simultaneously, these internal models must be accurate without *overfitting* to the point of rigidity. As defined by Friston (2010), "perceptual divergence" or Kullback-Leibler divergence is "a non-commutative measure of the non-negative difference between two probability distributions." Howhy (2013) provides a simpler explanation -- that perceptual divergence "measures the difference between the hypothesis currently selected and the true posterior beliefs under our model" (52). When

"perceptual divergence" is reduced but not completely dissolved, the person gets a statistically sound rendering of the world.

A prime challenge that remains for the Bayesian and predictive accounts of the mind is that they have yet to be implemented as an algorithm that effectively simulates what the human mind can do. There are no successful models that demonstrate proof of concept; and in deep learning, other predictive algorithms have notoriously fallen short of accomplishing human-level sophistication with language processing and production. [38] Kull (2018) touched upon predictive methods and deemed them inappropriate for contending with semiosis. Huettig and Mani (2016) also suggest that predictive processing may not be essential for language processing, for a number of reasons: 1) Current predictive processing frameworks lack specificity in treating processing of language. 2) Studies on the would-be biological markers of linguistic error processing (higher frequency brain waves) are not consistent, 3) Although research shows that individuals can detect and exploit statistical regularities in language, further work needs to be done to elucidate how predictive mechanisms accomplish this across a wide range of contexts. 4) Predictive processing has not been proven to be essential for language processing.

In spite of this, predictive algorithms and specifically Bayesian approaches have become increasingly widespread in the field of natural language processing. Zeevat (2015) argues in favor of a Bayesian approach,

[38] Recurrent Neural Networks, specifically LSTM (or Long Short Term Memory) and the algorithms Word2Vec and GloVe are a few examples of algorithms geared towards predicting character-by-character or word-by-word text.

and insists that “most of the priors for vision are directly usable in NLI [or natural language interpretation]. It follows that [human language interpreters] can find the most probable interpretation for a natural language utterance as reliably as they can find the most probably perceived scene for a visual signal”(4). Some iterated learning paradigms also apply Bayesian principles to investigate the issue of how repetitive learning and re-use of sound systems will result in languages with systematicity—or sound sequences which can be combined and rearranged. Griffiths and Kalish (2007) analyzed the linguistic behavior of learners in a chain, with every successor generating data to pass on to the next learner. The researchers assumed that learners use a Bayesian inference framework to pool their own data and biases with the data of the previous learner. Kirby et al. (2014) expanded this work to gain a better understanding of iterated learning evolution and how unstructured languages become more structured. There are also other proponents of Bayesianism, including the contributors to Zenker (2012), who have advocated to apply Bayesian methods to studying argumentation, or optimal persuasiveness.

In cognitive science, Bayesianism continues to build momentum and support from a diverse group of theoreticians. For Clark (2013) the Bayesian approach represents a unified account of cognition, action and perception – “a model of key aspects of neural functioning that makes structuring our worlds genuinely continuous with structuring our brains and sculpting our actions” (14). Howhy (2013) uses phenomenological and neuroscientific

evidence to build an argument in favor of a Bayesian theory of perception. One phenomenon that reinforces the theory is binocular rivalry; when attending to two pictures, one seen with the left eye and one seen with the right, the mind will blank out one of the pictures and render a single image. Seemingly, the mind recognizes the improbability of the co-occurrence of the items within the two pictures and selectively focuses on one or the other. Another phenomenon that Howhy notes is an optical illusion involving light. Through prior exposures, human agents have an expectation that light sources come from above, and seem to automatically apply this rule to interpreting visual scenes. This affects perception of depth and dimension, as exemplified in the image below. The circles perceived as concave are the ones that are shaded darker on top and lighter on the bottom; the circles perceived as convex are lighter on top and darker on the bottom. These are only two-dimensional images, and yet due to prior experiences in the world, the mind supplies the agent with a vastly different picture.

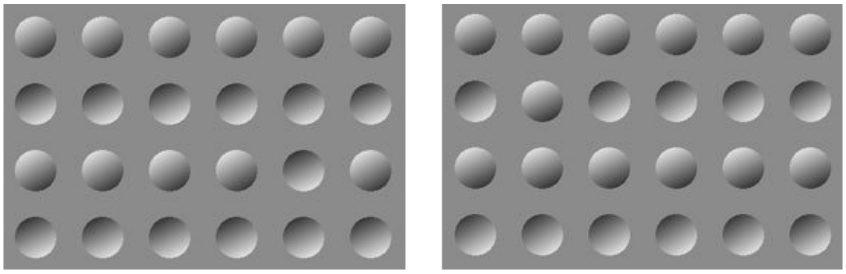

Figure 3. The Concave/Convex Illusion.

Such phenomenological examples make for a compelling case — and yet there are times when due to shading, the mind also favors an improbable interpretation of a scene. The Pulfrich Effect, named for German physicist Carl Pulfrich, can occur when a grey lens is placed over one eye as a human

agent watches a video. This is most easily observed when the video captures two swaying pendula traveling along perpendicular paths, although other visual stimuli can also cause the effect. In the Pulfrich Effect with the two pendula, an illusion occurs in which the suspensions seem to intersect and go through one another. Fodor and Pylyshyn (2014) comment on the Pulfrich Effect and other visual phenomena, stating that, “the question remains why some such reliable environmental regularities come to be instantiated in the perceptual architecture while others do not” (115). One possible explanation of the Pulfrich Effect is that the lens introduces a temporal gap in information being relayed in the brain. The shading of one eye prevents that retina from processing the visual signal at the same rate, and the latency causes the brain to arrive at two different interpretations.

Overall, Bayesian approaches offer a promising theoretical landscape, with room for transplanting the best features of other theories, as well as fresh growth. A current undertaking in machine learning is to intermesh the probabilistic scheme of a Markov network with one based in logic—as in the hybrid models discussed by Domingos (2015). Bayesianism and every other theoretical approach to mechanizing human minds can afford to do some self-critical weeding, however; if the intent is to model precisely the biological human brain, it might not only be necessary to pool the resources of all diverging perspectives, but also to acknowledge the counterproductive metaphors that pervasively affect theorization. These metaphors have a pivotal purpose in application, and while that leads to great results in

machine learning, clinging to the metaphors also occludes certain facets of *mind* and brain.

In the predictive processing and Bayesian views, the brain is conceived as a compression algorithm, and then alternately as a Markov Model with experience-defined interdependencies. The model of the human brain that pairs with this Markov Model is one in which visual cortex fills a subordinate role to the prefrontal cortex—like an underling in an office who handles the menial tasks and reports back to the boss when he spots a discrepancy in the paperwork. Although this may seem in line with the findings about the compositional nature of the brain, it fails to appreciate some aspects of the brain that will be explored in the culmination below, which deals with another metaphor: the *chiasm*.

The Chiasm

A chiasm broadly defined is a meeting of two opposing ends, or a crossing-point. It relates to the Greek term *chiazein* – to write *chi* or an "X" – and therefore has a literal, or physical referent. However, chiasm can also be a descriptor of ideological crossings, where any thesis and its antithesis are described — or through chiasmus, a rhetorical device in which an ABBA reversal of sentence elements may occur. In this way, *chiasm* blends both the physical or literal and the metaphorical through its many applications. One of Maurice Merleau-Ponty's legacies to cognitive science is the multi-faceted concept of the *chiasm*, which describes five important bodily

relations: the first is the relation between the eyes, which through the optic chiasma allows for one “sole cyclopean vision,” as Merleau-Ponty observes in *The Visible and the Invisible* (141). The second is the relation between the arms, hands and the bodily hemispheres. Out of the possibility of reflexive touch, Self and Other can be distinguished. The bodily relation between Self and Other is a third facet or type of chiasmic relation: Self from Other are at once distinct and connected, and the chiasm here reveals how problematic or harmonious interactions can develop through their social entwinement. The fourth type is a relation of language and semantics, as meaning arises from embodiment and involves positional attributes of space. All possible meaning is already contained with the possibilities of the human body. Last and most important, all of these relations are cast from a primal element that Merleau-Ponty refers to as flesh.

Merleau-Ponty emphasizes two core aspects of the mind in *The Visible and the Invisible*: that it 1) is a cross-way of the senses, and 2) shares an essential unity with the rest of the world through *flesh*. Flesh is beyond the strictly material, but through the chiasm and expression, it is at the same time every aspect of the material world diversely enrobed. In more simplistic terms: it involves all of the different relations mentioned above (Grausso 2019). Abram (1996) defines the term flesh as a *matrix* and uses it to defend his own hylozoism or perspective that all life is equally important in status—that is, trees and wildlife have the same value as human beings. However, flesh does not just describe an interconnectedness of the environment and

all living beings. Toadvine (2009) emphasizes the chiasm and shows why the concept of flesh cannot be taken as a hylozoism. For Toadvine, the chiasm is the reflexivity of flesh, through which the human forms an expression of nature that is simultaneously a divergence from the original and yet linked to it. Recognizing difference entails an appreciation of individuation. Merleau-Ponty seems not to be advocating for either perspective, but rather proposing the chiasm as an essential relation, which ultimately both absolves and creates the tension between Self and Other.

Within a single human being, several chiasmic relations are possible, all branching from Merleau-Ponty's five facets or relations. In terms associated with artificial intelligence, the chiasm could in part be viewed as an interconnectedness of the inputs, hidden states and outputs of an intelligent system—not only the complete entwinement of its perceptual, internal and motor functions, but also its immersion within a compatible world of which it is a part. These ideas feature in a broad range of theories on embodiment and the brain, many of which have the shared goal of overcoming Cartesian dualism and producing the best model of *mind* to replicate within artificial intelligence. The chiasm, like many other models, has many potential metaphorical extensions—but it also refers to the literal structure of the optic chiasma, and the contralateral wiring of the hemispheres of the brain and body. One of the metaphors discussed in the previous sections is compression. The process of compressing data might be inherently dichotomizing, if only because it results in a sparser representation

and a richer representation. Each theory is based on a particular view of how compression occurs in the brain, but they all seem to agree that more complex representation happens in the prefrontal cortex while the visual cortex handles the sparser details. It may also be that this happens chiasmically, without recourse to typical compression methods. For visual stimuli, the right hemisphere is king of complexity and richness, while the left hemisphere supplies a sparser interpretation. With auditory stimuli, the opposite is true: the left hemisphere manages nuanced speech processing, while the right hemisphere is attuned to more simplistic expressive sounds, like screeches or grunts. The hemispheres also produce different outputs when approaching a task. Split brain studies have shown that the right hemisphere focuses on the fuller perceptual context of the situation, but turns out to be mute. It cannot report the term “knight” when it sees a picture of one, but it can grasp the greater context in which “knight” would appear and infer “knight” from other contextual clues (Sidtis et al. 1981; Gazzaniga 2016, p. 243).

Split-brain research also reveals substantial differences in how the left and right hemispheres perform visual search tasks. Kingstone et. al (1995) showed that the left hemisphere of split brain patients will focus on individual features of a search target. Gazzaniga (2016) reports that if looking for a specific person, the left hemisphere in a split-brain patient might concentrate on the person’s hair or other physical feature. The patient’s right hemisphere on the other hand will choose a different strategy, and look at every

individual until finding the target. The right hemisphere insists on identifying a whole entity, whereas the left simplifies the task by selectively sampling parts of the whole. Findings from decades of research on split-brain patients strongly support the idea that the hemispheres of the brain adopt differential visual processing strategies, though it is difficult to assess how this applies in normative cases, as the right hemisphere tends to dominate in non-split brain patients performing visual attention allocation tasks.[39]

In a recent publication, Gazzaniga (2018) uses the split brain research he conducted over the course of decades to explore topic of the machine-brain metaphor. He begins with a broader historical account of the issue, including Descartes' reflections about automata, which were on display in French parks during the time that the philosopher concluded that the mind must be something other than a physical system. As Gazzaniga describes the mind-body dichotomy through the centuries, he comes to his own chapter of studying brain pathologies. Gazzaniga proposes that the brain is a robust rather than optimal system, one which functions as a layered architecture made up of different modules, with the ability to sustain damage to a module without completely disrupting consciousness. He also proposes the concept of complementarity from physics may be useful in understanding the brain and the mind – as both a physical system, and one which manipulates symbols to (in the form of language and mental representations) to self-monitor and direct future action. The concept of complementarity

[39] The studies of Zuanazzi and Cattaneo (2017) indicate that the left hemisphere and right hemisphere may also carry out independent processes, however, when it comes to allocating visual attention to contralateral space.

originally refers to the topics of the macrocosmic and microcosmic universe — the first with the more standard laws of physics, and the latter which involves shifting quantum dynamics. Gazzaniga argues that the brain and mind are similar complementary aspects of human intelligence that enable survival advantage.

In closing, Gazzaniga (2018) also comments on the machine-brain metaphor again, and reminds the reader, "…machines are by-products of human brains—brains are not the by-products of machines" (229). He implements a metaphor of his own in describing the brain, referring to "bubbles" or processes that are taking place in the different modules of the layered architecture, with a salience network helping the organism to decide where to direct its attention. He makes several rich points based on his research, which shows that the left hemisphere and right hemisphere can operate independently, as separate minds, after the corpus callosum has been divided.

Gazzaniga calls the brain a robust rather than optimal system because it continues to function when it has sustained damage from stroke or other traumatic brain injury, but "optimality" is another buzz word in machine learning and neuroscience. [40] In *Phenomenology of Perception,* Merleau-Ponty remarked that, "I have visual objects because I have a visual field in which richness and clarity are in inverse proportion to each other, and because these two demands, either of which taken separately might carry to

[40] Frison, as one example, speaks of optimality across many different publications and talks.

infinity, when brought together, produce a certain culmination and optimal balance in the perceptual process" (371). Optimality for the human brain could amount to a balance between richness and clarity – and so compression may have no role, because Merleau-Ponty's answer is not to contend with all of the data in the universe, or a sparse sampling of that data – but rather to work with both, and then to favor a balance between the two. From a Bayesian view, it might be said that the chiasmic brain offers a "representation" that is not a vector, guaranteeing little or no overfitting – but multiple different projections that go to the bounds of all possibility and then settles on a temporary model that fits the available data. These projections are always accompanied by an awareness of that balancing alterity – those other arrangements. When it comes to evolution, there are advantages to be reaped from such an approach. Seeing the monster in the shadows is not just a failure of someone's perception. It may be due to a quick judgment and perhaps even predictive process negotiated by the left hemisphere of the brain, which grasps at partial-structures and creates possible outcomes from them. It would be this mechanism that would save the perceiver if indeed that shadow turned out to have teeth. For Merleau-Ponty, *expression* is another facet of the chiasm, and it goes hand-in-hand with these quick judgments, because it involves the person or organism's ability to create a new perceptual content—that is, to develop its *own* monster in the absence of full perceptual detail from the world.

Hemispheric deactivation research reveals that the right and left hemispheres have expressive faculties. The right and left hemispheres are not equally talented artists. When going it solo, the left hemisphere produces more simplistic sketches of everyday objects, while the right hemisphere captures the objects in richer detail (Nikolaenko 1997). The asymmetry of the fusiform gyrus may in part explain these differential skills. The right parietal lobe might also responsible for the talents of its respective hemisphere, as Ramachandran (2011) notes in his case study with Nadia, an artistic savant with autism. These aforementioned brain regions have also be theorized to have a role in autism, dyslexia and metaphorization, which points to the possibility that the right hemisphere supplies some type of linguistic input to the left hemisphere related to spatiality. [41] Research involving dichotic listening also demonstrates the hemispheres' differential aptitudes with processing sound (Asenova 2018).

Another metaphor that the previous sections focused on was the mind as a *hierarchical* system. In general, the term *hierarchical* could stand to be replaced. If the right parietal lobe is implicated in constructing rich metaphorical comparisons, and the anterior cingulate cortex (which is closer to the prefrontal cortex) is involved in making comparisons during mismatch trials, which holds a place of higher command? [42] Imbalanced power structures may have a deep hold on our human ability to conceive of

[41] In a humanlike machine with two distinct but interconnected processors, this could potentially be achieved if the "right hemisphere" defined a function for the left. In turn, the left hemisphere could write the functions of the right hemisphere.
[42] The anterior cingulate cortex (ACC) is active during Picture Word Interference tests and mismatch tests. It plays an important role in attentional processes, which may be the only reason to in any way rank it above the right parietal lobe, as the ACC may be what allows the person to decide where to concentrate its resources.

alternatives to hierarchy, but the term *multi-layered* might better convey the organization of the brain. Furthermore, lateralization is of equal importance, and should come into consideration when designing an artificial architecture that seeks to replicate an embodied human being.

Thinking in terms of *hierarchy* and top-down processing may lead those using a Bayesian model to fail to fully appreciate human error. There is a certain resonance to Alexander Pope's aphorism "to err is human", even if human beings strive for accuracy in interpreting their world. A Bayes Optimal explanation posits that the mind constructs an estimation of what to expect when navigating through daily life. This should serve the organism in making good choices, but action-selection does not always follow the optimal route. Whether due to an effect of what the Ancient Greeks referred to as *akrasia*—a weakness of the will—or due to a predisposition that emerges through an individual's prior experiences—humans often commit errors. Making mistakes can result in a future improvement in action-selection, but being prone to error also has marked advantages. Errors, under this model, could be what grant human beings the ability to surpass an animal tendency to over-rely on tried and true behavior and take calculated risks. Humans are also inventive with language and deliberately or inadvertently engage in unconventional behavior, producing new terms that work their way into the lexicon.

While set parameters and standardization are important, and tried-and-true methods will have certain benefits, trial and error can lead to

potentially better problem solving techniques that yield greater long term returns. Imagination, error and what Merleau-Ponty calls *expression* all require deviation – the ability to see the world in more than one way. This ability may be naturally seated within the chiasmic structure of the brain, which produces two (or more) different ways of perceiving the world. If the left hemisphere perceives only partial visual input from the world, it is only contending with the partial data, which might be a valuable asset for breaking down and reconfiguring the elements in a visual scene. It might also be this valuable asset that somehow informs the right hemisphere whenever engaging in the arts, and creating new visual concepts that have never been seen before. There are also potential evolutionary advantages of hemispheric differentiation, especially with respect to coping with threat: if the right hemisphere receives more visual data, it is slower, but the left hemisphere can make faster acting decisions based on the limited data it takes in. The right hemisphere does the same with auditory input: since it does not have the demands of processing a full range of articulation, it can concentrate on the sounds produced by anything that goes “bump” in the night.

At present, the brain is viewed primarily as a two-way system, with inputs and outputs—information streaming through the retinas and into the visual cortex, or flowing down from the prefrontal cortex. Emphasizing the chiasm is a departure from this, as it conceives of the hemispheres as engaging in diverse but complementary processes, actively generating the

landscape and its auditory medley while also being open to the world. One risk of this view of the chiasm might be to dichotomize the hemispheres as two parts of a system. The tendency to dichotomize the hemispheres is most apparent in discussions about human talent and aptitudes, and a general notion that any person can be a right-brained or left-brained individual. In a recent book *The Master and His Emissary: The Divided Brain and the Making of the Western World*, McGilchrist claims he wishes to avoid dichotomizing the hemispheres, but then proceeds to set up a power dynamic between the hemispheres. McGilchrist (2009) states that his metaphor of "master" and "emissary" derives from a philosophical parable in the works of Nietzsche, but the tale he weaves is strikingly reminiscent of the fairytale *The Shadow* by Hans Christian Andersen, in which a man's Shadow eventually assumes his whole identity. For McGilchrist, the right hemisphere is the master, as it copes with richer details of the visual scene, contends with semantic information related to the natural world, and proves important to mathematical reasoning and the arts. The left hemisphere is an emissary that is scheming for itself and its own interests: it is concerned with man made things, and it deals with less visual information. [43] When a person experiences a stroke that damages part of the right hemisphere, the person may tell outrageous stories to explain away stimuli, presumably because of an over reliance on the left hemisphere. McGilchrist argues that the left

[43] The semiotic square and analyzing marked/unmarked relations might be relevant to this discussion. The left hemisphere could be considered marked. As Pelkey (2017) explains, the "left" has a sinister association across some cultures (171). While these associations may be ingrained, this is one of the reasons that recognizing the chiasm might be important—because it helps call into question such binaries or dichotomies, or at least acknowledge where they may exist and when they are useful or counterproductive.

hemisphere has set man on an unfortunate path, guiding him towards selfish behavior and detachment from the natural world.

Such a perspective of the hemispheres is problematic for the same reasons that the term *hierarchization* is problematic: both insist upon a possible imbalanced dynamic or power structure between regions of the brain just by virtue of the associations that can be made with the term *master*. To deem the right hemisphere of the brain a *master* is also to hierarchize, and to set up the left as not only *other* but also somehow *lesser.* While the point of McGilchrist's original analysis and updated (2019) analysis seems to be to show how the emissary has taken over for the master (and thereby upset the original power dynamic), the fact of using the language of power dynamics is problematic—simply because it may detract from how the hemispheres need to work in tandem for a person to function (at least after this person is of a certain age and to an extent the roles of the hemispheres have been determined through the forming of strengthened neural connections). Even though McGilchrist's final analysis fully appreciates the unique contributions of each hemisphere), to anthropomorphize and assign ranks might still run the risk of being misleading, for the same reason that using the term "greenhouse gas" when describing climate change is misleading. The information presented about greenhouse gases shows how harmful they can be, but "greenhouse" still bears with it a positive association, as discussed above. Likewise, the terms "master" and "emissary" come with associations that can inadvertently convey the wrong

idea about the hemispheres of the brain, despite McGilchrist's wonderful and detailed explanations of each.

The potential to dichotomize and hierarchize—to conceive of all structures as having a particular and restrictive order—is a part of a greater and pervasive issue, one that can be traced back to Western logic. The proposition and its negation are the ultimate dichotomy around which discourse proceeds. In natural language, *chiasmus* is a structure with a reversal: the reversed elements can be a proposition and a negation, or two clauses with the structure "AB" and "BA." In their meeting, the semantics of the sentence shift to convey a new message and the result is sometimes even a tautology. Through the interactivity of distinctive parts, these sentences become more than the sum of their parts.

Within neuroanatomy, the chiasm may seem to be reducible to two hemispheres; it would be tempting to contrast and dichotomize them, but Merleau-Ponty's later philosophy shows how this is avoidable—how the chiasm is more than the sum of its parts. The chiasm extends from the hemispheres, to the entire body, and to the field of vision. As Landes (2013) observes in a discussion on expression and the chiasm: "Lived experience is unaware of any absolute distinction between the seer and seen" (172). In perception, too, the seer is unaware of any absolute distinction between the hemispheres. The chiasm produces an experience that transcends the distinction and advances towards a completion, a coming together that is never absolutely realized.

The above theory of the chiasm delineates a possible way that brain handles this visual information and how the hemispheres' co-existence results in better engagement with the world—both for survival advantage and analysis of the environment. For perception's sake, the chiasm delivers optimal richness of visual information through the right hemisphere, while also providing a means of productive deviation through the left: the sparser visual information can be exploited in situations that call for faster action. These perspectives also complement Goodale and Milner's (1992) findings about the brain possessing two visual systems, corresponding to the ventral and dorsal streams. For auditory processing, the right hemisphere focuses on simpler sounds while the left manages more complex vocalizations and noise patterns. The chiasmic dynamic has the potential to be mechanistically reproduced, but there is a need to explore chiasmic structures more generally and lateralization in the brain. It would be counterproductive to completely focus efforts on machine learning models that seek to create a system with human level intelligence but fail to fully appreciate lateralization—and learner models in which semantics amount to static positions in vector space—potentially *even* if those positions are probabilistically and loosely defined. It is beneficial to consider the chiasm, not only as the natural structure of the brain, but also as it exists across different domains. Merleau-Ponty attempted this in 1964, and yet there is still much to expand upon and investigate.

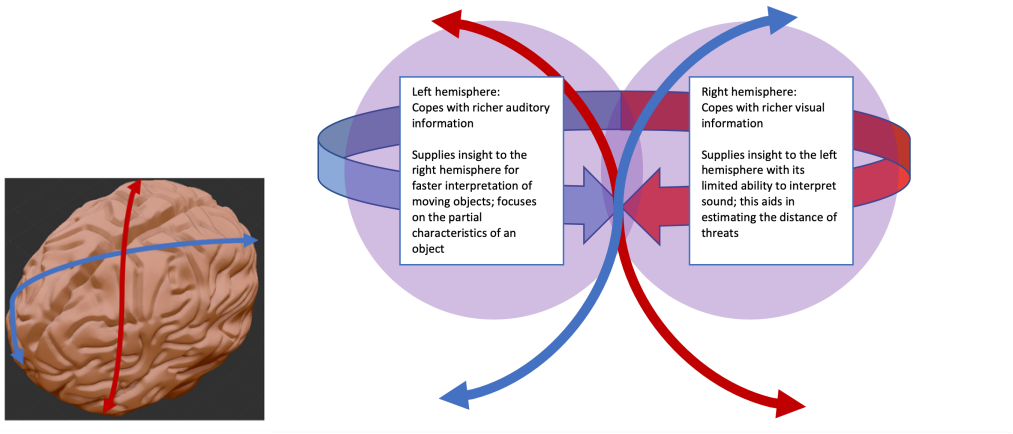

Figure 4. A simplified model of the chiasm.

Further Conclusions

Mechanistic models of the brain will continue to be proposed, and machine metaphors are too entrenched in the literature to be immediately discarded, but adhering to the idea that the human being is an automaton might hinder advancement and the use of some better metaphorization. The end result of clinging to mechanistic metaphors is the recycled use of terminology associated with machines, computers and computer science—or the terms that are related to specific processes and algorithms. These first formed a framework for alternate tasks and were later adapted to become theories of cognition. Better theories of cognition should also more strongly inform efforts in machine learning. Daniel Dennett (1992) once argued that the *self* is a center of gravity in a complicated object, which Ramachandran (2011) deems conceptually similar to “many vectors intersecting at a single imaginary point” (271). The chiasm is a point of intersection, and dispersion

of energies—it is a structure of not only embodied balance and the contralateral wiring of limbs, but also the coordinated joint effort between the hemispheres. In semiotics, the chiasm represents the human form. [44] As a syntactical structure, chiasmus is a diverging point of a thesis and antithesis: it brings together two different interpretations, using the same elements in different configurations. [45] For cognitive science, the *chiasm* bequeaths an answer to the mind-body dichotomy; it is an attractive descriptor that is not only potentially compatible with any theory of cognition proposed, but it also may inspire new ways of implementing human level intelligence in artificial systems because of the unique dynamics it defines. There are several issues at stake here, which makes the study of the chiasm valuable: 1. It recognizes the embodied aspect of the perceiver, and the crucial roles of both hemispheres interacting and carrying out a cooperative effort to produce vision. 2. It moves away from use of terminology associated with some aspect of power and control (i.e. hierarchy).

[44] Pelkey, Jamin. 2017. *The Semiotics of X: Chiasmus, Cognition, and Extreme Body Memory.* London & New York: Bloomsbury.
[45] There are several different sub-types of chiasmus (and antimetabole) that in some ways overlap with formal logic and set theory, while maintaining important distinctions.

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Review Article

Embodied X Figures and Forms of Thought

For literature scholars, classically trained rhetoricians, and even those who might not recognize the term but are still familiar with its elements through discourse, poetry and prose, the device chiasmus holds a special persuasive and compelling tonality. The term chiasmus derives from the Greek X, or "chi," and when encountered in a sentence, often appears in an impactful ABBA design, as in the following quote from John F. Kennedy's 1961 Address Before the United Nations General Assembly: "Mankind [A] must put an end to War [B], before War [B] puts an end to Mankind [A]." The complexities of chiasmus can vary, but a chiastic phrase or a structure will always involve a crossing – an "X" forged through the arrangement of signs or repeating themes. Lissner (2007) postulates that chiasmus arises from embodiment: chiastic phrases tend to be dichotomizing or binarizing, and she attributes this to our bipedal existence. In The Semiotics of X: Chiasmus, Cognition and Extreme Body Memory, Jamin Pelkey expands on this work, proposing that because humans are capable of creating an "X" from our

outstretched limbs, the “X” figure should be studied more intensively in and beyond the field of semiotics.

The book is a concise but wide-ranging treatment of chiasmus that moves the discussion of this rhetorical device well into cross-disciplinary domains, and reveals how our corporeal understanding of “X” fundamentally entwines with our modalities for making sense of the world. The first chapter focuses on anthropological studies of the Sentinelese, a small population that dwells on North Sentinel Island in the Indian Ocean. Through the Sentinelese, Pelkey introduces the book’s core concept: that extreme felt experiences correspond with the spread eagle posture, and that these experiences percolate through many aspects of our lives, manifesting in ways that reflect those bodily extremes. For the Sentinelese, the embodied “X” is a prelinguistic means of communication. As a central part of both aposematic displays and shows of celebration, it signifies two vastly different states of being. What is so noteworthy about this posture in the Sentinelese can also be found in nonverbal exchange cross-culturally, as an exhibition of both threat and triumph.

Embodied chiasmus, or embodied “X,” can indicate any number of extreme and opposite conditions. The posture can convey life or death, and pain or pleasure; it encapsulates either or, while in some situations calling to notice that these are not absolutes. As Pelkey describes it, embodied chiasmus results in broad “chiastic modeling” that appears in iconography and artwork, but also extends further into customs and cultural practices,

sports, philosophy of mind and psychology. In his introduction, Pelkey examines chiastic modeling in the mural found at Cueva de la Serpiente in Baja California, Mexico (Bradshaw Foundation 2011). The “Serpent Cave” mural does not “simply [show] life and death, abundance and scarcity, but the transition phase itself: the point of confrontation and reversal between two extremes” (p. 9). The Vitruvian man is another figure that captures the essence of embodied chiasmus, and Pelkey uses Vitruvius as the primary means of developing the argument that humans have an “inborn conception of space” that underlies Euclidean geometry (p. 18).

Pelkey concentrates on transverse, or horizontal symmetry, and this sets him apart from Turner (1991), Norrman (1998, 1999), and Lissner (2007) who all prioritize vertical symmetry. According to Pelkey, the “X” that we compose with our bodies is likely the first comparison we generate, as we ascertain the difference between feet and hands, thighs and arms. The embodied “X” may also tacitly affect human cognition and influence communication. Chiastic body- memories issue forth through our forms of self-expression and signing. From the Vitruvian man to where it appears in modern graphics, the “X” has a forceful presence. The viewer who discerns the substance of “X” does so in a highly visceral way, through a multitude of extreme bodily associations. “X” is not only a message, but also a rendering of the self, or the body. In its varying chiastic types, it can also be a depiction of other. Another type of chiasmus naturally emerges between two people when they communicate—they form an “X” with the orientation of their

bodies, perhaps over an object of common interest. Pelkey delineates four types of chiasmus. This is reminiscent of the fourfold syntactic typology of Paul (2014): (a) the "X," (b) the hourglass, (c) the diamond, and (d) argyle patterning. Although Pelkey acknowledges that the scope of his volume cannot allow for a complete consideration of all the complexities of the typology, he endeavors to gather and assess prominent models that fit within his four major categories. He begins the second chapter with the "X" figure. In Pelkey's interpretation, the "X" is the "spread eagle leap," which in sports can be viewed as a risk-taking move that manages to be both freeing and imperiling for the performer. In addition to commenting on athletes who execute these hazardous but impressive moves, Pelkey also investigates this idea through an analysis of Wallace Stevens' poem "The Motive for Metaphor" (1947). As Pelkey notes, the final line spotlights "the vital, arrogant, fatal, dominant X" – the elements that create the daring, spread eagle leap – the vigor of vitality, presented alongside the possibility of fatal error.

His discussion of sports, torture, and poetry provides a sampling of chiastic iconography. He delves into the "spread eagle" as an icon, which he traces back to the likeness of an eagle with spread wings that was embossed on leather coins from the Roman Empire. The term "spread eagle" underwent several significant developments, and Pelkey notates these on a timeline, along with giving an account of how "spread eagle" has been assigned positive and negative meanings—used variously to refer to torture,

defeat in sporting events, and titles of high honor, among other things (p. 53–54). Another poignant example of “X” that Pelkey highlights is the saltire on the Scottish flag, which stands as a symbol of national pride. The cross honors St Andrew, who in the oral tradition is reported to have died through the torture of crucifixion. This would have been an opportunity for Pelkey to elaborate on religious iconography, and include the cross and the Chi Rho, but such additions would perhaps require another book.

The third chapter continues the treatment of “X” iconography by compiling brand logos that visually impart a range of experiences of the embodied agent. Pelkey identifies several corporate and product brand marks in which the “X” denotes a single person, specifically a “spread eagle human form, with identifiable head, arm and leg representations, such that arms are raised and legs parted at obtuse angles relative to the sagittal midline of the torso” (p. 67). Among the diverse companies that have implemented the “X” in their logos are many that offer health, fitness and insurance services, and others that promote technology, connectivity between peoples, or specific events like the Burning Man festival in the Nevada desert. These designs hint at optimal physical conditions, while other logos contrast drastically with these images and tell a story of pain, like the one for Crohns and Colitis Canada. Some companies and organizations also incorporate the “X” into their names and logos to create blended icons with text and pictures, as in many “eXtreme” sport logos (p 76). The blended icons also have similar visual effects. Beyond the brand logos, Pelkey

mentions the iconic skull and crossbones of the Jolly Roger. This historical example further underpins the purpose of "X" as "evoking primal dialectics of survival: life and death, flight or fight; the chance of success, the risk of failure" (p. 83).

The "X" type produces a strong sense of life and death, and pain and pleasure—but the hourglass chiastic type also accomplishes this, as it arises out of and factors into concepts of time and torture. For Pelkey, our bodily associations with the hourglass are subtly different from those we hold for "X." The hourglass is a reminder of mortality, the beginning and end of all things – but its "dihedral symmetry" also creates a "double mirror." Pelkey suggests that the hourglass stands as a representation of self and other. He homes in on Lacan's L-Schema (Lacan 2006 [1960]) as a chiastic model that fits within the hourglass category, because it is the "ego constantly projecting its self-image and assumptions with confidence onto others and having this image reflected back with little change" (p. 89). Access to otherness is partially obstructed in the hourglass model, and Pelkey even goes so far as to say that in many cases, the "Other is off-limits" (p. 86). Drawing on Hegel (1977 [1807]) and Heidegger (1969), Pelkey progresses to the subject of dialectic – the thesis, antithesis, and the synthesis. Likening Heidegger's approach to dialectic to the Lacanian L-Schema, he argues that, "Both diagrams model the infinite perpetuation of self-reinforcing, self-referential relationships between contrasting pairs that are locked in cycles of opposition and identity, negation and difference" (p.

92). The hourglass type restricts instead of opening up the relationships between One and Other. The meeting point between the two is narrow and weak. This results in instability – continual loops in a closed system "on the verge of collapse" (p. 93).

In Dylan Thomas' poetry (1971 [1953]), Pelkey locates hourglass X-stanzas that contain a "litany of despair" (p. 101). The poem "Vision and Prayer" seeks to bring about harmony between opposites such as life and death, but Pelkey ultimately identifies the theme of the poem as "crisis incarnate" (p. 102). To further reinforce his perspectives on the hourglass type in poetry, Pelkey might have critiqued other poets who work with the hourglass structure to address the same themes. Instead, he moves on to the multimodal exhibition entitled "The End of Money" (Gaitán 2011), which took place at the Witte de With Center for Contemporary Art in Rotterdam from May 22 to 7 August 2011 and utilized the hourglass symbol as its design. Pelkey concludes that, as it appears in this exhibit, and on the covers of books, or as a focal piece for movie posters, the hourglass type points to "impending doom" (p. 111). The Bhavacakra is the final symbol that Pelkey classifies as belonging to the hourglass type, as it comprises several hourglasses and illustrates the cycle of life and inevitable death. The tension and binarism that come to the fore with the hourglass type can also be considered through application of the semiotic square, or Greimas square. This tool aids in the assessment of truth-functional logic, or a proposition and its negation ("contrary relations"). The "subcontrary relations" define

instances in which an exception must be made for the proposition to hold true. Pelkey explains that in the “traditional semiotic square, the center is eviscerated in favor of an exclusive focus on the extremities, or margins” (p. 121). Within the center of the square, it is possible to behold the hourglass type. The upper half of the diagram that lays out the “contrary relations” occupies a privileged position over the bottom half, or the “subcontrary relations.” Pelkey asserts that the semiotic square is “a developmental given of human tacit cognition, proceeding from salient features of human evolution” (p. 118).

If the semiotic square is indeed an appropriate model of cognition, and also an exemplar of the hourglass type, this may be an especially promising area for further research. The problem with ideation that conforms to such a model is how it demands hierarchizing and clear categorization, tends to admit no mediating ground (through the law of excluded middle, or tertium non datur), may ensnares thinkers within its confined template. This may be an unavoidable consequence of embodiment, as Pelkey suspects, and he believes using the semiotic square as a tool might at least aid us in making harmful dichotomies explicit. The body can be mapped onto the semiotic square, with the right hand as the proposition, the left as the negation, and the legs as subcontrary relations. Across many languages worldwide, “there are few exceptions” to the tendency to associate “right” with positive attributes, such as goodness and honesty, and “left” with negative attributes, such as debility and wickedness (p. 126).

The right hand establishes primacy over the left; the proposition establishes primacy over its negation. Building on his remarks about the hourglass type and embodiment, Pelkey takes on the topic of movement – and Sheets-Johnstone's theory that "our ability to think relies on the movement of our whole body to find or create spatial regularities" (p. 129). Sheets-Johnstone designates the term "kinetic melody" as a descriptor for the spatiality and temporality of bodily dynamics. Although Pelkey does not cite many other theorists in this section where further evidence could have been beneficial, he draws on Sheets- Johnstone's (2012a: 129–130) research to assert that, "complex dynamics underlie posture," and "felt movement" engenders "kinetic analogy" and "imagination." What Pelkey calls "imagination" might also appropriately be referred to as "simulation" or the mental rehearsal of activity. The outcome is that through movement and embodiment, we compare or analogize our extremities and this affects how we conceptualize other matters. Binaries, or what are often described as "double-binds," are common in our systems for making sense of the world, yet these double-binds are often "hidden" or go unnoticed by those who compose and use them (p. 135). As already mentioned, Pelkey champions the semiotic square as an instrument for laying out and grappling with double-binds. Through a critical reading of the 2013 country hit "Follow Your Arrow" (Musgrave et al. 2013), Pelkey demonstrates how to engage with the double-binds in the lyrics and evaluate the song with the semiotic square.

In Chapter Six, Pelkey provides an example of a product that appeals to our inclination to analogize with our bodies. Vibram's FiveFinger® Footwear is a brand of shoe fashioned like a glove, with spaces for each toe. The popularity of such a product depends on the customer's application of conceptual blending to perceive relationships that exist between experiences, "frames" or "mental spaces" (p. 140). Pelkey concentrates on four types of blending networks, taken from Fauconnier and Turner (2002: 119–135): "(1) simplex, (2) mirror, (3) single- scope, and (4) double-scope" (p. 140). Since Vibram's FiveFinger® Footwear invites a comparison between hands and feet, fingers and toes, and gloves and shoes, it can be classified as belonging to a double-scope network. A double- scope network "involves the imaginative blending of two frames" (p. 141).

The "double-scope" network lies at the center of Pelkey's discussion, as these networks "emerged late in human revolution and are thought to underlie the singularity known as the human language facility" (p. 140). Pelkey goes on to say that, "the blend is only a single token of an embedded type that belongs to a broader cross-linguistic paradigm set so robust that it might reasonably be identified as a universal feature of human tacit cognition" (p. 142). This further reinforces Pelkey's chief argument that blending and analogic modeling derive from our ability to note the relations between the upper and lower parts of the body. To bring the matter into the linguistic domain, he surveys languages that have "systematic congruences" between terms for arm and leg, and hand and foot. Pelkey finds this

"syncretic experiential paradigm" of "arm-leg partonomy" typified in "the undifferentiated arm-hand and leg-foot continua featured in languages like Hlepho and Savosavo" (p. 155). Hlepho Phowa is an aboriginal language from southeastern Yunnan Province, China, and Savosavo is a Papuan language of the Soloman Islands. In addition to these and other linguistic examples, Pelkey ties in the research of Comrie (2011), who surveyed 196 world languages and found that "63% are either 'decimal' systems, based on the number 10, or 'quinary' systems, based on the number 5" (p 158). Comrie's findings lead Pelkey to conclude that "fingers and hands" are of "profound importance" in "establishing mathematical concepts" (p. 158). He explains that, "Another 21% of world languages are either based on the number 20 ("vigesimal") or some hybrid of 20 and 10. This latter fact points to the intrafield relations of hands and feet" (p. 158). These data strengthen the main points of Pelkey's thesis, before he advances to the last of the last of his types, the diamond type and the argyle pattern. He segues into these with a discussion of solipsism, the philosophical position that a person's experiences are all that is true and knowable for that person. The "X" type and solipsism are in consonance, insofar as they both elucidate or model solitary existence. But "X"s can also be found in company. The "XX" shows the interrelationship between two individuals, although this symbol bears similarities to the hourglass type, and yields the same problematic dynamic, in which the two are locked in perpetual contention. With the "XX," as in the case of the hourglass "double mirror," the self will ceaselessly project onto

Other, resulting in narcissism and further ensuring solipsistic behavior. The "XXX" is a symbol of three that are also in competition. "XXX" adorns famous pirate flags in the shape of skulls and crossbones, and it is the title of a popular film starring Vin Diesel (p. 156–157). Pelkey declares that "XXX" figures are "not merely communicating to an audience, they are also in communication with each other" (p. 187). "XXX" presents the "social striving for mastery over other selves" (p. 187). This can be substantiated in the example of piracy, and by the aggression and violence in the Vin Diesel film, but also through other examples like "XXX" adult films. In an "XXX" configuration, the middle "X" occasionally outsizes the surrounding two, as in the title xXx (Cohen 2002). The dominance of the center "X" is at once apparent – yet, in spite of how complex and even threatening we might assume these X- marks to be, Pelkey proceeds to offer up "X" types that have a more equalizing and unifying visual impact.

The diamond type is an arrangement of the double-X with two intersecting perspectives that form a "rhomb" at the center, or a place of common middle ground. Pelkey's diamond type bears some similarities to Paul's circle type. Based on a reading of poems with chiastic structures, Paul (2014) concludes that his circle type can be associated with melancholy and weariness. Pelkey revisits Petrarch's Sonnet LXXIV, one of the sources from which Paul extrapolated the tone of his circle type. Pelkey notes that in this sonnet, "the poet is … reflecting on the nature of love" – and thus concludes that the circle and diamond types must be constituted differently than Paul

suggests (p. 213). Pelkey distinguishes himself from Paul in insisting that the diamond develops around a third other, and consists in a shared awe or wonderment for the two observers. This shared wonderment is particularly evident in spread-eagle lattice logos, such as the one for the company Doing Family Right, which offers many services, including resources for parents who want to form better connections with their children (p. 202). Another brand mark that Pelkey chooses to highlight is for Dos Equís beer, which depicts a prominent interlocking double-X around a graphic of Aztec ruler Moctezuma II. In this instance, the visual story may be more complex, as it seems to convey a reverence for the historical figure, though the enclosure of the double-X has an oppressive and imperious quality. Pelkey acknowledges these conflicting elements, and interprets the double-X to be a symbol of Germany and Spain – due to Spain's colonial influence on Mexico, and because a German entrepreneur helped establish the Moctezuma Brewery, where the beer originated (p. 204). In his analysis of the logo, Pelkey goes on to claim that, "In the Cuauhtémoc Moctezuma Brewery and the Dos Equís brand, Germany meets Spain in the colonized territory of the Aztecs (and other indigenous peoples of Mexico)" (p. 205).

From the diamond type, Pelkey progresses onto argyle – a pattern that might evoke thoughts of socks and stuffy middle-aged golfers. Pelkey sees it differently: for him, the argyle pattern graphically achieves the effect of bringing together the diverse views of the collective. Both this and the diamond type put the One in contact with Other, and lead us "back into the

territory of complex integration and the self-forgetful fields of creative analogy" (p. 194). Overlapping lattice patterns like argyle are common across cultures, and Pelkey briefly traces them through the literature on Turing patterns and "form constants" that can be experienced during altered states of consciousness. These altered states might temporarily affect a person's sense of separation between self and other. The argyle pattern could be an abstraction of the self, surrounded by the masses. Pelkey states that the "general mode" of the argyle pattern is "inquiry" and the mood is "growth."

Toward the end, Pelkey refers to Merleau-Ponty (1968 [1960]), who treats chiasm as an "intertwining" that Pelkey says "is itself the beginnings of an escape route from the endless oscillation between self and other." Yet he also contrasts Merleau-Ponty with Sartre, in whose play No Exit (1989 [1944]) the character Garcin famously says that "hell is other people." Finishing with these two outlooks helps to underpin the significance of Pelkey's work in general, even if the comparison might not be wholly tenable, as it risks falling into the trap of dichotomization that the book seems to warn against. Attaining a deeper understanding of chiasmus may also give us a better understanding of ourselves, and our predilection for comparing and contrasting.

Pelkey envisages chiasmus as an important tool for "grappling with and feasting on" binaries, yet he questions whether or not "binary pairs are con- genial to human thought," as Lohmann (2010: 1) supposed (p. 223). While Pelkey ascertains that binaries are "congenital to human thought," he

believes they can only be considered “congenial” when they can be identified, problematized and depolarized. He applies this notion to inquiry in anthropology, where he says, “one must decide between anthropology as humanity and anthropology as science” – yet this attitude and dichotomy are prevalent across disciplines, and we could easily replace “anthropology” with any other field. In Pelkey’s reckoning, each of these forms of inquiry is necessary, and through recognizing how we can be hindered in pursuing one or other, it might be possible to allocate a place for both. If embodied agents are predisposed to divide up the world, then we need to be vigilant about how and why we make these partitions, and to become better at making adjustments.

Conceiving of chiasmus as a “fundamental mode of human modeling,” Pelkey also reminds us of what more is at stake and of interest in studying such a model: it not only changes how we undertake analytic and metacognitive processes, but also transforms our awareness as embodied agents who constantly navigate by perceiving spatial relationships. Though Pelkey gravitates towards the supposition that “X” markings tend to express a singular type of message or its dialectical opposite, the purpose of chiastic structures might also be to affirm the competition between the messages – not merely for the sake of revealing that they are at odds, and that this relationship cannot be sustained – but instead to confound any such fixed perception of the pair. Chiasmus can construct and deconstruct a proposition, all while keeping the original proposition visually intact. At the

syntactical level, chiasmus brings to light the interchangeability of things, the fluctuation and the drastic reversals that make up the ephemeral moments of life, and our reality. As embodied agents, we miss much through inattention, and there is robust evidence to show that we cannot attend to two objects, as in the phenomenon of inattentional blindness – but language in general, and chiasmus in particular, permits a workaround to this limitation. Syntactical chiasmus moves the subject and object, while also preserving an initial state and producing a convergence.

Pelkey's pioneering approach to chiasmus should engage anyone pondering our capabilities or limitations as thinkers and embodied observers. His elaborated typology stands as a useful grounding point around which rich dialogues can emerge to further our understanding of the symbology and signs we use. Finally, as Pelkey briefly remarks, coming to terms with the chiastic model might open new paths of inquiry into other possible worlds – which should be of interest not only for logicians and philosophers, but perhaps also theoretical physicists, neuroscientists, and designers of android AI systems.

It is notable that in thought experiments on this subject, we often think of other worlds as being composed of opposites – that whatever transpires here should not have transpired in another world. Pursuing further research on chiasmus could allow us to make strides in determining why we are as we are, and to confront the roots of our biases. Furthermore, recognizing the presence of these chiasms within and outside of us can become an impetus

to constructing alternatives. It may enable us to expand our outlook and transcend insular thinking.

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