

METAPHYSICS OF THE COGNITION DEBATE: A PLURIMODEL THEORY OF COGNITION

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ABSTRACT

Proponents of the dual-process theory claim that two distinct types of mental faculties or minds are responsible for human cognition. The first is evolutionarily old and not unique to humans but shared with other organisms. Type-1's key feature is autonomy from cognitive capacities; hence, it does not require working memory. Type-2 is evolutionarily recent and thought to be uniquely human. Its key feature is reflective cognitive-decoupling of Type-1 processes, if warranted; and it requires working memory. Critics, however, argue that one mind is sufficient to account for human cognition and propose a unimodel theory of cognition. The debate over these theories depends upon metaphysical notions concerning the nature of cognitive capacities and processes; and, how to investigate and explain them. In this paper, I explore these notions in terms of analyzing the metaphysical presuppositions of dualism and monism, and then the methodological approaches of holism and reductionism, as well as the ontological categories of organicism and physicalism, which are often unspecified and/or unexamined in the cognition debate. Clarification of these metaphysical notions and consideration of others is important for progressing towards the debate's resolution. To that end, a plurimodel theory of cognition—based on a metaphysical presupposition and a

methodological approach of pluralism and pragmatism, respectively, as well as on an ontological category of dynamical system—is introduced and discussed.

1 Introduction

In the past several decades, cognitive neuropsychologists have proposed the dual process theory (DPT) of cognition.¹ Proponents of DPT claim that two distinct types of mental faculties or minds are responsible for human cognition.² The first type (T1) is evolutionarily old and not unique to humans but shared with other organisms. Its key feature is autonomy from cognitive faculties and hence does not require working memory. In addition, T1 represents unconscious or preconscious, nonanalytic processes, which are relatively fast and undemanding of cognitive capacities, and it includes intuitive knowing. T1 also relies on the affective, and it correlates poorly with intelligence but strongly with personal experience. The second type (T2) is evolutionarily recent and thought to be uniquely human. Its key feature is reflective cognitive-decoupling of T1 processes, if or when warranted; and it requires working memory. T2 is analytic in nature, and consequently it is relatively slow and demanding of cognitive capacities. It includes explicit knowing, and it correlates with intelligence and consists of cognitive faculties—such as inferential reasoning. Jonathan Evans articulates the essential nature of DPT as “two minds in one brain”.³

Critics of DPT, however, argue that the dichotomous two-mind approach is not only unwarranted but that a continuous one-mind

¹Gawronski and Creighton 2013, Kahneman 2011, Sloman 2014, Stanovich 2011.

²Evans 2009, Stanovich *et al.* 2014.

³Evans 2010.

approach is sufficient to account for human cognition. For example, Arie Kruglanski and colleagues introduce a unimodel theory (UMT) of cognition, as an alternative model to DPT.⁴ UMT serves as a bridge to connect both types of reasoning with respect to the “rules of the game”, which exhibit an “if-then” structure. For example, one rule states, “If both alternatives are recognized but one is recognized faster, infer that it has the higher value on the criterion”.⁵ This UMT rule and other rules like it are operative in both intuitive and deliberate cognition. In addition, since more than a single rule is available rule selection involves a two-step process: (1) the problem and memory set the boundaries for rule choice, and (2) the processing potential and rational context then guide rule selection. The goal of cognitive research, according to Kruglanski and colleagues, is to clarify UMT rules and their operations. To that end, they propose a cognitive energetics theory in which UMT rules constitute part of a “force-field” of purposeful cognitive activity.⁶

Another DPT critic, Stephen Newstead, in commentary on a paper by Keith Stanovich and Richard West,⁷ claims that the two types of thinking Stanovich and West promote are not distinct processes. “There is a continuum”, according to Newstead, “between automatic and controlled processing...the distinction between fast and slow processing is a difference of degree than kind”.⁸ In other words, the two types of thinking dual-process theorists advocate do not represent ontologically independent processes but rather related processes occupying “opposite ends” of a spectrum. Magda Osman also proposes a similar

⁴Kruglanski and Thompson 1999, Kruglanski and Orehek 2007.

⁵Kruglanski and Gigerenzer 2011, 101.

⁶Kruglanski *et al.* 2012.

⁷Stanovich and West 2000.

⁸Newstead 2000, 690.

alternative single-system model; rather than dichotomous pairs of features describing two separate systems, the alternative model Osman posits situates cognitive processes on opposed extremes so that “representation along the continuum leads to a corresponding progression in the type of learning, from implicit, to explicit, to automatic”.⁹ In addition, Osman and Ruth Stavy utilized studies conducted on children’s cognitive development with respect to intuitive rule formation to support a dynamic graded continuum model of cognition.¹⁰

Finally, Gideon Keren and Yaacov Schul also criticize DPT and question “whether the dichotomous characteristics used to define the two-system models are uniquely and perfectly correlated”.¹¹ For Keren and Schul, the two systems are insufficiently independent; and, they claim that a “hybrid” model combining the two systems is as equally—if not more—robust than DPT for explaining cognition. They go on to propose a model similar to Kruglanski and colleagues’ UMT. According to Keren and Schul, “rather than having two qualitatively different subsystems that carry the higher order functions of the human mind, one can assume that our (single) mental apparatus is capable of shifting between many different mental states, each of which aims to solve a particular task”.¹² In other words, cognition represents a single mental apparatus in which different mental states emerge in response to varying environmental contexts, i.e. mental operations vary as a function of the task, and not because of two independent minds.

⁹ Osman 2004, 993.

¹⁰ Osman and Stavy 2006.

¹¹ Keren and Schul 2009, 537.

¹² Keren and Schul 2009, 546.

Evans and Stanovich recently responded to DPT critics, especially those proposing alternative models such as UMT.¹³ They specifically challenged Kruglanski and Gigerenzer's proposal that UMT rules can unify cognitive activity, since the nature of the rules associated with both cognitive types are different: rules associated with T1 processing are concrete while T2 rules are abstract. According to Evans and Stanovich, then, "calling both cases 'rules' would just be a semantic device to encourage the view that Type 1 and Type 2 processing can be collapsed into one entity".¹⁴ They also replied to critics who propose a continuum of cognitive activity, claiming that these critics conflate the distinction between type and mode of cognitive processing. Modes can vary, types cannot. They provide the example of superstitious thinking, which they argue is not a type of T1 processing but of T2 processing. "Because Type 2 processing is the only type of processing that is characterized by flexible goals and flexible cognitive control", Evans and Stanovich concluded, "it is variation in this type of processing that all thinking disposition measures are assessing".¹⁵ In other words, superstitious thinking involves regulation informed through cultural context.

As evident from the above review of the cognition debate between DPT and UMT proponents, metaphysical notions concerning the nature of cognitive or mental faculties and processes are often unspecified and/or unexamined. In this paper, I explore these notions in terms of analyzing first the metaphysical presuppositions: DPT's non-substance/property dualism and UMT's monism. The dualistic presupposition allows DPT advocates to approach or to investigate cognitive phenomena in terms of holism, while the monistic

¹³Evans and Stanovich 2013.

¹⁴Evans and Stanovich 2013, 231.

¹⁵Evans and Stanovich 2013, 229.

presupposition allows UMT advocates to use reductionism. Given the respective presuppositions and approaches, DPT proponents construct an ontological category of organicism to classify and explicate cognition, while UMT proponents use physicalism. Clarification of these metaphysical notions and consideration of others are important for progressing towards a resolution of the debate over cognition. To that end, a plurimodel theory of cognition—based on metaphysical presupposition and methodological approach of pluralism and pragmatism, respectively, as well as on an ontological category of dynamical system—is introduced and discussed.

2 Metaphysics of Cognition Debate

Traditionally, metaphysics pertains to the nature of concrete or abstract entities and events in both the natural and social world, including concepts such as being, existence, time, and space.¹⁶ Aristotle called it first philosophy. In addition, metaphysics pertains to the assumptions or presuppositions that form the scaffolding or worldview for investigating and explaining the natural and social worlds. The metaphysical strategy taken in this section involves first the identification and discussion of the presuppositions or assumptions that undergird the DPT-UMT cognition debate. Specifically, the presupposition of non-substance/property dualism that grounds DPT is discussed initially, followed by an examination of monism that forms UMT's presuppositional basis. These presuppositions allow then neurocognitive scientists to take a specific approach towards investigating and eventually explicating cognitive activity. For DPT that

¹⁶Loux and Zimmerman 2003, Lowe 2002.

approach involves holism, while for UMT it involves reductionism. Finally, DPT advocates utilize an ontological category of organicism, along with a notion of emergence, while UMT advocates employ the category of physicalism, along with a notion of mechanism, to account for cognition.

2.1 Metaphysical Presuppositions of Dualism and Monism

A scientist's or a scientific community's conception of nature or worldview depends upon specific background assumptions or presuppositions. R.G. Collingwood divided these background or metaphysical presuppositions into two types.¹⁷ The first he called relative presuppositions, which function as both background assumptions for asking a question under one set of conditions and for answering it under another set. For instance, use of a measuring tape presupposes that a discrete value can be realized with it (answer to a question) and that the measurement is reliable (background assumption to asking a question). The second type he called absolute presuppositions, which always constitute background assumptions for asking questions. For example, he claimed that Newton and his followers absolutely presupposed some events cause others. Importantly for Collingwood, the logical efficacy of these presuppositions, i.e. their ability to engender questions, is independent of their truth-value; rather, this efficacy depends upon their being absolutely presupposed. Moreover, absolute presuppositions are required not only for framing questions about the natural world but they are also critical for analyzing and interpreting experimental evidence. DPT presupposes non-substance/property dualism absolutely,

¹⁷Collingwood 1940.

while UMT presupposes monism absolutely—as discussed in this subsection.

In general, dualism is the metaphysical presupposition that two separate entities compose reality.¹⁸ As Robert Herbert succinctly states a version of it, dualists claim: “objects are composed of two kinds of things, sensible properties and the substances that underlie them”.¹⁹ Two types of dualism are possible, then: property dualism in which two separate properties but only one substance exists, and substance dualism in which two separate substances exist. Traditionally, dualism—especially in the philosophy of mind literature—is associated with René Descartes in which the mind represents a non-physical thinking substance or *res cogitans* while the body is a physical substance extended in space or *res extensa*.²⁰ According to Descartes’ argument, since physical entities are extended in space and since the mind is not, then, the mind is not a physical entity.²¹ Although neither of these entities can be reduced to the other, they can interact with one another, according to Descartes. For example, the mind can give rise through an act of the will to bodily actions while the body can influence mental states through sensory perceptions. This type of dualism is generally called Cartesian interactionism. Other types of dualism are prevalent in the philosophy of mind literature, such as predicate dualism, but they are not germane to the present discussion.²²

The dualism that grounds DPT, however, is not traditional Cartesian substance interactionism or some other type of contemporary dualism; rather, it is a dualistic presupposition that has its roots deep in Western

¹⁸Lowe 2000, Robinson 2003.

¹⁹Herbert 1998, 145.

²⁰Alanen 2003, Baker and Morris 2002.

²¹Descartes 1996.

²²Robinson 2003.

philosophy—binary opposition.²³ The naissance of binary opposition is often credited to Parmenides, who claimed something cannot “be” and “not be” simultaneously.²⁴ However, its modern conception originates with Ferdinand de Saussure’s linguistic work and the Structuralism movement.²⁵ For de Saussure, linguistic analysis begins with binary pairs in which each binary term is given meaning with respect to its opposite. For example, the meaning of “presence” is fully definable only with respect to the binary pair, “presence and absence”. In other words, presence’s full meaning is found in what is not absent. Schematically, given A & B then A is ~B. Claude Lévi-Strauss and Roland Barthes further developed this notion of binary opposition.²⁶ And, Roman Jakobson, in particular, championed using binary opposition for linguistic analysis and identified twelve oppositions such as vocalic and non-vocalic.²⁷ Finally, the Poststructuralist, Jacques Derrida, recognized that one of the pair often dominates the other. Derrida gave the example of the masculinity and femininity binary pair in which masculine values are more highly regarded than feminine values.²⁸

As Keren and Schul point out, the appeal of dualism for theories like DPT is its reliance on the notion of binary opposition. They cite the “simplicity principle” of Emmanuel Pothos and Nick Chater for categorizing experimental data and empirical evidence parsimoniously, to justify dichotomous thinking *vis-à-vis* binary opposition.²⁹ According to Keren and Schul,

²³Utaker 1974.

²⁴Kazmierczak 1995, Tarán 1965.

²⁵Caws 1990, Gadet 1989.

²⁶Leach 1989, Moriarty 1991.

²⁷Bradford 1994.

²⁸Powell 2006.

²⁹Pothos and Nick Chater 2002.

a dichotomy is exclusive and exhaustive (items are either in A or in B, and if an item is in A it is not in B, and vice versa), thus leaving little uncertainty and providing the feeling that one has a simple (and complete) model or understanding of an entire corpus of data (i.e., the entire world).³⁰

In other words, binary opposition provides DPT advocates with a seemingly straightforward means for explaining neurocognitive empirical studies in which test subjects perform reasoning tasks either intuitively or logically, with little or no overlap between these two processes. Consequently, dualism seems to be hardwired into the human psyche—whether the investigator or subject—when it comes to cognition, which makes DPT a seemingly formidable and insuperable theory.

In contrast to DPT's dualism, especially in terms of binary opposition, the metaphysical presupposition of UMT of cognition is monism. By monism is meant the notion that there is one ultimate substance or unifying principle that constitutes the world and its inception or origins.³¹ For UMT, especially as espoused by Kruglanski and associates, cognition depends upon a single process that utilizes a set of rules. In a critique of the reliance of DPT on binary opposition, they propose that the cognitive capacity used to apply a particular rule to a rational task gives the appearance of two sets of processes.³² What their research into parameters influencing judgment suggests, however, is that cognitive activity represents a continuum, which depends upon the relevance of the information needed to make a judgment rather than on discrete processes. And, they conclude that cognitive activity is not dualistic in terms of binary opposition, i.e. non-overlapping type 1

³⁰Keren and Schul 2009, 544.

³¹Jaworski 2011, Schaffer 2010.

³²Kruglanski *et al.* 2006.

and 2 processes. Moreover, they conclude that the UMT provides a “framework” for explicating binary oppositions, such as intuition versus rational or heuristic versus systematic. Specifically, they propose that the binary pairs represent poles along a continuum of cognitive activity, as Newstead and Osman also proposed. Thus, only a monistic process is required to account for cognitive activity, since there is no discrete ontological difference in the processes that constitute cognitive activity.

2.2 Methodological Approaches of Holism and Reductionism

A scientist’s or a scientific community’s investigation of the natural world depends upon a particular methodological approach to that world. During the first part of the twentieth century, two approaches—holism and reductionism—achieved notoriety for how best to examine and explain natural phenomena. Although holism certainly has its roots in the Aristotelian adage, “the whole is greater than the sum of its parts”, the term was only introduced in the first half of the twentieth century. Jan Smuts coined it in reaction to the prevailing approach of mechanistic reductionism. Smuts defined holism as “the ultimate synthetic, ordering, organizing, regulative activity in the universe which accounts for all the structural grouping and syntheses in it, from the atom and the physico-chemical structures, through the cells and organisms, through Mind in animals, to Personality in man”.³³ Given the expansive nature of holism, Smuts realized that the scientific community might take the notion as “a mere assumption which may have a philosophical or metaphysical value, but that it has no scientific importance, as it cannot be brought to the test of actual facts and

³³Smuts 1927, 326.

experiments”.³⁴ Indeed, the scientific community did respond as he presaged and it did not widely accept the concept.³⁵

However, in post-genomic and systems biology of the late twentieth and early twenty first century, the notion of holism has resurfaced as a means for addressing the complexity of biological phenomena.³⁶ Contemporary holism involves an approach by which a scientific community investigates natural phenomena in their wholeness or integrity because “the properties and behavior of ‘whole’ systems or objects (cells, persons, societies, etc.) cannot be reduced to, or explained fully by reference to, the properties and behavior of their parts”.³⁷ In other words, the simple summation of the properties of the individual parts constituting a phenomenon cannot account for its overall properties; rather, the properties of the phenomenon *qua* whole arise from its structure or organization, and the relationships among the different parts. Thus, the behavior of a phenomenon is irreducible to the behavior of its parts and reflects its unique and specific organization. Finally, causation is top-down in which higher-ordered structures regulate and temper the activities of lower-ordered structures.³⁸

Although various types of holism—or antireductionism for some like Thomas Nagel who contrast it strictly with reductionism—are proposed in the literature, only epistemological or theoretical holism, methodological holism, and ontological holism are examined in the

³⁴Smuts 1927, 330.

³⁵Andersen 2001.

³⁶Gatherer 2010.

³⁷Woodhouse 2000, 155.

³⁸Although top-down or downward causation remains controversial, it is beginning to gain support (Ellis *et al.* 2012).

present section.³⁹ Epistemological or theoretical holism pertains to the discovery or formulation of organizational laws that are required for explicating the behavior of a phenomenon. In antireductionist terms, theories and laws pertaining to the holistic dimension are not reducible to lower level theories and laws governing the constitutive elements of it. Methodological holism refers to empirical and experimental investigations that maintain a phenomenon's integrity or coherence. In antireductionist terms, holistic protocols do not compromise organizational structure or reduce it to component parts in order to study the part and then synthesize the phenomenon based on the properties of its parts. Ontological holism also pertains to the distinctiveness of a phenomenon *vis-à-vis* its components, i.e. a phenomenon *qua* whole is not simply representative of an aggregation of its components. In antireductionist terms, a phenomenon's properties are not reducible to properties of its parts. Finally, ontological holism also pertains to causation, as mentioned earlier, in that higher-order structures can causally influence its parts and regulate them, i.e. top-down causation. In antireductionist terms, causation is not simply bottom-up in terms of the traditional analytic-synthetic method.⁴⁰

Holism is the approach of neuropsychologists advocating DPT to investigate and explicate the nature of cognition. In terms of epistemological or theoretical holism, DPT *qua* theory of cognition approaches cognitive activities as the complex interaction of two predominant processes, which are responsible for specific cognitive activities. In other words, cognition is not reducible to one particular

³⁹Nagel 1998, see also Edmonds 1999, Esfeld 2001, Fodor and Lepore 1992, Gatherer 2010, Rosenberg 1998.

⁴⁰The traditional analytic-synthetic method refers to the resolution of a phenomenon into its constitutive parts (analysis) and the reconstitution of those parts into the phenomenon (synthesis). For further discussion, see Cellucci (2013, 142).

process, such as rule utilization. In terms of methodological holism, DPT represents investigation of cognitive activities at multiple levels to maintain their integrity. In other words, cognitive activities cannot be investigated without investigating them *vis-à-vis* other activities as well. As for ontological holism, DPT provides a means for exploring the differences in cognitive activities among cultures. For example, Richard Nisbett and colleagues demonstrated that Eastern cognition is often context-dependent and concrete compared to Western cognition, which is generally context-independent and abstract.⁴¹ According to Emma Buchtel and Ara Norenzayan, DPT provides a means for explicating these differences.⁴² Eastern cognitive activities reflect predominantly T1 processing, although not exclusively, while Western chiefly T2 processing, although again not exclusively.

Throughout the twentieth century, reductionism was the predominant approach towards investigating nature, especially biological phenomena. For example, biologists aimed to reduce inheritance in terms of classical genetics to molecular genetics.⁴³ Briefly, reductionism refers to the investigation and understanding of natural phenomena, such as living organisms, in terms of their component parts. “Reductionism”, according to Thomas Nagel, “is the idea that all of the complex and apparently disparate things we observe in the world can be explained in terms of universal principles governing their common ultimate constituents: that physics is the theory of everything”.⁴⁴ The drive to reduce natural phenomena and the scientific theories accounting for them to one theory, i.e. a theory of everything,

⁴¹Nisbett *et al.* 2001.

⁴²Buchtel and Norenzayan 2009.

⁴³The reduction of classical genetics to molecular genetics is a controversial topic (Sachse 2007, Sarkar 1998).

⁴⁴Nagel 1998, 3.

was part of a larger effort, especially by the early twentieth century logical positivists and their academic descendants, to unify the sciences—particularly in terms of the physical sciences.⁴⁵

Although various types of reductionism have been identified and discussed in the literature, only epistemological or theoretical, methodological, and ontological reductionism—to parallel the types of holism—are considered in this section.⁴⁶ Epistemological or theoretical reductionism refers to the articulation of knowledge at higher levels of organization within terms of lower levels. For example, an organism's phenotype can be expressed in terms of its genotype, which, in turn, can be specified with respect to a particular nucleotide sequence. Thus, biological laws governing organismic activities can be articulated sufficiently—if not completely—in chemical and/or physical laws, although such reduction has yet to be achieved fully. Next, methodological reduction involves investigating the constitutive parts of a phenomenon in order to characterize them and to synthesize the phenomenon based on their characterization. Finally, ontological reductionism pertains to an indistinctiveness of the phenomenon *vis-à-vis* its components, i.e. a phenomenon simply represents an aggregation of its components. In other words, properties of the phenomenon *qua* whole are a summation of the properties of its parts. Ontological reductionism also states that causation is from bottom-up in that the components constituting a phenomenon are sufficient to account for it synthetically.

For proponents of UMT, epistemological or theoretical reductionism refers to explicating cognitive activities in terms of rule-based activity alone. In other words, DPT can be reduced to UMT in that the cognitive processes involved in intuitive reasoning or T1 processing depend

⁴⁵Oppenheim and Putnam 1958, Trout 1991.

⁴⁶Marcum and Verschuuren 1986, Sachse 2007, Sarkar 1992.

exclusively on rule-based activities comparable to those of deliberative reasoning or T2 processes. Moreover, UMT relies on methodological reductionism in that cognitive activity like DPT's T1 and T2 processes are similar or even identical *vis-à-vis* rule selection and utilization to perform a cognitive task, i.e. cognition represents employment of a rule or set of rules under a particular situation. In other words, cognition can be investigated simply as an aggregation of the rules used to make a judgment. Importantly, according to UMT advocates, "the same rules can underlie both intuitive and deliberate judgments".⁴⁷ Finally, ontological reductionism for UMT involves bottom-up causation in that the rule or set of rules employed in cognitive activities, whether intuitive or deliberative, are sufficient to account for it synthetically, while for DPT advocates both intuitive and deliberative activities are ontologically distinct—not a trivial distinction.

2.3 Ontological Categories of Organicism and Physicalism

A scientist's or a scientific community's metaphysical presuppositions and methodological approaches lead to constructing ontological categories, which represent the nature of the kinds or sorts of entities that constitute or exist in the world, whether natural or manufactured. Jonathan Lowe identifies four ontological categories, including propositions, sets, masses or material bodies, and organisms or living bodies.⁴⁸ The categories are part of a hierarchy, such that propositions and sets are derived from the category of abstract objects, and masses and organisms from the category of concrete objects. In turn, abstract and concrete objects are derived from the category of objects, which is

⁴⁷Kruglanski and Gigerenzer 2011, 106.

⁴⁸Lowe 2006, 2011.

derived from the category of an entity's particularity in contrast to the category of its universality. Each of these categories, according to Lowe, is "individuated by the distinctive existence and/or identity conditions of their members".⁴⁹ For the category containing masses those conditions are predominantly physical, while for that containing organisms they include, besides the physical, also the organic and its adaptability. In this section, the reasons are examined why DPT proponents often construct an organicist category and UMT proponents construct a physicalist category to classify cognitive capacities and activities.

Although the roots of organicism extend back to the Greeks with Aristotle's adage about the relationship between parts and wholes, the notion achieved widespread attention in the late nineteenth and early twentieth centuries.⁵⁰ Probably the most celebrated champions of organicism in the English-speaking countries were the members of The Theoretical Biology Club, which met in Cambridge and Oxford prior to World War II and afterwards in London until 1952, when it failed to obtain funding from the Rockefeller Foundation.⁵¹ Members of the club included Francis Huxley, Peter Medawar, Dorothy and Joseph Needham, Karl Popper, Conrad Waddington, Joseph Woodger, and Dorothy Wrinch. The club's goal was to tackle and possibly resolve the following problem: "What is the relation between those large particles which we call elephants, trees, or men, and those extremely small ones which we call molecules or electrons?"⁵² Alfred North Whitehead's philosophy of the organism was influential among the club's members, especially in terms of providing a moderate position between—or an alternative to—

⁴⁹Lowe 2006, 6.

⁵⁰Allen 2005, Haraway 1976, Phillips 1970.

⁵¹Hall 1999, Ho 1997.

⁵²Senechal 2012, 127.

the extremes of mechanism and vitalism.⁵³ Two of the major criticisms or complaints against organicism are ambiguity with respect to defining its nature and its association—albeit loose—with vitalism.⁵⁴

Denis Phillips, in a historical analysis of the notion of organicism identifies five versions of it in the literature. The first represents a rejection of biological mechanism as adequate for explicating organism *qua* whole, particularly in terms of the kinds of relationships required to constitute the organism. As Phillips notes, this version has served as the basis for the other four. The second version is predicated on the Aristotelian adage that the properties of the organism *qua* whole are greater than the sum of the properties of its parts, while the next claims that the organism itself determines the properties of its parts. The fourth version asserts that the properties of the parts cannot be “understood”, if isolated from the organism as a whole. Phillips acknowledges that advocates of this version of organicism are unclear by what is meant by the term, “understood;” but, he offers this defense: “the intention of organicists probably was to state that the nature of the parts (i.e., their defining characteristics) cannot be known if the parts are considered in isolation from the whole”.⁵⁵ The final version proposes that an organism’s parts dynamically interrelated and interdependent upon one another.

Although organicism was eclipsed temporarily during mid-twentieth century, it reappeared in the late twentieth to early twenty-first century.⁵⁶ For example, Scott Gilbert and Sohotra Sarkar propose a version of organicism they call materialist holism, which they claim accounts for the emerging complexity seen during developmental

⁵³Morgan 1926, Needham 1928.

⁵⁴El-Hani and Emmeche 2000, Gutmann and Neumann-Held 2000, Sheldrake 198.1

⁵⁵Phillips 1970, 418.

⁵⁶Gilbert and Sarkar 2000, Denton *et al.* 2013.

processes. This holism is materialist in order to distinguish it from vitalist holism. To that end, they combine both bottom-up and top-down causation and identify the combination as a mechanistic property of living organisms. “The properties of any level depend”, as Gilbert and Sarkar go on to explain, “both on the properties of the parts ‘beneath’ them and the properties of the whole into which they are assembled”.⁵⁷ At a higher level, properties emerge from the interactions of the underlying parts.⁵⁸ In addition, the emergent properties exhibit regularities that can be accounted for through organismic laws. Gilbert and Sarkar recognize that some organicists claim emergent properties are unpredictable and so cannot be accounted for *via* such laws. However, they argue that emergent properties can be used to explain organismic behavior, even though it is unpredictable, and they cite evolutionary history as an example.

DPT’s ontological category is organicism, in the sense that cognition represents an emergent property that cannot be reduced to the property of anyone component comprising either T1 or T2 processes. In terms of Phillips’ versions of organicism, DPT represents an example of the final version in which the different cognitive processes are dynamically interdependent and interrelated to one another. In other words, T1 processes are intimately related or connected to T2 processes, e.g. *via* T2 oversight processing. T2 processing can decouple T1 processes if T1 output appears questionable, delaying a cognitive decision until a reasoned decision is made *via* T2 processing. Moreover, a change in the properties of T2 processes can have an impact on a cognitive outcome. For example, if T2 processing does not override a questionable T1 output when necessary then an error in judgment could be made. Moreover, James McClelland identifies various

⁵⁷Gilbert and Sarkar 2000, 2.

⁵⁸Chalmers 2006, Goldstein 1999, Kim 2006, Mitchell 2012.

constructs within cognitive science that represent “emergents.” Specifically, he lists architectural constructs, such as attention and memory, and cognitive processes and their outcomes, such as beliefs and inferences.⁵⁹ Certainly, DPT includes each of these constructs.⁶⁰ In sum, the distinctive existence and/or identity conditions of the cognitive processes of DPT are organic, i.e. adaptable, in nature and not simply or strictly reducible—in contrast to UMT—to the physical.

Physicalism is the metaphysical category in which reality is explicated narrowly in terms of matter or material substance and forces acting upon it.⁶¹ It is considered the successor of materialism, which holds that the world is composed of matter only, since physicalism incorporates notions of physical forces and energy.⁶² “Physicalism”, according to Andrew Melnyk, “is roughly the thesis (1) that every entity is either itself a physical entity or is exhaustively composed, ultimately, of physical entities, and (2) that every property is either itself a physical property or is realized, ultimately, by physical properties”.⁶³ The world—whether living or not—is made up of physical stuff, and this stuff interacts in a mechanical or mechanistically way.⁶⁴ In other words, the world is a machine composed of individual parts that operates consistently and predictably for the most part, given a specific input that, in turn, determines an outcome. For physicalism machines cannot adapt, in contrast to organicism where organisms can.

UMT’s ontological category, especially as Kruglanski and colleagues define UMT, is physicalism.⁶⁵ It is not physical in the sense of matter

⁵⁹McClelland 2010.

⁶⁰Evans 2010, Stanovich 2011.

⁶¹Stoljar 2010.

⁶²Ney 2008, Papineau 2001.

⁶³Melnyk 1997, 622.

⁶⁴Machamer *et al.* 2000, Woodward 2002.

⁶⁵Kruglanski *et al.* 2012.

only, for that is strictly materialism; rather, cognitive rules are analogous functionally to physical forces in the sense that as forces can (and can be used to) act upon matter to transform and shape it, so rules can be employed to make decisions and judgments under given epistemic conditions. Rules, then, are the cognizing force undergirding epistemic faculties, whether intuitive or deliberative, and form part of UMT's "force-field" of purposeful cognitive activity. Moreover, they are comparable to laws of nature in causal terms in that these rules are followed mechanistically in terms of a computational theory of cognition.⁶⁶ According to some, cognition is analogous to digital computation in which rules provide the software to analyze experiential data in order to generate a cognitive or an epistemic output.⁶⁷ In other words, cognitive agents are like "digital computers" in a very real and ontological way.⁶⁸

3 Plurimodel Theory of Cognition

It appears that the debate between proponents of DPT and UMT of cognition has reached an impasse because of the limits associated with the metaphysical, methodological, and ontological notions informing the debate.⁶⁹ The metaphysical presuppositions of DPT and UMT are too

⁶⁶Mackor 1998, Newell 1990, Searle 1990, Simon 1996.

⁶⁷Block 2009.

⁶⁸Pylyshyn 1989.

⁶⁹Evans and Stanovich (2013) recently addressed the DPT-UMT debate, especially in terms of the criticism by UMT proponents that cognition represents a continuum of processing styles and not discrete types, and defended a default-interventionist model in which Type-2 processes can intervene on Type-1 processes. In response, Kruglanski

parsimonious to capture the extensive nature of cognition. And, their methodological approaches are often so constrained and myopic that they distort cognitive phenomena. Finally, the ontological categories are not robust enough to account for the causal complexity of cognition. In response to the apparent impasse associated with the debate between advocates of DPT and UMT, a plurimodel theory (PMT) of cognition—based on a metaphysical presupposition of pluralism, a methodological approach of pragmatism, and an ontological category of dynamical system—is introduced and discussed in this section.

PMT’s metaphysical presupposition is a contemporary form of pluralism, particularly an ontological pluralism. As a presupposition, ontological pluralism represents different ways of being or existing.⁷⁰ The different ways of being are predicated upon “different *kinds of things*”.⁷¹ And, the different kinds of things exist or “be” because they “behave fundamentally differently”.⁷² Moreover, the different things can vary with respect to spatial-temporal dimensions, a different “being-at,” and in terms of their properties, a different “being-in”.⁷³ For PMT, ontological pluralism expands the cognitive world to include a larger context, such as the body, other persons, and/or the environment, to account for different ways in which cognitive agents function. For example, metacognition involves the ability to reflect about thinking, which includes the manipulation and regulation of metacognitive knowledge and experience.⁷⁴ Neither DPT nor UMT can account fully for metacognition, since either reduces the process to

(2013) charged that Evans and Stanovich’s model appears similar to a single-process model.

⁷⁰McDaniel 2009, Turner 2010.

⁷¹Turner 2012, 421.

⁷²Spencer 2012, 916.

⁷³McDaniel 2010, Spencer 2012.

⁷⁴Papaleontiou-Louca 2008, Proust 2013, Tarricone 2011.

individualized, localized components or cortical areas.⁷⁵ PMT's metaphysical presupposition of pluralism, however, provides a rich ontological framework, especially in terms of extending cognition to environmental contexts outside cortical areas, sufficient to explicate the complexity of metacognitive processes, rather than restricting the cognitive world to two processes or even to one process.⁷⁶

PMT's pluralistic presupposition has a significant impact on the methodological approach to cognition. The approach is pragmatic with respect to both holism and reductionism, in that either approach is mobilized practically when needed to investigate a phenomenon like cognition.⁷⁷ Neither extreme holism nor extreme reductionism is sufficient for examining everything about a phenomenon. Sometimes a practical or moderate approach is required. According to Bruce Edmonds, "we accept that there are some worthwhile problems where the reductionist technique works well and we also accept that there are problem domains where the chances of a reductionist technique working are so remote and the problem so important that we value other forms of knowledge about it".⁷⁸ An interesting example of this approach is the meta-theoretical analysis of theories of cognition that takes a pragmatic approach in terms of utilizing both holism and reductionism. This approach allows the comparison and possible

⁷⁵See Arango-Muñoz 2011, Shea *et al.* 2014, Thompson *et al.* 2011. Interestingly, in order to evade the restrictions of DPT's dualism with a move towards pluralism, Evans proposes a hybrid model in which both types of cognitive faculties stream through "a type 3 processing system which is responsible for (optionally) recruiting working memory and type 2 processing, and for resolving conflict, if required, between the two systems" (2009, 48).

⁷⁶Barutta *et al.* 2011.

⁷⁷Historically, pragmatism is considered an anti-metaphysical approach to the world but it can provide a particular way of viewing it in order to structure questions about it and to design methods to investigate it (Hook 1927, Pihlström 2009).

⁷⁸Edmonds 1999, 70.

integration of apparently disparate theories of cognition, such as connectionist, embodied, and extended theories of cognition, from a pragmatic perspective.⁷⁹ The advantage of such an approach for PMT proponents is the avoidance of myopia in which cognition is distorted methodologically.

Finally, PMT's metaphysical presupposition of pluralism and methodological approach of pragmatism provide the basis for constructing its ontological category, which is dynamical system. Definitions of dynamical system range from things in motion to vector fields mapped onto manifolds.⁸⁰ Although no consensus definition of dynamical system is presently available in the literature, dynamical system can be defined generally as "the study of processes that unfold over time in a deterministic manner (absent any perturbations), from an initial state, based solely on the functional relationships among the variables in the system".⁸¹ More formally, a dynamical system is characterized by temporal development or evolution of a system in terms of a set of all possible states or state space, a set of all possible temporal moments, and an evolution operator for transforming one space state to another at any given moment.⁸² According to Randall Beer, for a dynamical system, "the explanatory focus is on the structure of the space of possible trajectories and the internal and external forces that shape the particular trajectory that unfolds over time".⁸³

Dynamical system has been applied to cognition, especially in terms of all possible thoughts and actions of a cognitive agent.⁸⁴ "Cognitive dynamic systems", according to Simon Haykin, "build up rules of

⁷⁹Barutta *et al.* 2011.

⁸⁰van Gelder 1998.

⁸¹Gelfand and Engelhart 2012, 2.

⁸²Port 2006.

⁸³Beer 2000, 96.

⁸⁴Haken 1996, Port 2006, van Gelder 1998.

behavior over time through learning from continuous experiential interactions with the environment, and thereby deal with environmental uncertainties".⁸⁵ A cognitive dynamical system, then, provides ontologically the needed complex state-space manifold on which to map the mental activities as the cognitive agent makes rational decisions or judgments over given periods of deliberation, whether intuitively or reflectively. Moreover, it offers a more feasible alternative to explaining, especially developmentally, cognitive behavior than traditional theories such as representational or computational theories of cognition. For example, a cognitional dynamic system analysis of the Piagetian A-not-B error study provides a robust explanation for the error—since it incorporates attentional and visual processes, motor processes, and short-term and long-term memory processes—compared to other explanations, including Piaget's original explanation in terms of the child's immaturity with respect to conceptualizing object permanence.⁸⁶ In sum, PMT's ontological category captures the dynamism and complexity of cognitive activities, in contrast to DPT's organicist ontology of emergence and UMT's physicalist ontology of deterministic mechanism.

4 Conclusion

The metaphysical presuppositions and methodological approaches, along with their attendant ontological categories, are critical for analyzing and moving towards resolving the cognition debate between advocates of DPT and UMT. In particular, DPT's metaphysical

⁸⁵Haykin 2006, 1911.

⁸⁶Thelen and Smith 1994.

presupposition of pluralism captures the extensive nature of human cognition as compared to the metaphysical presuppositions of either DPT or UMT, which are too parsimonious. And, its approach of pragmatism provides a comprehensive method for investigating human cognition as compared to the limited and overly myopic approaches of DPT and UMT. And lastly, its ontological category of dynamical system is sufficiently robust to account for the complexity of human cognition as compared to the ontological categories of DPT and UMT, which are too constrained in terms of representing the causal interrelatedness of cognitive processes.

Finally, the proposed PMT of cognition not only provides the philosophical resources for addressing the DPT-UMT debate and possibly resolving it but it also affords “a unified theoretical framework for cognitive science, as well as an understanding of the emergence of cognition in development and evolution”.⁸⁷ As noted earlier, this is especially true for integrating various theories of cognition, ranging from the connectionist theory to the extended theory of cognition.

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⁸⁷Beer 2000, 97.

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