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# INTERDISCIPLINARITY AND THE HISTORY OF WESTERN EPISTEMOLOGY

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*Abstract:* The development of interdisciplinary theory is problematic in several ways, not least the ambiguity inherent in the diverse conceptualizations and applications of the term. However, the focus in interdisciplinary scholarship on disciplinary negotiation, complexity, and integration allows for a more coherent approach to such developments. At its core, interdisciplinarity constitutes a unique approach to knowledge and therefore is involved in questions of epistemology. The idea of interdisciplinarity arises from and responds to the key epistemological strategies in the Western philosophical canon. These strategies, including logical determinism, duality and absolute truth, are examined in detail through a survey of primary works. This survey will help situate interdisciplinarity in the History of Ideas and begin to lay the foundation for a philosophically grounded theory of interdisciplinarity.

## Introduction

Although recent scholarship on interdisciplinarity has accomplished much in the areas of curriculum, pedagogy and methodology, the development of interdisciplinary theory remains in relative infancy. This is to be expected. The idea of interdisciplinarity is educative for the very reason that it is innately ambiguous and easily adapted to diverse suitors. In its malle-

ability, interdisciplinarity can, and should, mean different things in different contexts. Interdisciplinarity provides a crucial response to a paradigm shift resulting from the fundamental failure of disciplinary structures of knowledge to address contemporary conundrums. In the 21st century we are beset by complex problems that cross the boundaries of knowledge, culture, economics, politics, science, art, technology, and religion. The grand organizational structures that once delineated knowledge no longer suffice. In their breakdown interdisciplinarity promises a refashioning of our approach to knowledge. In the inherently infinite nature of this approach, cohesion has begun to emerge. The prospect of a theory of interdisciplinarity has coalesced around the concepts of integration and complexity. This paper is grounded in that scholarship.

Interdisciplinary inquiry involves the negotiation of disciplinary perspectives; each discipline has a perspective or worldview, distinguished by the phenomena it explores, the assumptions and methods it employs, and the theories it builds (Newell & Green, 1982, p. 25). Although cross-disciplinary borrowing has a long heritage, Newell (1998) asserts that explicitly interdisciplinary approaches to knowledge are a novel and innovative way of integrating disciplinary perspectives:

Indeed, the interdisciplinary motivation to seek a more comprehensive perspective would have had little urgency prior to the development of the distinctive worldviews of reductionist disciplines. Thus interdisciplinarity is appropriately seen as a response to the development of academic disciplines and the intensification of specialization that dates back to the late nineteenth century. (p. 533)

This response involves: loosening disciplinary boundaries, disrupting their existing frameworks, stimulating the exchange of ideas between their domains, and developing hybrid communities of knowledge (Klein, 1996, p. 36). “The rhetoric of interdisciplinarity calls for lowering disciplinary walls, opening gates between fiefdoms, and lessening tariff mentality. Even as new interests challenge and reconstruct boundaries, however, they are enmeshed in boundary work” (p. 56). The boundary work of interdisciplinarity is directed into the activity of integration, which is negotiated, situational, and contingent (p. 218).

Boix Mansilla (2006) identifies three approaches to integration utilized in interdisciplinary research—(1) conceptual bridging, (2) comprehensiveness, and (3) pragmatism—all of which involve decoding comparative disciplin-

ary epistemologies. Interdisciplinarity entails not only the interpenetration of disciplinary boundaries, but also more fundamentally, a meta-cognitive rethinking of the ways in which we restructure knowledge itself (Newell, 1998, pp. 535, 548).

Underlying all facets of the disciplinary perspective is epistemology. Epistemology is not merely a technique by which disciplines validate truth; it is how disciplines actually frame knowledge and “see” reality. Thus, interdisciplinary at its core integrates the conceptual frameworks of the disciplines themselves. How this conceptual integration occurs is the subject of much speculation and debate within interdisciplinary scholarship (Newell, 1998). However, as Klein (1996) insists, the interdisciplinary approach to epistemology is not reductionist, nor does it seek a grand unification of transdisciplinary truth claims. Rather, interdisciplinarity shifts epistemology “from absolute answers and solutions to tentativeness and reflexivity. In all interdisciplinary activities, some time should be devoted to examining the philosophical underpinnings of the challenge they pose to disciplinary approaches. Good interdisciplinary work requires a strong degree of epistemological reflexivity” (p. 214), yet this remains underdeveloped (Newell, 1998; Boix Mansilla, 2006).

Nonetheless, substantial groundwork has been laid for the epistemological ramifications of interdisciplinary integration. In particular, the idea of complexity has been proposed as a basis for interdisciplinary inquiry. In contrast to the tendencies of the Western epistemological tradition, complex systems:

are non-hierarchically structured. They obey multiple conflicting logics, employ both positive and negative feedback, reveal synergistic effects, and may have a chaotic element. To understand them, linear and reductionist thinking must be replaced by nonlinear thinking, pattern recognition, and analogy. ... Metaphors for describing knowledge have shifted from foundational and linear structures to networks, webs, and complex systems.” (Klein & Newell, 1998, p. 6)

Complexity is thus characterized as self-organizing, yet quasi-stable and dynamic (Newell, 2001, p. 2). Newell contends that because interdisciplinarity inherently involves the negotiation of disciplinary perspectives, it is the nature of interdisciplinary inquiry to focus upon how the behavioral patterns of complex systems achieve coherence through the dynamic interaction of their constituent parts (p. 21). Klein (2001) acknowledges that complexity

has long been a keyword in discussions of interdisciplinarity (p. 43). This provides the point of departure that this paper will explore.

## The Concept of Integration: Toward a Philosophically Grounded Theory of Interdisciplinarity

The concept of integration further differentiates interdisciplinarity from this epistemological tradition. Interdisciplinary integration is not simply the juxtaposition of multiple disciplinary perspectives. Rather:

By contrasting the ambiguities and assumptions of individual definitions, one can construct a higher-order, comprehensive meaning, accommodating discrepancies and integrating around identified commonalities. Resolution does not mean a false consensus or unity, as differences are neither reduced nor blurred. Instead, resources are marshaled for the task at hand ....The skills involved are familiar ones: differentiating, comparing, and contrasting different disciplinary and professional perspectives; identifying commonalities and clarifying how the differences relate to the task at hand; and devising a holistic understanding grounded in the commonalities but still responsive to the differences. (Klein & Newell, 1998, pp. 14-15)

This involves interdisciplinary inquiry in cognitive operations, which overcome the domination of any single perspective, and further synthesizes these perspectives into an ongoing dynamic interaction of understanding. This approach, in contrast to epistemological traditions, is a polyvalent movement, rather than a linear, deterministic goal. Furthermore, interdisciplinary theory implies that this cognitive operation of integration is a native tendency of the human mind, and well adapted to the complexities of reality (Nikitina, 2005, p. 414). The assertions and assumptions of complexity and integration have deep ramifications for the development of a theory of interdisciplinary, and thus are worthy of careful and systematic exploration.

The idea of "A Theory of Interdisciplinarity" is by nature paradoxical. There have been many contenders, but none have achieved substantial traction (Klein & Newell, 1996, p. 5). This is due, in part, to the ambivalence inherent in the interdisciplinary idea. Newell (2001) made one attempt in proposing complex systems theory as a model for an interdisciplinary research. He asserted that this theory adequately accounted for the dynamics of complexity embraced by the interdisciplinary approach to knowledge. This met

resistance not least on the grounds that the tenets of complex systems theory were disputed within its intended disciplines, and that its application as a universal approach to knowledge was inherently problematic (Klein, 2001, p. 45). Moreover, as Klein points out, a theory connotes a system of ideas, with supportive principles, which are testable within the domain in which the problem is posited. This reflexive epistemological turn undermines the external validity of any theory beyond its specified domain within a community of consensual knowledge, calling into question any theoretical claim of unity or universality. Thus, Newell's proposal constitutes "a modernist agenda in the midst of postmodern skepticism" in its very attempt to totalize the interdisciplinary approach to knowledge (Klein, p. 44). Theory is tested by its systematicity and commensurability, rooted in close observation of phenomena and yielding generalizable conclusions about how nature works; yet the interdisciplinary approach to epistemology explicitly accepts that complex phenomena are at least partially indeterminate. Complexity, says Klein, asks more of theory than it can deliver (p. 53). She argues that complex systems could aid interdisciplinary inquiry better in the guise of metaphor, than theory.

Initially, I was alarmed by these theoretical developments, fearing that establishing interdisciplinarity as a field focused upon complexity and integration circumscribed and limited its potential. A field implies fences, after all. However, the synthesis of complexity necessarily involves wide-ranging issues over how knowledge itself is developed, constructed and established. The epistemological foundations of the disciplines rest upon deeper and more ancient philosophical principles that transcend the development of the disciplines themselves. Interdisciplinarity, by challenging disciplinary structure, questions and responds to the epistemological ideas within which they are framed. The interdisciplinary critique of the disciplines, at its core, questions reductionism, in particular the divide and conquer strategy of isolating phenomena into discrete categories that each require specialized methods of inquiry. By insisting upon the disruption of these categories, the idea of interdisciplinarity asserts that the accumulation of knowledge cannot be limited by prevailing paradigms. Instead it offers an alternative approach that reconfigures not only disciplinary boundaries, but also the epistemological foundations upon which they rest.

In order to develop the possibility of interdisciplinary theory then, it is necessary to investigate these foundations in detail. Instead of the kind of top-down positioning of interdisciplinarity as a variation of general systems theory that Newell proposed, I propose to uncover the ways in which interdisciplinarity is involved in the History of Ideas. This more oblique

strategy will help interdisciplinarity define what it is not. This project is not meant to illustrate the ways in which interdisciplinarity is exemplified by polymaths over the course of Western thought, but rather demonstrate how the interdisciplinary approach to knowledge is an extension of and a response to the insights and problems developed within Western epistemology.<sup>1</sup> Thus, this paper provides an overview of key primary texts of selected canonical thinkers in the Western philosophical tradition. These thinkers collectively developed an epistemological framework, which characterize a particular approach to knowledge, which came to dominate the Western thought (Hutchins, 1952). This paper will concentrate upon three fundamental principles of that epistemological framework—(1) logical determinism, (2) duality, and (3) absolute truth. To be sure, there are other ways to characterize the Western philosophical tradition, and other issues such as ethics and ontology, with which that tradition is concerned. However, I will limit my inquiry to these three principles in order to make this initial survey more manageable, and because these principles are essential points of contention for interdisciplinarity, as strategies of reductionism.

Interdisciplinarity asserts that logical determinism, though not without utility, constitutes an attempt to simplify complexity into linear structures. Duality, as well, strives to reduce phenomena into the binary of polar opposites, and thus avoids the more pluralistic complexity that interdisciplinarity embraces. Finally, the notion of absolute truth runs contrary to the very spirit of the interdisciplinarity, positing some ultimate, perfect solution to complex problems, as opposed to the more fluid, dynamic and pluralistic epistemological strategies that interdisciplinarity implies. The identification of these three principles may, ironically, itself be seen as a reductionist; however, in the spirit of interdisciplinary inquiry, I see these principles as intertwined threads, which achieve synergistic cohesion.

Over the course of Western thought these three principles were established, built upon each other, and became transformed.<sup>2</sup> This analysis provides interdisciplinarians with a reasonably detailed account of the complexities of epistemological thought, which led up to theoretical assertions of interdisciplinarity. The development of interdisciplinary theory, as an epistemology of complexity, must emerge from an explicit and deep understanding of the problem of truth, and the ways in which this problem has been traditionally approached. Furthermore, demonstrating that the interdisciplinary idea arises from this tradition serves to situate it within the greater context of the history of ideas, supplying it with a genealogy and thus helping legitimize it as a vital approach to knowledge.

## The Quest for Certainty

The Western philosophical canon—here including Plato, Aristotle, Augustine, Aquinas, Pascal, Bacon, Locke, Hume, Kant, and Hegel—is involved in a “Great Conversation” of ideas that represent a profound examination of questions of being and truth, reflecting the ways in which acclaimed scholars worked through these conundrums towards higher refinements of understanding (Hutchins, 1952). These canonical figures investigated the paradoxical nature of human consciousness and its relationship with the world. In so doing they fashioned a collective epistemological paradigm within which this relationship was situated.<sup>3</sup> The unity of these thinkers, as a cohesive canon, has been traditionally asserted as composing a body of work essential to understanding Western thought itself. One such advocate was Robert Maynard Hutchins.<sup>4</sup> As Klein (2005) says, “Hutchins’s model and like-minded programs were grounded in a conception of knowledge that located the coherence and integration of all fields in an epistemological realism” (p. 32). Such notions of the unification of knowledge now seem antiquated and idealistic, but the development of interdisciplinary theory is nonetheless well served by an investigation into the origins of this tradition and the focal points of the interdisciplinary critique of this structure.

This tradition began with a few interconnected problems concerning the apparent schism between consciousness and reality. Because the human mind is endowed with the capacity for abstraction, we have the ability to separate our thoughts from material and temporal world, from immediate sensory input and instinctual reaction, into a world of reflection and rumination. Indeed, our abstract minds have the ability to separate ourselves from ourselves, to look upon our own existence as an object of awareness, an awareness that can withdraw into seemingly endless meta-levels of subjectivity. This propensity for meta-cognition characterizes the paradox of human consciousness—profoundly enlightening while deeply unsettling. It is the project of this canon to sort through this paradox with the intent of eliminating epistemological vertigo. In their native states, neither the human mind nor the world pervading it seem ever to sit still. However, for Plato, Aristotle and Augustine, recognition of the unsettled, transitory state of nature is deeply disturbing, a meta-cognitive realization that “*what is*” is not “*what should be.*” Augustine, in his *Confessions*, powerfully articulates this attitude:

For examining whence it was that I admired the beauty of bodies celestial or terrestrial, and what aided me in judging soundly on things

mutable and pronouncing, “This ought to be thus, this not”; examining, I say, whence it was that I so judged, seeing I did so judge, I had found the unchangeable and true Eternity of Truth, above my changeable mind. And thus by degrees, I passed from bodies to the soul, which through the bodily senses perceives; and thence to its inward faculty, to which the bodily senses represent things external, whitherto reach the faculties of beasts; and thence again to the reasoning faculty, to which what is received from the senses of the body is referred to be judged. Which, finding itself also to be in me a thing variable, raised itself up to its own understanding, and drew away my thoughts from the power of habit, withdrawing itself from those troops of contradictory phantasms; that so it might find what that light was, whereby it was bedewed, when, without all doubting, it cried out, “That the unchangeable was to be preferred to the changeable”; whence also it knew That Unchangeable, which unless it had in some way know, it had had no sure ground to prefer it to the changeable. And thus with the flash of one trembling glance it arrived at THAT WHICH IS. (VII.23, *caps in the original*)<sup>5</sup>

The members of this canon saw abstract awareness as a portal into a deeper understanding of what the world was *really* based upon—ideal structural patterns underlying the chaos of reality and the human mind. From this, a discernable epistemological agenda emerges, upon which all the thinkers of the canon elaborate, debate and struggle. As a result, the metaphysical tendencies of these thinkers advocated control over chaos, the reconciliation of its inherent disorder with a more static underlying order. This inverted the burden of proof from what was given by experience to what was abstracted from it and, because of the meta-cognitive separation of consciousness from the material and temporal, the abstract ideal was taken as the ultimate truth. From its beginnings in Socrates, this lineage sought to displace the alternative epistemological framework of mythological or metaphorical insight, and the poetic tradition through which it was expressed. Members of this canon took a decidedly reductionist approach to knowledge, and beginning with Aristotle, began painstakingly organizing and categorizing the phenomena around and within them into hierarchical matrices, in which all things were labeled and indexed into a schema of geometrically tabulated relationships. It is these very protests against the state of nature that makes epistemology necessary—epistemology arises from skepticism.

In response to these problems, the Western canon developed the three



epistemological strategies of logical determinism, duality, and absolute truth. These ideas continue to have a pervasive influence over contemporary discourse. In order to deal with complexity, both the strengths and weaknesses of every epistemological stance must be assessed and integrated into an overall approach to knowledge. The ambivalent stance inherent in the interdisciplinary approach to complexity regards attempts at unifying knowledge as essentially illusory (Klein, 2001, p. 48). Therefore, the interdisciplinary approach to complexity fundamentally negotiates the epistemological contexts within which we conceive of complexity itself. If the interdisciplinary approach to knowledge rejects the reductionist tendencies of this canon, these tendencies must be examined in some detail, with an eye toward the further development of its own epistemological strategies.

### *Logical Determinism*

A powerful epistemological strategy established in this canon is the application of logic and reason as a primary means of gathering and assessing knowledge of the phenomenal world. For its advocates, the notion that there is order to the cosmos presented a self-evident point of departure for their ideas about truth. They observed that nature possessed elegant taxonomies and patterns of change. Thus, they often perceived the changing world as an illusion, the bungling Fall of Spirit into Nature. Reason was their initial response to this problem. From this vantage they determined that there was logical order to nature, a configuration shared by human consciousness. By disciplining the mind, it could come to behold the logical procession of nature as she truly is—systematically organized, and changing within a determinate causal structure. This project, of course, did not come off without a hitch. As this epistemological line of thinking progressed, its rosy vision of a clockwork universe perceived through the lens of logic became increasingly problematic, and therefore their strategies for keeping this project intact became more contorted. It is important to the development of interdisciplinary theory to take account of logical determinism and carefully observe how this idea established and transformed itself over the course of this lineage.

Plato believed that without rational order, there could be no truth, and thus no knowledge (Reeve, 2003, p. 26). Knowledge is the ability of knowers to render reasoned explications of what they know, to define their terms within a logical set of criteria, effectively tethering opinion and stabilizing it through reason (Prior, 1998, pp. 106-107). Indeed, Socrates' overall strategy for determining truth, the dialectic, aimed at pinning down explana-

tions about phenomena into basic, indisputable terms. For Plato, this logical imperative was not merely a function of the mind, but was embedded in the cause and effect scheme of phenomena itself. Aristotle established this chain of reasoned causality as a primary epistemological strategy, which continues to act as a standard for truth to this day. This strategy addressed both the causal structure of nature (assumed to be inherent in the phenomena themselves) and the logical structure of the human mind, reducing the investigation of reality to the art of syllogism, where, like geometric proofs, demonstration proceeds from what is certain and prior toward an inevitable conclusion (Aristotle, *Prior Analytics*, 41b, 64b).<sup>6</sup> Aristotle believed that there was inherent in human consciousness the matrix for causal determination, a logic within which the universe could be formulated by a well-disciplined mind, and which reflected the logical organization of the phenomena found in the external world (*Posterior Analytics*, 92b, 99b).

Augustine can be credited with establishing the syncretism between Greek and Christian thought that came to so characterize Western epistemology. He saw in Socrates the grasping at an eternal and ultimate cause of all being, reducible to the act of the one true God (Augustine, *City of God*, VII.3). By tethering the origin of natural phenomena to the story of Genesis, he established creation of being as a singular event from whence all of time could be traced through a genealogical chain of causality. Aquinas further augmented Augustine's syncretism by adapting Aristotle's explanatory principles to his own philosophical scheme (Ross, 2003, p. 147). He asserted that a well-disciplined mind is necessary to understand things "as they are," fixed upon more mathematical faculties, as a means of reducing the changing world into a more finite and stable order (p. 156). Reason allowed for the systematic separation of truth from falsehood, based upon the law of non-contradiction and the recognition of first principles (Williams, 2004, pp. 506-507). Aquinas posits the ideal of perfection, which in essence involves a return to unity from the corruption of material diversification. Human intelligence is meta-cognitively aware of this process, and yearns for its reconciliation. This desire is deeply imbedded in consciousness, but grants epistemological guidance only through contrast. Humans are doomed to gather truth conjecturally, by reasoning probable cause and effect (Aquinas, LXXXVI.4).

For the interdisciplinary approach to epistemology the ways in which Augustine and Aquinas deal with determinism is instructive. It illustrates the synthesis of two distinct epistemic traditions, which struggle with each other while attempting to achieve common ground. The mixture of logical deter-

minism with the divine will of God represents an epistemological power play, wherein determinism is bestowed with authority without undermining the supremacy of direct intuition or divine revelation. Interdisciplinarity is often faced with similar paradoxes when attempting to form holistic understandings of complex problems, where contrasting epistemological approaches come into conflict. Examining the ways in which the members of this canon deal with epistemological conflicts help put the problems inherent in the development of interdisciplinary theory within a useful historical context.

In Descartes, we see a mind willing to take the conceptual orientation of determinism to its logical heights. For him, truth could only be derived through deduction, a mathematical purification of experience. His epistemological aim was to accept nothing more than what was presented to the mind so clearly and distinctly that it was indubitable, and reason systematically and exhaustively from this infallible position (Descartes, *Rules*, II). This constituted a kind of natural light that apprehended reality in terms of cause and effect, as a progression from the deficient to the perfect (*Meditations*, III). Descartes offered a new vision of causality, comprising not simply the formal steps of a deterministic chain, but also knowledge of the organizing principles underlying the interdependence of its elements (Jones, 2001, p. 60). In the end, Descartes founded these causal patterns of phenomena on the omnipotent God, declaring that the laws of nature were enshrined in eternal truth. These laws are deemed immutable because God's will is immutable (Oakley, 1998, pp. 673-674).<sup>7</sup>

In response, Francis Bacon established empiricism, the determination of truth through the inductive method of reasoned observation (Bates, 2001, p. 10). This replaced the linguistic logic of syllogism with a method of devising effective formulae for describing and experimentally reproducing natural processes (Faulkner, 2003, p. 210). Bacon's approach conceptualizes objectivity as a vantage point attained by a disciplined mindset able to neutralize its own interference in observing reality. While Descartes turned this objective neutrality inward, Bacon externalized it, using logic and reason as a means of understanding reality without getting tangled up in it. Reality changes, but understanding must keep itself steady. For Locke, causality is derived not from the motions of the external world, but from the succession of ideas passing through the human mind. When the mind cannot bring ideas together through immediate comparison, it fills in the gaps by demonstrating the agreement or disagreement of intermediate ideas through logical proofs. This is reason (Locke, IV 2.2). Locke emphasizes objectivity, the

imperative to collect and weigh evidence from a position of indifference, to separate cognizance from comprehension. Yet, sensory knowledge is itself suspect—filtered and uncertain. For Hume, this was the central epistemological conundrum (Cunningham & Fitzgerald, 1996, p. 42). The different operations of mind must be put in order, so that accurate and just reasoning will prevail. Following Locke, Hume saw causal determinism primarily as a cognitive process. Learning proceeds largely through association, the mind perceives repeated patterns of behavior and resemblances between particular objects, and then abstracts relationships between phenomena into habits of thought that have descriptive and predictive application (Wilson, 2003, pp. 292-293). He recognized that the human mind had an agenda, seeking to make reality reasonable by organizing it into causal chains and generalized relationships. As useful as these schemas might be, Hume was not convinced that they represented structures inherent in the phenomenal world. In his judgment, reason could not, by its own rules, verify logical determinism.

Although the empiricists seem to rebel against the logical determinism of this canon, they are nevertheless ensconced within it. Their methodology of careful observation is based upon the premise that the mind distorts reality, and therefore the natural disposition of consciousness must be disciplined into order. The empirical critique of logical determinism is an important impasse for interdisciplinarity, for it is an early example of the meta-cognitive reflection on method that is crucial to interdisciplinary inquiry (Berg, 2004, pp. 4-5). The empiricists demonstrated that determinism constitutes a particular approach to reality dominated by mathematical rules. These rules attempted to stabilize our perceptions of reality by fixing it into formulae of causality. Although identifying these causal patterns may help us organize and understand the phenomenal world, they are simply tools for human awareness, and do not necessarily reflect reality. This has two implications for interdisciplinarity. First, that the epistemological strategy of logical determinism has utility in structuring some complex problems. And second, that interdisciplinarity's more fluid and dynamic approach to knowledge has deep roots in the Western tradition.

Kant could not bear the impasse left by the empiricist declaration that the human mind was a blank slate filled with reality distorted through experience. He sought to connect consciousness with reality precisely and decisively. In doing so, he devised a comprehensive critique of logical determinism, in order to define the limitations as well as the potentials of consciousness. For Kant, logic was an illusion, illustrating the form but not the content of cognition, able to maintain or oppose with semblance of truth

any single assertion whatsoever (Kant, Second Part III). Kant explores the connection between the logical structures of the mind and the organization of reality itself in a sophisticated and nuanced way. Reason, as abstraction, has the capacity to extrapolate principles that might not correspond to reality, to imagine chains of causality that surpass verifiable experience. Truth is an epistemological act wherein reason makes decisions about reality, based upon its logical rules of order. For Kant, all these rules were suspect, presuppositions of the logical mind outstripping its empirical bounds. Yet, surely reason could not expect its suppositions to have an effect on the world of experience unless its ideas were consistent in some way with reality (Second Division Book II 2.7). Kant's tautology here is persuasive—indeed, how could we know something unless we were predisposed to know it, and unless there was something there to know? To deny this, one must assert that reality is nothing more than a phantasm solely within consciousness. Even Descartes could not fully stomach this assertion. The logical structures of cognition and the causal structures of the phenomenal world must therefore be connected in order for human beings to function at all. However misconstrued this relationship might be, there is for Kant an inalienable connection between reality and the way we make sense of it.

The simplicity of logical determinism was for Hegel hopelessly idealistic, fragmenting objects and reinstating them through demonstration. His method was a peculiar inversion of syllogism. Instead of a conclusion deriving from the universal to the specific, he proceeded from an ongoing synthesis of opposites (Findlay, in Hegel, 1977, p. ix). This was a different kind of causal progression, alive and fluid, where phenomena were determined by what they were not, and the dynamic of distinction brought about higher and higher levels of knowledge (Hegel, §171).<sup>8</sup> For Hegel, the process of thesis, antithesis and synthesis is a dynamic logic, tumbling over itself toward a final reconciliation of the mind and reality. Hegel argues that our experience is grounded in the perceived regularity of the natural world (Westphal, 2003, p. 167). We can only achieve self-consciousness if experience “provides us a sufficient minimum, humanly detectable degree of regularity and variety” (Westphal, 2006, pp. 287-288). Thus Hegel, in an ambivalent way, affirms that being has a causal structure not necessarily determinable through logic, without denying that logic may have importance to this structure, and without denying the existence of an underlying reality of phenomena.

Here at the end of our epistemological lineage, the hopes of logical determinism, of the reasonableness of reality, are left unsettled. The perfect ideals of geometry, of truth through mathematical clarity, become convo-

luted within the debate over subjectivity and objectivity. Although a point of contention within this canon, the power of determinism persists to this day. Most disciplines in the natural and social sciences utilize determinism as a crucial epistemological strategy. Thus, the power, and indeed, fruitfulness of the rational approach to epistemology cannot be dismissed in any development of interdisciplinary theory. As a negotiation of epistemologies, interdisciplinarity must recognize logical determinism in its synthesis of disciplinary perspectives. Conversely, interdisciplinarity recognizes that logical determinism represents a powerful strategy of reductionism—an attempt to contain the dynamic complexity of reality and consciousness within a linear progression, a phenomenal flow chart broken down into discrete, defined steps. Interdisciplinary integration, by contrast, utilizes non-linear techniques that are neither routine nor formulaic, but rather recursive and iterative. “The guiding metaphors shift from foundation and structure, implying a fixed body of knowledge, to an evolutionary process in which the body of knowledge changes as modifications are made” (Klein, 1996, p. 221). Interdisciplinary theory contends that the phenomenal world should be examined in its native complexity, which is neither stable nor deterministic, ephemeral or random, but rather is evolving—intelligible without being strictly predictable (Newell, 2001, p. 9). Logical determinism, when it is employed as a dominant epistemological framework, stifles this complexity and mystifies its uncertainty by claiming its certainty and predictability. However, this critique of reason is not mere dismissal. The problem of this epistemological tradition is imbalance, privileging logical order to such an extent that it begins to impose itself on reality while simultaneously alienating itself from that reality, and without having established that phenomena have such inherent reality. Interdisciplinarity, in contrast, accepts both order and chaos, reason and the irrational, as concurrent facets of a more complex, dynamic holism and is open to the dynamics of the nature of any essential reality in relation to its constituted shadow (Welch, 2007). Logical determinism in this light is part of the epistemological toolbox of the interdisciplinarian, balanced within a multiplicity of methodological avenues useful for inquiry.

### *Duality*

Chains of causality and the logic of the disciplined mind constitute an imperative for reductionism that sought to organize phenomena into the simplest structures conceivable. Accordingly, duality also pervaded the epistemological strategies of this canon. This was accomplished by placing phenomena

within pairs of polar opposites, a system that governed their epistemological frameworks. This fixation upon “twoness” is understandable, not only because of its mathematical power (there can be nothing simpler than duality within any system of distinguishable parts), but also because it is a fundamental way in which the phenomenal world is organized. The problem is not that this canon imposed an alien order upon reality, but rather that they clung to more ordered tendencies of phenomena and projected these tendencies as universal law. Duality made the complexities of the phenomenal world more manageable by reducing it into basic, static simplicities.<sup>9</sup> As the project of this canon progressed, this strategy became more and more problematic. Interdisciplinary theory in part arose in response to the breakdown of dichotomy, concerned rather with reframing epistemology in a more multifaceted way. Such a project is well served by an investigation of the epistemological traditions upon which its own theories are inevitably built, an investigation conducted in the interdisciplinary spirit of both critique and appreciation.

Plato contended that everything has one opposite only and no more (*Protagoras*, 332).<sup>10</sup> Furthermore, he declared that words were either true or false, that meaning could not simply be relative to the perspective of the “knower” (*Cratylus*, 385). This assertion establishes epistemology on an either/or footing—there is truth, one truth, in any given binary paradox, and the determination of this truth is a process of separating the eternal and static from the material and transitory. Plato formulated this as a fundamental duality between body and soul (Dorter, 2003, p. 15). This entails an epistemological distinction between what we perceive through our corporeal senses and what our abstract consciousness asserts as truth.

Aristotle was similarly engrossed with the structure of opposites, understanding that phenomena were most often defined by what they were not. Change itself implied a pair of opposites, a dynamic interaction within which phenomena manifested themselves, structured by the dichotomy of a positive state versus its privation (*Physics*, 227a; *Metaphysics* 1067b). Although Aristotle saw that the dynamic of polar opposites involved an epistemological give and take, he sought to establish a sure footing for truth by contending that between opposites there was a “Golden Mean” wherein these dynamics achieved static equilibrium (*Nicomachean Ethics*). In the ideas of the Ancient Greeks, the notion of duality is established as an essential epistemological structure. It is necessary for interdisciplinarity to take stock of the power of this idea while assessing its utility, to acknowledge its epistemological potential while avoiding its reductionist tendencies, simultaneously observing how this idea transformed itself.

Augustine was completely enamored with the idea of duality, and applied it to the very structure of the universe (*City of God*, VIII). Human consciousness is caught between the divine and the corrupt, possessing both spiritual and corporeal vision. Augustine saw the dual nature of human existence as involved in the intermediate dynamic of opposites, but he, like Plato and Aristotle, could not bear contradictions to coexist. Thus, he sought to resolve the conundrum by decisively forsaking the bestial and material for the angelic and divine. Following along these lines, Aquinas elaborated upon the dualism set up by his canonical forebears. Opposites are known through each other, as darkness is known through light. Thus the perfection of the universe requires imperfection, so that every grade of goodness could be realized within time (XLVIII.1-2).

Aquinas believed that spirit forms matter, as a transcendent patterning upon which the corporeal attains manifestation—the soul organizes matter into life and this bestows the human animal with consciousness (Ross, 2003, p. 156). The line between intellectual virtue, whereby reason is perfected, and divine virtue, where the mind is united with God, becomes blurred for Aquinas (Williams, 2004, p. 512). In his attempt to reconcile them, these two higher faculties of consciousness end up tumbling over each other in an unsettled struggle for epistemological supremacy.

Pascal was more than happy to settle this dilemma. He saw human nature as essentially bifurcated between the state of grace, the spiritual endowment of God unto man, and the state of corruption, our bestial, mundane existence (Pascal, 434).<sup>11</sup> Within our dual nature is our inherent acknowledgment of corruption—we know the divine through understanding how our existence has fallen from it. Pascal's epistemology insists upon the primacy of divine, immediate intuition over the discursive reason. This schism between sensory experience and divine intuition was a pivotal paradox for the epistemological strategies of this canon. Augustine, Aquinas and Pascal constitute a particular movement within this lineage, intent upon bestowing the epistemological dominion of God over man, eternal over mortal.

Descartes' basic dichotomy was that of body and mind. He sought to make sense of the seeming schism between corporeal and spiritual existence by acutely defining the way in which these two facets of human existence presented themselves to consciousness. For Descartes, human consciousness possessed the innate ability to make sense of reality. Like an epistemological seal, sensory input was impressed upon the wax of consciousness, a mixture of bodily and eternal senses (*Rules*, XII). Between sense perception



and its apprehension by the mind, there is a moment of translation in which the bodily sense might lose track of reality as the mind forms an idea of it (*Meditations*, II).

Descartes considered sensory experience with suspicion, as something that clouded reason and limited human knowledge. Because our minds have the freedom to wander from material anchors in time and space, it is always possible to formulate doubt about apparently self-evident perceptions. Descartes fathomed the meta-cognitive realization of the problematic relationship between subject and object, but positioned abstract consciousness over sensory perception, with intuition as an intermediate faculty negotiating epistemologically between them (Bagger, 2002, p. 208). His mediating sense of intuition is informative for interdisciplinary theory, for subject/object dualism is, in fact, permeable and oscillating. If interdisciplinarity is to find some footing in the discourse of truth, this decisive juncture in epistemology demands a resolution. The meta-cognitive abilities of our mind recognize both a conjunction and disjunction with the phenomenal world. Interdisciplinarity cannot decide this in either/or fashion, but must rather synthesize the dispute.

In Bacon's view, the Western canon to that point was far too contemplative, fixated upon metaphysical principles and fundamental truths, rather than determining the nature of the objective world through empirical science (Faulkner, 2003, p. 213). Bacon sought to correct this by privileging objective knowledge in his dualistic scheme. Sensory perception may be limited, but for Bacon it is our surest path to truth (Bates, 2001, p. 10). However, sensory perception is not the totality of understanding; we possess the ability to identify connections and analogies extrapolated from our bodily senses. And here Bacon was caught in the paradox of dualism. Understanding is an act wherein consciousness processes sensory input and in doing so alters it. Although consciousness possesses the inherent ability to transgress a pure apprehension of reality, it is also the conduit for our knowledge of reality, the way we make sense of our perceptions. Still, for Bacon's dualism, there was no attempt to dynamically balance the subjective/objective schism. Rather his work attempts to produce a methodology that perfects the translation of object to subject, and thereby determines epistemological certainty.

Locke fundamentally questioned the ability of the mind to know it is making sense of reality. He rejected the metaphysics of his canonical forebears and bluntly asserted that there were no innate principles in the mind (Locke, Book I 1.2). The dualistic split between mind and body was absolute for Locke, and subjective conceptions, such as the objects of mathematics, were

purely rational and had no necessary bearing upon reality (Book I 1.22). His investigations into the relationship between reality and the mind led to an almost phenomenological breakdown of the mechanisms of consciousness. The senses let in ideas, which are lodged in memory and labeled. From this storehouse of sensory data, the mind abstracts generalizations and assimilates patterns of organization (Book II 1.2). Although objects do exist because they stimulate our senses, our abstract understanding of them constitutes an addendum, an extra layer of perception. For Locke, there was no necessary connection between reality and consciousness other than an apparent conformity between the two (Book IV 4.3, 11.1; Chappell, 2003, p. 261).

Hume further elaborated on the dualism of ideas and impressions. Although consciousness seems unlimited, in actuality it is narrowly confined to the modification of materials afforded by sense and experience (Hume, §13). Hume asserted that moderate skepticism is necessary to inquiry, that doubt, caution and modesty should accompany every just reasoner (knower), and that any philosophy not supported by empirical evidence should be discarded (§132). However, skepticism is not a damnation of our inability to cross the appearance/reality divide, but rather an argument that we are incapable of securing anything valid upon which to ground the activity of judgment (Callanan, 2006, p. 372). Empiricism effectively inverts Cartesian dualism, contending that the reasoning mind distorts reality and mistakes its abstractions as a higher level of truth, rather than allowing reality to dictate truth through a refinement of sensory perception (Pitt, 2005, pp. 346-347). The empiricist school provides a context for the interdisciplinary negotiation of knowledge. The meta-cognitive awareness of the subject/object dichotomy places its poles in flux. We become aware that our minds are actively producing knowledge while passively experiencing the phenomenal world. This epistemological reflexivity is critical to the interdisciplinary approach to knowledge (Klein, 1996, p. 214).

Kant sought to reestablish the basis of the metaphysical tradition by demonstrating that a connection between the dual natures of the mind and reality must exist in order for experience to happen at all (Kant, Preface to the Second Edition). However, he asserted that the relationship between these two elements must be distinguished. The spontaneity and diversity of thought requires careful examination and discipline. This discipline comes from a meta-cognitive awareness of the process of conscious experience. We synthesize experience by joining together representations into a single cognition, but this knowledge is *pure (a priori)* only when it is derived previous

to our analysis (First Division, Book I §6). This “transcendental idealism” does not deal directly with the objects of experience, but investigates the dynamic of phenomena and consciousness through the examination of the mental configurations that make such a relationship possible. This intricate and inextricable synthetic relationship between subject and object is the basis for Kant’s transcendental epistemology, setting out conditions that must obtain if self-evident aspects of our experience are to be possible. Kant attempts to integrate subject/object dualism by affirming that, in order for us to be aware of the phenomenal world, we must have at least some empirical knowledge of the world around us (Westphal, 2006, p. 286).

Hegel explored dualism with even more nuance, refashioning the dialectic into a sophisticated system in which polarity itself formed a process of mediation whereby epistemological conundrums were to be settled. Hegel saw that epistemology could not get caught up in the binary of truth versus falsity—at least not initially. The basic duality of phenomena is more fluid, involved in tumbling organic unity, wherein opposites are not mutually exclusive, but rather their antithesis to each other actually allows for their manifestation, and their dynamic relationship inevitably leads to synthesis unto higher systemic states (Hegel, §2). Hegel contends that the process of reflection, the back and forth movement between polarities, is itself necessary to the unity of subjective and objective knowledge (Findlay, in Hegel, 1977, p. 497). Consciousness distinguishes itself from something while simultaneously relating to it, and this process is *knowing* (Hegel, §82). According to Hegel, the history of epistemology began with the subject and object schism, and then lapsed into a fixation of certainty upon one or the other pole (§101). However, in actuality, consciousness and reality are perpetually adjusting to each other, being tested and transformed (Findlay, in Hegel, 1977, p. 507). Objects are conditioned by opposition and pass over into their unity, which directly unfolds its diversity, returns again to unity, over and over in a kind of spiral staircase of higher and higher assimilations of truth. Eventually, consciousness becomes aware of itself as a mediating agent; therefore, the unity of consciousness is the unity of subject and object explicit in thought itself (Hegel, §549). Hegel’s phenomenology culminates in his notion of Spirit, wherein the two poles achieve their ultimate synthesis, reconciling the paradox of dualism. What emerges from the cycle of thesis, antithesis and synthesis is not a descent into more abstract obscurity, but rather a series of complications in which consciousness discards layers of obscurity between reality and itself, revising its conceptions unto the perfect conjunction of subject and object that is Spirit (Findlay, in Hegel, 1977, pp. 376-377).

With Hegel, the either/or framework of subjectivity and objectivity, which held such sway over the epistemological debates within this canon, becomes, at last, fluid and dynamic. Hegel represents an attempt to demonstrate how previous approaches to dualism could not capture the epistemological nuances of the relationship between consciousness and reality. He chose neither extreme of this polarity, but rather focused upon the dynamic between them. In doing so, he continued this tradition's fixation upon twoness, however intertwined and dynamic, as a primary structure of truth. This approach entails a decision to position the binary as a dominant epistemological structure.

For interdisciplinarity, this decision cannot go unquestioned. Dualistic thought pervades common notions of truth, and constitutes another strategy of reductionism powerfully imposed by this canon. Interdisciplinarity recognizes that consciousness, reality, and the relationship between them is inherently complex, entangled in myriad relationships which often do not conveniently conform themselves to dichotomous structures. It explicitly rejects the either/or framework this canon attempted to establish (Newell, 2007). Thus the interdisciplinary approach to knowledge embraces both/and thinking—"the nature of reality is singular and multiple, objective and subjective, as well as particularistic and holistic. Similarly, the paradigmatic assumption regarding the nature of truth is that the world is stable and dynamic" (Stember, in Newell, 1998, p. 556). The work of the empiricists, and that of Kant and Hegel, intimates that the organization of phenomena exists within a state of dynamic equilibrium, a creative tension structuring itself in the midst of its dissolution.<sup>12</sup> Nevertheless, the legacy and power of duality is such that it is difficult to fathom reality in any other way. However, the interdisciplinary approach to knowledge refuses to simplify complexity, and thus demands a more sophisticated level of synthesis than this canon envisioned. Interdisciplinarity is involved in an epistemological dynamic that is able to construct its frameworks both within and beyond duality.

### *Absolute Truth*

The epistemological strategies of logical determinism and duality are facets of an overall project of this canon to stabilize truth within reductionistic structures. They sought out fixed standards by which a distinction between truth and falsehood could be infallibly judged. This led them early on to postulate an essence underlying reality in a metaphysical realm, eternal and unchanging. The notion of absolute truth may seem more an epistemologi-

cal goal than a strategy, but this idea led to the techniques of metaphysics and objectivity, which pervaded this canon. For these thinkers, the concept of absolute truth is an inherent propensity of the human mind, evident in its capacity to perceive general and predictable patterns in nature. This intimated that there was a kind of epistemological rudder embedded in human consciousness, an innate understanding of the fabric of the universe only possible through the benefit of an incisive intellect and/or the blessings of divine revelation. Our capacity for abstract thought is the product of a rarified relationship with the cosmos and the creative forces underpinning it.

In retrospect, such notions seem idealistic, the intellectual projection of an ultimate, unseen order tautologically verified through faith or reason. And indeed, this notion became gradually more problematic as this canon developed, undermining metaphysics without dismissing it entirely. The notion of absolute truth, though it may seem naïve or even dangerous to 21st century thought, nonetheless retains a powerful sway over the human mind, as well as human emotion. Interdisciplinary theory rejects absolute truth as radically reductionistic, an impediment to the ongoing investigation of complexity in its native plurality. However, this canon, in exploring absolute truth, uncovered a deep and richly complex understanding of consciousness and reality. Although interdisciplinarity may dismiss absolute truth as an epistemological goal, it is well served by acknowledging the power of this idea, and appreciating the nuanced ways in which it is developed and transformed in this canon. It also behooves interdisciplinarians to understand this canon as it forms the roots for much of what subsequently becomes a hegemonic political challenge to the existence of interdisciplinarity (Augsburg & Henry, 2009).

Plato sought to establish secure epistemological ground through reason, which draws upon the superior rational principle of the soul (Plato, *Republic*, 602-603). For him, notions of the unchanging, divine, pure and unalloyed essences of the cosmos were not mere images in the mind, but realities reached through the ordering of the intellect (*Symposium*, 212). These constituted ideal forms, the metaphysical patterns of reality, upon which the phenomenal world manifested itself in space and time. Truth is established dialectically when one is able to abstract and rationally define the ideal under inquiry, and disprove all objections through unfaltering argument. For Plato, we have direct prenatal knowledge of the forms, and return to communion with them once our memories have been appropriately jogged through the method of the dialectic (*Phaedo*, 73; Reeve, 2003, p. 24; Dorter, 2003, pp. 13-14). Plato's forms constitute an assertion that truth is absolute, a founda-

tional substratum of reality, reflected in the structure of consciousness. Dialectical reason was a means of slicing through the unpredictable dynamic of the phenomenal world, in order to directly commune with the eternal, static laws upon which it rested.

Although Aristotle rejected Plato's ideal forms, he pursued an epistemological strategy based upon the scientific discovery of universal principles—an essence he called substance (996b-997a). This metaphysical substance is immanent both in the nature of the phenomenal world and human consciousness, which share the common essence of soul. Matter is an actualization of this pre-existing substance, an irreducible structure that manifests itself into the organization of material elements. Following Plato, Aristotle fundamentally shifted epistemological investigation unto a rarified dimension of pure intellect. He held that our conceptualizations of objects must be ontologically basic, or else the true nature of reality would be fundamentally elusive, and the central project of metaphysics would be impossible (Loux, 2003, p. 44). Although the metaphysics of absolute form attempts to simplify the complexities of epistemology, it nonetheless illustrates profound insight into the nature of consciousness. What led the Ancient Greeks to formulate metaphysical ideals is a formulation of our cunning ability to out-think nature by understanding its underlying structure. However, this canon took a radical approach to understanding. Logic and duality were simply organizational techniques toward their goal of comprehending nature finally and completely. This obsession with absolute truth, though smacking of hubris, nonetheless recognizes that human consciousness has a deep relationship with the nature of the phenomenal world. Their compulsion to investigate truth to its ultimate conclusion drove this canon to discover how limited and strange this relationship actually turns out to be.

For Augustine, absolute truth is attained through direct communion of the soul with the light of God. Man's immortal soul is impregnated with God's immanent understanding of his own creation (*City of God*, X.3). Thus, true understanding is achieved from union of creature with creator. Like Plato's recollection, truth is consciousness recovering the forgotten memory of what it was before man's fall into the corrupt mutations of the phenomenal world. Recollection implies recognition, an experiential moment when the truth actually pierces through the cloudiness of mundane understanding, a revelation that constitutes the grace of God bestowed upon, yet related through, mere mortal intelligence (XI.11). Absolute ideals are inherent in consciousness because it possesses a deep awareness of its shared being with God. Augustine's epistemological foundation rests upon the sacred and

infallible truth of the “Word of God” (Koch, 2000, p. 49). His method is abstraction, not as in the positing of a separate realm of ultimate knowledge existing apart from the phenomenal world, but as a transcendent realization that objects in the phenomenal world were based upon divine organizational structures that constituted their essence and the source of their existence (Miles, 2007, p. 53).

Aquinas also held that absolute truth is gained primarily through revelation (Aquinas, I.1). Some truths, such as arithmetic and geometry, proceeded from the natural light of the intellect, while the higher truth came from the principles of God (I.2). Revelatory wisdom surpasses all other faculties of consciousness—in fact, faith perfects reason (I.8). Aquinas reasoned: God, as the author of the intellectual power, can be seen by the intellect. Therefore, in order to see God, there must already be some likeness innate in consciousness that allows it to bear witness to the divine (XII.2). The world was made through the agency of God’s intellect, and thus there must be in the divine mind a pre-existent form from which the world was patterned, and in this the notion of the ideal consists (XV.1). Within the intellect there is the illusion of contradiction, but in reality truth must be immutable and absolute (XVI.8). Truth takes place through the senses apprehending things as they really are. Although the intellect creates falsity by composing and dividing reality, falsity identifies by contrast what a thing is (XVII.2). Aquinas, like his forebears, asserts that man understands because the intellectual principle is inherent in his form, participating in the divine, uncreated light, in which all eternal ideals are contained (LXXXIV.5). In Aquinas, epistemology is based upon illumination, an assimilation of the senses with the divine, and a mystical union of the mind with God, which, though culminating in revelation, is still inherent in the ordinary, mundane thought processes of human beings (Williams, 2004, pp. 507-511).

Pascal viewed the epistemological conundrum in this canon with absolute clarity—man’s true bliss is to be in God, and to be cut off from him, the sole source of our ills. God created man holy, innocent, perfect, filled with light and understanding, directly present in God’s glory and the wonders of his creation (Pascal, 430). Pascal advocated the combination of reason and religion, for without religion there would be nothing mysterious left to reason, and without reason, religion would seem absurd and ridiculous (273). Reason must realize that there are things beyond its understanding, accepting that faith is an epistemological necessity for absolute truth (267). Proof is different from faith—one is human and the other a gift from God, who utilizes proof as an instrument for understanding. God is an immanent,

hidden presence within the world, and although it is not possible to realize God fully or directly, one recognizes the loss of God's presence. This strange epistemological flux between knowing and not knowing, not knowing what is known, and knowing what is not known, is at the core of this canon's epistemological paradox.

In hindsight, Pascal's arguments may seem like a desperate attempt to shore up a failed epistemological tradition—his work struggles to maintain the vital connection between human consciousness and an absolute metaphysical dimension to reality that is immanent, transcendent and fundamental. It acknowledges that consciousness and reality share an underlying order, and that these patterns can be best accessed and comprehended through spiritual means.

As a negotiation of epistemological perspectives, interdisciplinarity cannot fail to take into account the Christian position on truth. The power of a direct, spiritual connection to absolute standards for truth persists to this day, and engages itself in contemporary discourse over numerous real-world problems. Therefore, interdisciplinary theory, in forming a synthetic approach to complexity, must acknowledge the power of Christian absolutism from both a critical and pragmatic stance, recognizing its dangers while appreciating its influence.

Descartes pursued the imperative for an infallible method for truth, obsessed with the idea of certainty based upon the abstract purity of geometry. Just as the idea of a triangle or a sphere could be perfectly held within the mind, the ideal of the Perfect Being could achieve the same level of self-evidence (*Discourse*, IV). Within consciousness, one idea may lead to another, but must ultimately arrive at an irreducible principle. Like others in this canon, Descartes posited epistemology in the negative—we know absolute truth though our intrinsic capacity for doubt and the consequent desire to achieve it (*Meditations*, III). Truth manifests itself experientially as a kind of cognitive dissonance. Within our will is the capacity to choose the truth, to realize the infinitude contained within our conscious awareness. In this way error may be avoided, because truth and existence are unified in the realization of "I am" as a necessary truth. Once this cognitive vantage has been established, one can seek to understand the patterns in the phenomenal world (Grosholz, 2003, pp. 224-228).

As opposed to the mysticism of Pascal and the introverted idealism of Descartes, the empiricists grounded their epistemological system on the close observation of the phenomenal world. For Bacon, a mind turned in on itself spins fine and elegant cobwebs of no substance. This made the es-



establishment of absolute truth much more problematic, for the nature of the phenomenal world is essentially transitory. However, Bacon was not completely prepared to dismiss metaphysics altogether, claiming that all knowledge must overcome individual experience, as much as the conception of truth would permit (*Advancement of Learning*, IV, 5-6). Human understanding is by nature prone to abstraction, supposing that which is fluctuating to be fixed. According to Bacon, it is better to dissect than abstract nature through empirical experimentation (*Novum Organum*, First Book, 51). Empirical discipline brings the senses under control and allows recollection of the true state of reality to be accomplished. Bacon is a transitional figure for the empiricists, combining the discipline of careful observation and experimentation with an innate understanding of the metaphysical realm of universal principles.

Locke asserts that the mind is best employed according to its capabilities and limitations, and should avoid assertions of certainty where there are only probabilities, while conversely avoiding the pitfall of Cartesian disbelief (Introduction 5). Truth is not engraved upon the mind, but requires the employment of reason and discourse—it must apply itself to reality (Book I 2.1). Locke also acknowledged that ideas are often implied by their absence, and the recognition of this distinction can be used as an epistemological guide (Book II 21.37). However, he confesses that pure epistemological certainty of objects and the forms underlying them is impossible for corporeal beings. For Locke, the metaphysical doctrine of immutable essence is only an abstract ideal. This abstraction has the practical benefit of bundling reality into more manageable structures, yet it is a grave error to mistake the way our mind organizes reality for reality itself (Book III 3.19, 6.13). Instead, knowledge for Locke was expressly intuitive, the truth of the first glance, unpolluted by cognition, where the mind is in the single instance of being directly impressed by the phenomenal world through the senses. It is on this phenomenal moment that the certainty and evidence of all knowledge is derived (Book IV 2.1). This discipline of observation and experiment, as confined as it may be is, according to Locke, the only epistemological strategy left to inquiring minds (Book IV 3.28). Locke's work represents a coordinated but convoluted attack upon the metaphysics that came before him, destroying the doctrine of innate knowledge and the principles of certainty inscribed upon the mind (Chappell, 2003, p. 261).

Hume's work continues the empirical attack on the metaphysical tradition, with its intention of fixing all questions of truth with certainty. Empirical philosophers, who represent the common sense of mankind, are ground-

ed in the phenomenal world, thus rectifying the error of absolutism. Nature, rather, favors a mixed approach, balancing science and humanism (Hume, §4). If we were unable to associate objects in relationships, all knowledge would be limited to direct experience, making it impossible to adjust means to ends, produce good, avoid evil, and employ our natural powers. Hume's skepticism concedes that some inferences are more reasonable than others, but argues that a high ratio of inferential success does not constitute evidence of proof (Dauer, 2000, pp. 126, 133). This reverses the traditional conception that metaphysical patterns are the primary epistemological standards that determine whether or not our subjective inferences are themselves rational. Hume disabuses us of the dream of absolute truth, and thus involves knowledge in the human predicament (p. 137). He argues that the ground of the validity of our judgments and beliefs cannot be identified with the activity of reason, concluding that judgment itself must ultimately be considered a non-rational practice (Callanan, 2006, p. 363).

Hume's skepticism, though it throws us out of the metaphysical Eden, in a sense liberates us to act and make judgments as living beings within the phenomenal world. The empirical response to absolute truth is quite instructive for interdisciplinarity. Hume recognized how nature was inherently dynamic and complex, ill disposed to metaphysical absolutism. He asserted that epistemology can only be conducted in participation with the phenomenal world, and thus required an active and ongoing engagement within current environmental and social conditions. Empiricism, despite its tendencies for objectivity, restored humans to the world. Interdisciplinarity embraces this sense of complex interaction.

Kant attempted to describe reason's ability to comprehend absolute truth—how things are “in themselves”—through the accordance of cognition with its object. He acknowledges that human nature desires universal and secure criterion for truth, and this is a kind of self-evident proof that such truths must be inherent in reality. Yet because knowledge is an abstraction of subject to object, a universal and objective test of truth is impossible (Second Part III). Kant attempted to free knowledge from empirical conditions so that things in themselves may be apprehended in their unalloyed purity. Epistemological perfection is attained when plurality falls back into unity of conception. It is not the appearance of objects, but their underlying *transcendental schema*, which lie at the foundation of our pure sensory conceptions (First Division Book II 1). However, reason tends to overreach its bounds, to project itself upon the phenomenal world and draw conclusions that do not necessarily correlate with reality. Kant affirms that there is a cos-

mological order, a transcendent basis for phenomena that is intelligible by the pure understanding alone. However, questions concerning metaphysical substance, or the existence of a higher plane of absolute truth, are, for Kant, utterly without meaning.

Nevertheless, Kant argues that despite the correctness of Hume's dismissal of the epistemological power of reason alone, one can employ rational judgments that secure knowledge. His transcendental strategy maintains that we can accept the possibility of knowledge of the real world (Callanan, 2006, p. 363). Kant accepted Hume's skeptical attack on reason's ability to ground judgment, but believed that Hume went too far in denying the possibility that there are correlate structures within subjective and objective knowledge. In Kant's analysis, we can only possess knowledge insofar as we detect both regularities and differences within the manifold content of our sensory intuition (Westphal, 2003, pp. 166-167). This movement of integration between subject and object is spontaneous; its activities cannot be reduced to a purely deterministic structure. Yet, the synthesis between objective empirical knowledge and the subjective structures of cognition are not simply free; they are connected and mutually configured, thus lending legitimacy to our cognitive judgments about the world (2006, pp. 279-280). With Kant, then, the notion of absolute truth breaks down, yet asserts itself. Within the interconnection between cognitive and empirical knowledge there persists the notion that human beings experience the world at a fundamental level, not simply in our instinctual reactions to it, but also in the abstractions we make of it. Kant's essential refutation of the empiricists asserts that reality does not merely permeate our senses, but that our minds are prepared by nature to receive and organize that sensory input. Wisdom comes from recognizing that our propensity for abstraction can become delusional, and this implies that we also have the ability to recognize when we exceed our limitations, and in that reflective realization, there is the standard for truth.

Hegel understood that empirical knowledge was not built upon the reduction of truth to basic bits of sensory inputs as an epistemological foundation; rather all pathways of thought lead to the "Absolute Idea" and to the knowledge of it, which is, in fact, itself (Westphal, 2003, pp. 151-152). Universals, for Hegel, enjoy a sunken, implicit existence within natural objects, as the essences, which explain them. However much these universals may exist apart from subjects, they achieve truth in the self-consciousness of Spirit, in which all universal patterns of logical and natural being are subsumed (Findlay, in Hegel, 1977, p. xi). Absolute knowledge is simply the realization

that all forms of objectivity are identical with those of the subject, that in comprehending the world abstractly, we are seeing everything in the form of ourselves involved in the activity of conceptual unity. In its conceptual grasp of objects, consciousness necessarily grasps what itself is, and in grasping itself, it grasps every phase of objectivity (p. xxviii). Hegel proposed a sophisticated and nuanced understanding of objectivity in which higher levels of knowledge are successively attained through a kind of spiral staircase of meta-cognitive awareness, resulting from multiple iterations of the synthesis of thesis and antithesis. Hegel asserts that the Absolute is not to be comprehended, but rather felt and intuited (Hegel, §6). In the end, our cognitive awareness must eventually reach Spirit—self-supporting, absolute, real being. Absolute being is not exhausted when determined as the essence of thought, but becomes all reality, and this reality *is* knowledge (§598). This process of Spirit becoming phenomena involves it in history—Spirit emptied out into Time. The goal of Absolute Knowing, of the Spirit that knows itself as Spirit, is a recollection of the structure within which Spirit organizes itself. The philosophical recognition of this organization is epistemology, the science of knowing within the sphere of manifest appearances (§808).

By the end of this canon, the notion of absolute truth has significantly unraveled itself. According to purveyors of this canon, absolutism arises from a deep need in human nature for an eternal, static essence upon which to affix an epistemic standard. For the early members of this canon, absolute truth was a self-evident syllogism—if the mind can abstract the notion of absolute truth from reality, then absolute truth is a fundamental structure shared by both reality and mind. Although absolutism poses few epistemological problems for the monotheistic beliefs shared by these thinkers, their insistence upon reason problematizes their agenda. A spiritual connection with the divine essence of the cosmos transpires within a mindset of unquestioning serenity. The epistemological primacy of revelation permeates this lineage, yet reason itself compelled these thinkers to question this relationship. Perhaps this was the fruit of the tree of knowledge—that human consciousness came to question itself. However, it is this very capability that allows us to understand the world on an abstract, fundamental level. Members of this canon, from Plato to Hegel, characterize this meta-cognitive awareness as a kind of mythical event, a falling out of a direct communion with the Absolute, resulting in a craving to rejoin it. However, loss of absolute knowledge also created the possibility to understand the phenomenal world as only an outsider could. In order for reason to analyze the world, reasoning knowers must fall into subject/object dualism so that we may be

able to determine truth from the detached vantage point this epistemological tradition demands. The dominion of reason impels truth to undergo proof, and establish itself with the same surety as God, or at least a triangle.

This is not to say that Plato simply hallucinated metaphysics. Plato's absolute forms represent the tendency of the human mind to discern underlying patterns to the cosmos, patterns heavenly manifest in the clockwork passage of celestial bodies, in the Eureka moment when the mind discovers some fundamental principle of the universe. This moment is the recognition that the world has organizational structures of awesome power and complexity—a design not projected by the mind, perhaps imprinted upon the mind. Although reason was able to best religion in this epistemological debate, reason finally falls into itself, discovering its own inadequacy to explain the metaphysical basis for its very own method. With Hume, Kant and Hegel, absolutism unravels. Absolute truth cannot be proven beyond a reasonable doubt.

For interdisciplinarity, this ideal of absolutism is all but anathema. Though the synthesis of perspectives may be greater than the sum of its parts, the goal of integration neither crafts a holistic perspective that restores a lost wholeness nor imposes a new epistemic unity of knowledge (Klein, 2005, p. 65). Interdisciplinarity, instead, embraces a more postmodern view of epistemology which relinquishes the need for universal, absolute knowledge toward more polyvalent notions of truth that necessarily involve the clash of differences, within which mutually incompatible assumptions can all be “correct” (Newell, 1998, pp. 558-560). This allowance for essential difference is central to interdisciplinary theory while simultaneously problematizing its development—tension and conflict are integral to integration (Klein, 1996, p. 216). As Klein (2001) describes it,

differentiation produces imminent side effects in other fields that cannot be handled within the codes of the system. Indicative of this development, the problems of society are increasingly complex and interdependent. They are not isolated to particular sectors or disciplines, and they are not predictable. They are emergent phenomena with non-linear dynamics. Effects have positive and negative feedback to causes, uncertainties will continue to arise, and unexpected results will occur. “Reality” is a nexus of interrelated phenomena that are not reducible to a single dimension. (p. 48)

Although Klein's epistemological stance embraces the problematic, this

need not be a problem. Interdisciplinarity, by forsaking the comfortable stasis of absolute truth, opens itself to new and surprising insights into the nature of complexity (Klein, 1996, p. 217). At the same time, being on the epistemological fence invites critics to feed off its uncertainty, and portends questionable security and stability that some may find unsettling and others find has literal consequences for their interdisciplinary careers.

## Conclusion

By assimilating the epistemological strategies of this lineage, interdisciplinary theory can more adeptly position its response. Although critical of these strategies, interdisciplinarity is essentially synthetic, and thus interdisciplinarians must take into account the strengths and weakness of these traditional approaches to truth. The compulsion for logical determinism holds the danger of reducing complexity to mathematical algorithms and geometrical theorems, a propensity for quantifying all phenomena. At the same time, interdisciplinarians must acknowledge that this propensity opens avenues of understanding, enabling feats of engineering and numberless discoveries in both natural and social science. The domination of duality professed throughout works examined here seems simplistic, yet twoness is an essential principle in widely ranging phenomena, within consciousness and nature. The notion of absolute truth is inculcated in numerous conflicts besetting the human condition now and throughout time. Conviction of absolute truth—be it religious, philosophical or ideological—leads inevitably to intractable conflict, and too frequently to violence and atrocity. Reason, like religion, involves the assumption that truth can be attained only in accordance to its own laws; yet its adherents believe, as all ideologues do, that these laws are universal and self-evident to any intelligent mind.

This hubris may now be well impugned; however, the methods of organizing phenomena that are set forth by this canon do indeed constitute progress from ignorance and confusion. Reason has its utility, and should remain a part of the epistemological arsenal of human faculties. Truth may not be absolute, but this does not mean that human consciousness is incapable of understanding the world around it, albeit while making the world it seeks to understand. In fact, it is evident that our impact on this planet, at least, is direct, profound, and transformative. And there is reason to believe that we do, in some partial, skewed way, fundamentally know what we're doing. Interdisciplinary theory, if it is to establish an epistemology of complexity, should take into account the deep understanding of truth this canon pursued.

The groundwork established by the works presented in this paper provides a point of departure for the development of interdisciplinarity, endowing it with the benefit of two millennia of epistemological trial and error. Lessons from these trials constitute an ejection from the Eden of metaphysical absolutism offered by this canonical lineage, propelling interdisciplinary theory into the nebulous realm of difference and undecidability:

Interdisciplinary cognition is located in the attempt to construct meaning out of what initially seems to be noise...Noise occurs in the introduction of a borrowing, in addressing technical problems by drawing on competing perspectives, in developing hybrid interests, and in disrupting and restructuring of traditional practices. (Klein, 2006, p. 84)

Thus, in order to fully situate interdisciplinarity in the History of Ideas, it is necessary to explore the ways in which the canonical principles of determinism, dualism, and absolute truth were disrupted and mutated within the schools of phenomenology, post-structuralism, pluralism and pragmatism, which collectively form a more sophisticated approach to the epistemic problems arising from this lineage of canonical thinkers.<sup>13</sup>

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## Notes

<sup>1</sup> As an initial caveat, although I have substantial training and background in the discipline of philosophy, in particular the History of Ideas, I am not a philosopher; I am an interdisciplinarian. For this project, I immersed myself in the Western philosophical tradition in order to ascertain the ways in which contemporary conceptions of interdisciplinarity, as the synthesis of complexity, arises from the History of Ideas.

<sup>2</sup> A subsequent paper will deal with the way these principles became unmoored in the more recent schools of phenomenology, post-structuralism, pluralism and pragmatism, but this present work concentrates upon a canonical lineage from Plato to Hegel.

<sup>3</sup> This is not to say that such an august group of thinkers form a completely unanimous voice. The ideas of these thinkers, although interconnected and explicitly drawing upon each other over the course of the lineage, are complex and often in conflict. For example, Western philosophy is often characterized

in terms of schisms between Plato and Aristotle, or Cartesians and Empiricists. I contend that all of these schisms are themselves circumscribed by and contained within a more pervasive epistemological structure, which possesses generalizable tendencies, including reductionism.

<sup>4</sup> Hutchins edited the collection, *Great Books of the Western World*, from which this survey exclusively draws its primary source material.

<sup>5</sup> All canonical citations in this article conform to standard numbering systems commonly used for each work. Additional clarifying remarks are made for some specific works.

<sup>6</sup> All references to Aristotle “are approximate indications of the pages and columns of the standard Berlin Greek text”—*from the editors of the Great Books of the Western World*. Titles of individual works are also provided.

<sup>7</sup> Descartes’ emphasis upon mathematical abstraction and the supremacy of intellect is problematic, and subsequent members of this canon sought to reconcile his theories, while never entirely abandoning the strategy of determinism.

<sup>8</sup> All references to Hegel are according to his own section numbers in *The Phenomenology of Spirit*, denoted by the § symbol.

<sup>9</sup> Here it might be useful to differentiate between duality, the tendency to organize phenomena into polar opposites, and dualism, which usually refers more specifically to the subject/object dichotomy.

<sup>10</sup> All references to Plato are in the standard Staphanos pagination, without column letters. Specific dialogues are also identified.

<sup>11</sup> All references to Pascal’s *Pensées* are by Brunschvicg numbers.

<sup>12</sup> This understanding was developed more thoroughly by the schools of phenomenology and post-structuralism, which I will explore in a subsequent paper.

<sup>13</sup> These findings will be presented in a subsequent work.

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